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The National Institute of Engineering

(An Autonomous Institute under Visvesvaraya Technological University, Belagavi)

THE NATIONAL INSTITUTE OF ENGINEERING

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TOTAL	**39**	**28**	**9**	**10**	**27**	**25**	**10**	**7**	**20**	**0**	**175**

NC- National Conference, **IC**– International Conference, **NJ**- National Journal,
IJ- International Journal, **B** - Book

Department
of
Civil Engineering

Seismic Internal Stability Analysis of Modular Block Reinforced Earth Retaining Wall

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ABSTRACT

In India, Mechanically Stabilized Earth (MSE) walls are used extensively for fyovers in highways, slope protection works, and railway and airport projects. Recently, many failures of MSE walls have been reported and these wall failures resulted in excessive deformations or collapsed altogether. The primary causes could be insufcient or improper design and construction. In particular, a focus on stability analysis and design is needed. This study focuses on detailed static and seismic stability analysis taking into consideration the efect of various vital parameters. This study mainly aims at numerical modeling using FEM and analytical calculations as per the guidelines of AASHTO, BS8006, and China railway code TB10025. Parametric analysis has been carried out using a numerical tool GEO5, consideringtheefect of soil type, wall-fascia inclination, the vertical spacing between reinforcements, soil reinforcement interaction, the tensile strength of reinforcement, and surcharge magnitude. Internal stability results of Modular Block Reinforced earth retaining wall (MBW) obtained from AASHTO, BS 8006, and China Railway code TB 10025 design guidelines, show that safety factors against pullout and rupture are in close range. Backfll soil with well-graded gravel (GW), well-graded sand (SW), and poorly graded gravel (GP) has yielded good results for internal stability. The Factor of Safety (FS) against pullout failure is reduced by 15–50%, as the inclination angle increases from 50°to 90°. FS values against pullout, rupture and slip are higher for a greater number of reinforcements. FS values against pullout, rupture and slip are higher for a greater number of reinforcements. Pullout and slip resistance in the reinforcement is independent of the tensile strength of the reinforcement. For lesser magnitudes of surcharge, FS against pullout, slip, and rupture is maximum. The conclusions derived from the results of this study give a better idea of understanding the behavior of the MSE wall associated with geotechnical materials.

***Full paper:** *International Journal of Geosynthetics and Ground Engineering. vol. 9, no. 31, 2023*

Finite Element Analysis of Segmental Precast Concrete Panel Reinforced Earth Retaining Wall

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ABSTRACT

Reinforced earth retaining walls are being utilized more frequently in civil infrastructure projects as an alternate design structure to typical reinforced concrete walls and other structures for supporting backfill. The objective of the present study is to model and analyze a 2-dimensional Segmental Precast Concrete Panel (SPCP) wall using the 2-dimensional finite-element tool PLAXIS and analyze the behaviour of the wall concerning the effect of reinforcement type and surcharge loads. The present work also includes the investigations of the effects of reinforcement type and surcharge loads, as well as the influence of different supporting systems on the deformations and ground-surface settlements of the SPCP wall. Ribbed steel reinforcements, Polyethylene Terephthalate (PET) geogrids and Density Polyethylene (HDPE) geogrids are used to evaluate the wall deformations for reinforcement types. For ribbed-steel reinforcement, ground settlements and wall deformations are 14% and 25% less compared to those of PET and HDPE geogrid reinforcements, respectively. With the increase in surcharge on the backfill soil, wall deformations and surface-ground settlements are increased significantly by 150%. To decrease the deformations of walls resting on soft soil, pile foundations and aggregate piers are considered as supporting solutions. In the case of reinforced blocks with pile foundation as supporting systems, the wall deformations and settlement are 60% lesser than for aggregate pier supporting systems.

***Full paper:** *Jordan Journal of Civil Engineering, vol. 17,no. 4, 2023*

Numerical analysis of pile group, piled raft, and footing using finite element software PLAXIS 2D and GEO5

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ABSTRACT

Foundation plays a vital role in weight transfer from the superstructure to substructure. However,foundation characteristics such as pile group, piled raft, and footing remain unfolded due to their highly non-linear behaviour in diferent soil types. Bibliography analysis using VOSvierwer algorithm supported the signifcance of the research. Hence, this study investigates the load-bearing capacity of diferent types of foundations, including footings, pile groups, and piled rafts, by analyzing experimental data using fnite element tools such as PLAXIS 2D and GEO5. The analysis involves examining the impact of various factors such as the infuence of surcharge and the efect of diferent soil types on the load-bearing capabilities of the diferent types of foundation. For footing, parametric investigations using PLAXIS 2D are conducted to explore deformational changes. Pile groups are analyzed using GEO5 to assess their factor of safety (FOS.) and settling under various criteria, such as pile length and soil type. The study also provides insight into selecting the right type of foundation for civil engineering practice. Findings showed that diferent soil types have varying deformational behaviours under high loads with sandy soil having less horizontal deformation than clayey soil. Also, it was observed that increasing the pile thickness by 50% resulted in a reduction of 13.88% in settlement and an improvement of 16.66% in the FOS. In conclusion, this study highlights the importance of professionalism, exceptional talent, and outstanding decision-making when assessing the load-bearing capabilities of various foundation types for building structures.

***Full paper:** *Scientific Reports. vol. 13, no. 15875, 2023*

Role of Clay Mineralogy in the Estimation of Permeability Coefficient in Compacted Fine-grained Soils

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ABSTRACT

The Foundations constructed upon the soils is depending upon the three major criteria i.e., strength, stiffness, and stability, In all three cases, the subsoil is expected to be in a compacted state. In coarse-grained soils, the result of compaction is a problem of substantiality, whereas physicochemical sort of response for fine soils. There is comparatively limited research known about the effects of clay mineralogy on the permeability properties of fine-grained soils, as well as different placement conditions and energy levels. In this study, consolidation behavior will be estimated for the six field soils and one artificial soil having different liquid limits, the Mineralogical composition of clay, and its plasticity properties under placement conditions like 95% of the γd max on dry and wet sides, and at OMC. The permeability behavior of these soils under study is computed by calculating the IS Light and Heavy Compaction energy levels' corresponding consolidation properties (Cv and Mv) using five practical approaches that have been described in the literature. The coefficient of permeability (K) of soils is calculated accurately with a fair degree of accuracy by 1-D consolidation test data like Cv and Mv. The estimated values of K were compared with the K values obtained from experimental studies under various stages of loading, and it was observed that there was good agreement between the two. These results were validated using Abaqus software through Finite Element Modelling analysis.

***Full Paper:** *Civil Engineering and Architecture, vol. 11, no. 2, pp. 629-651, 2023*

Compression Curves and Compression Indices of Compacted Montmorillonitic and Kaolinitic Soils

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ABSTRACT

The engineering behaviour of fne-grained soils is a dominant function of their clay mineralogical composition. Based on their dominant clay mineralogical composition, the natural fne-grained soils may be grouped as montmorillonitic soils, kaolinitic soils and montmorillonitic-kaolinitic soils. This article presents the e-log σ′ behaviour and compression indices of compacted montmorillonitic and kaolinitic soils at salient points along their compaction curves. It is shown that in spite of having almost the same liquid limit and or plastic limit, compacted montmorillonitic and kaolinitic soils exhibit vastly diferent e-log σ′ behaviour and compression indices, irrespective of the placement conditions. It is illustrated that the compacted montmorillonitic soils exhibit higher compression indices than the compacted kaolinitic soils under any placement condition. The results from the present study are hoped to have practical values while selecting the type of soil and or placement conditions for better performance of geotechnical structures where compaction is preferred to be adopted.

***Full paper:** *Geotechnical and Geological Engineering, vol. 42, pp. 755-765, 2023*

Ageing Effect on Shear Strength of Mixed Kaolinite-Bentonite And Sand Clay Minerals

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ABSTRACT

Fine-grained soils are mainly composed of kaolinite, montmorillonite, illite clay mixtures in various ratios beside sand in the natural world. Only demographically significant areas are being studied for the shear behavior of these soils, which takes a lot of time and money. Clay's basic behaviour demonstrates a lower shear strength magnitude, In order to solve this issue, extensive research was done to boost clay's shear strength. In view of increasing shear strength of clay , in this experimental study , different proportions of clay minerals were taken namely kaolinite ,bentonite and natural sand, which depict the kaolinitic , montmorillonitic and sand in nature. At the outset, out of 3 ingredients, Bentonite was kept constant at 10% and other ingredients namely kaolinite & sand were varied with minimum and maximum fines in the mix proportions. Further similar sets of experimentation were done with Kaolinite & Sand variations as explained, each time keeping the bentonite proportion constant at variation from 20 to 80%. Each sample with the pre-decided proportion was tested for its unconfined compressive strength by fixing the OMC and MDD as per required value which were done precedingly. Prepared samples were kept in plastic pouch for the period of 30,60 and 90 days . These samples were also observed for SEM analyses for microstructure study. From this experimental analysis it was observed that the unconfined compressive strength and shear parameters like cohesion, and angle of internal friction were increased with different ageing span varying from zero to 90 days and also analysed in terms of their respective microstructures. The results shows that the trend of increasing shear strength with 0 to 90 days of ageing effect as well as increase in Bentonite content in the mix proportion . Unconfined compressive strength (qu) increased from 78 kpa to 110 kpa(for minimum bentonite of 10%) with increase in ageing from 0 to 90 days and observed 140 kpa to 204 kpa with the increase of bentonite in the mix proportion (maximum content of 80%) subjected to ageing effect from 0 to 90 days . From SEM analysis it was observed that crystalline white lumps and agglomerate structure were formed with increasing bentonite content in the mix proportion and ageing effect from zero to 90 days. It was responsible for the increase in strength and shear parameters of the mix proportion.

*__Full paper:__ *Tuijin Jishu/Journal of Propulsion Technology*, vol. 44, no. 4, 2023

Non-Rectangular Plates With Irregular Initial Imperfection Subjected To Nonlinear Static And Dynamic Loads

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ABSTRACT

This manuscript deals with the static and dynamic buckling of plates with non-rectangular shapes. The plate has an uneven imperfection and is made of natural composite materials. The model is validated with the existing results. The static buckling loads and the first natural period of the plate are first evaluated. Then, the imperfections are incorporated in the form of the first five buckling mode shapes, and the plate is subjected to in-plane loads. The effect of imperfection and inclination of the edges on the behaviour is evaluated. It is observed that due to the difference in the first five buckling mode shapes of the plates, the plates do not show any definite trend in both nonlinear static loading and nonlinear dynamic loading cases.

***Full paper:** International Journal of Advances in Engineering Sciences and Applied Mathematics, vol. 15, no. 4, pp. 155-158, 2023*

Studies on The Post Crackingbehaviour of Recycled Aggregateconcrete Beams Atelevated Temperature

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ABSTRACT

Purpose – The majority of previous studies made on Recycled Concrete Aggregates (RCA) are limited to theutilisation of non-structural grade concrete due to unfavourable physical characteristics of RCA including thehigher absorption of water, tending to increased water requirement of concrete. This seriously limits itsapplicability and as a result it reduces the usage of RCA in structural members. In the present study, the impactof hybrid fibres on cracking behaviour of RCA concrete beams along with the inclusion of reinforcing steel barsunder two-point loading system exposed to different sustained elevated temperatures are being investigated.Design/methodology/approach – RCA is substituted for Natural Coarse Aggregates (NCA) at 0, 50 and 100percentages. The study involves testing of 150mmcubes and beams of size (70031503150)mm, i.e. with steelreinforcing bars along with the addition of 0.35%Steel fibresþ 0.15%polypropylene fibres. The specimens arebeing exposed to temperatures from 1008 to 5008Cwith 1008 interval for 2 h. Studies weremade on the post crackanalysis,which includes themeasurement of crackwidth, crack length and load at first crack. The crack patternswere analysed in order to understand the effect of fibres and RCA at sustained elevated temperatures.Findings – The result shows that ultimate load carrying capacity of reinforced concrete beams and load atfirst crack decreases with the raise in temperatures and increased percentage of RCA content in the mix.Further that 100% RCA replacement specimens showed lesser cracks when compared to the other mixes andthe inclusion of fibres enhances the flexural capacity of members highlighting the importance of fibres.Practical implications – RCA can be used for structural purposes and the study can be projected forassessing the performance of real structures with the extent of fire damage when recycled aggregates are used.Social implications – Most of recycled materials can be used in the regular concrete which solves twoproblems namely avoiding the dumping of C&D waste and preventing the usage of natural aggregates. Hencethe study provides sustainable option for the production of concrete.Originality/value – The reduction in capacity of flexural members due to the utilisation of recycledaggregates can be negated by the usage of fibres. Hence improved flexural performance is observed forspecimens with fibres at sustained elevated temperatures.

***Full paper:** *Journal of Structural Fire Engineering, vol. 14 no. 4, pp. 501-521. 2023*

A Review on Shear Strengthening of Reinforced Concrete Beam Using NSM-FRP Technique

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ABSTRACT

This study summarizes recent research on near-surface mounted (NSM) technique to strengthen RC (Reinforced Concrete) beams to enhance its shear capacityby using fiber-reinforced polymers (FRP). This technique falls under the category of fibre based materials. Because of the advantages in terms of simplicity of installation, increased stiffness, strength and durability, FRP composites are gaining popularity across the globe. This paper provides an outline of the near-surface mounting (NSM) techniques to strengthen existing structures and review on current methods adopted for the NSM-FRP technique. This technique provides a remarkable improvement in load carrying capacity during its service, along with increased stiffness after concrete failure.

***Full paper:** *AIP Conference Proceedings vol. 2759, no. 1, 2023*

Analysis and Design of Eccentrically Loaded Corner Combined Footing for Rectangular Columns

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ABSTRACT

Some of the constrains related to boundary issues demand the column to be placed either on the edge or corner of the site boundary. In such cases, the design and analysis of footing becomes challenging. An attempt has been made in the current paper to analyse and design eccentrically loaded corner combined footing for rectangular columns by considering four cases of different locations of the columns, which is subjected to axial load and bi-axial moments. Analysis and design is carried out by transferring the CG of loads to the CG of footing. This method can satisfactorily be used for real conditions.

***Full paper:** *AIP Conference Proceedings vol. 2759, no. 1, 2023*

An Experimental Study on Structural Performance of Reinforced Concrete Beams Strengthened for Combined Flexure and Shear by Using NSM-GFRP Strips

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ABSTRACT

Near surface mounted fiber reinforced polymer (NSM-FRP) technique is the latest & most effective techniques used in strengthening the existing structural components, which requires strengthening against increased service loads, faulty design, environmental effects, etc. In the past, many researches on NSM technique have been carried out by using different cross-sectional shapes & dimensions of FRP materials to strengthen for shear & flexure. In the present experimental study, the behaviour of R.C. beams strengthened for combined flexure & shear studied. The beams of 150x150x700 mm size with M30 grade of concrete & Fe500 steel were considered. The control beams (unstrengthened) & strengthened beams using GFRP (Glass fibre reinforced polymer) strips were subjected to three point loading to study the behaviour of beams in combined shear & flexure. The main objectives were to assess the behaviour of strengthened beams with control beams & to study the influence of the orientation of shear strips. The beams were studied for the failure characteristics, yield & ultimate load carrying capacity, stress-strain behaviour, deflection, & crack patterns. From the test results, it's been observed that, the load carrying capacity of the strengthened beams were increased, the improved in deflection, when compared to the control beams. The ultimate load carrying capacity of beams with shear strip orientation of 45°, 60° & 90° were increased by 50.3%, 39.3% & 25% respectively, compared to the control beams. This NSM strengthening technique can be advantageous & suitably adopted to enhance the load carrying capacity of the beams.

Full paper: *IOP Conference Series: Materials Science and Engineering, 3rd International Conference on Sustainable Construction Technologies & Advancements in Civil Engineering. (ScTACE 2022), vol. 1282, 2023*

Analytical Study of Low-Speed open Circuit Wind Tunnel Using ANSYS Fluent

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ABSTRACT

Wind is an omnipresent natural element with which the structures must be in harmony during normal winds and also gusts. Civil engineering structures are stationary with respect to the ground. However, they are moving bodies with respect to the air. Thus, it becomes imperative for civil engineers to obtain wind pressure acting on a structure at various points of interest which has to be incorporated in the structural design. For simple geometry, one could infer the values offered in the respective national standards. However, for complex geometry one must resort to obtaining the values using open / closed circuit low speed wind tunnels. This study presents the dimensioning principles involved in an open circuit low speed wind tunnel and the bluff body to be introduced, various possible configurations of an open circuit low speed wind tunnel based on parametric study and an analysis performed using ANSYS-Fluent for a bluff body introduced in the wind tunnel. ANSYS-Fluent allows the user to realize the potential of obtaining results on a scale model even before physical model testing, thus, saving time and cost involved in physical testing of models. Obtaining precise results and using them in design will economize the structure and render sustainability. Static and dynamic pressure acting on the bluff body and the velocity of wind at various points of interest along the length of the wind tunnel are the findings of this analytical study.

***Full paper:** International Conference on Sustainable Infrastructure: Innovation, Opportunities & Challenges - 2023 (SIIOC-2023), Organized by Department of Civil Engineering, National Institute of Technology Karnataka Surathkal (NITS), 2023*

The Failure Behaviour of Concrete Cubes in Compression

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ABSTRACT

Concrete is a mixture of cement, fine aggregate, coarse aggregate, water and sometimes they use admixtures. After the concrete cube is cast and cured, the compression strength of the concrete is tested for 7, 14 and 28 days. The failure behaviour of concrete cubes depends on the type of material used, such as cement, aggregates and so on. This study explains the concrete cube failure behaviour and what the reasons are for it. The failure behaviour differs for different cube sizes and shapes, and the failure of a concrete cube indicates whether the obtained failure is satisfactory or not. The actual failure of the concrete cube is an hourglass failure; failures other than hourglass failure are due to eccentric loading, flaws in the testing apparatus, human errors and so on. Concrete cubes can fail in a variety of ways, such as crushing, tensile cracks, edge failure, surface cracks and so on. Moreover, failure may occur in the aggregates or interface of the concrete matrix. However, in this study, the failure behaviour observed differs for different cubes due to various factors influencing it.

***Full paper:** *International Conference on Sustainable Infrastructure: Innovation, Opportunities & Challenges - 2023 (SIIOC-2023), Organized by Department of Civil Engineering, National Institute of Technology Karnataka Surathkal (NITS), 20th - 21st April 2023.*

Thermal performance of Residential Buildings at Different Locations

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ABSTRACT

The thermal dynamic thermal properties of the building envelop is an important parameter in thermal comfort studies. The present experimental study investigates the thermal performance parameters of the wall envelopes for the residential buildings at from different locations. The study involves actual field measurements of the buildings inside & outside wall surface temperatures. Time lag (TL) and Decrement factor (DF) are the major parameters that are being evaluated for building wall envelopes.

The K-type thermocouple (as temperature sensor), integrated with Micro-controller (Arduino) is used for acquiring data of measured temperatures from the building envelope. In addition to the temperature sensors, a Micro SD card adapter module (to store the surface temperature data) and a DS3231 RTC module (for date and timekeeping) have been used. As a result, the integrated device forms a low cost data acquisition system (DAQ). The data is post processed for obtaining the time lag and decrement factor.

The result shows that the time lag varies between 4.36 to 6.5 hours and the decrement factor lies in the range of 0.213 to 1.750. These results help in understanding the thermal behavior of the building envelope in residential buildings.

Full paper: *International Conference on Sustainable Infrastructure: Innovation, Opportunities & Challenges - 2023 (SIIOC-2023), Organized by Department of Civil Engineering, National Institute of Technology Karnataka Surathkal (NITS), 20th - 21st April 2023.*

An Experimental Study on the Structural Performance of Full Scale RC Beams Strengthened for Shear Using NSM GFRP Strips

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ABSTRACT

More than ever before, there is a growing need for extending the service life of existing structures by means of retrofitting or rehabilitating given the rising scarcity and increasing costs of raw materials for reconstruction on one hand and on the other, to reduce the emission of greenhouse gases involved in the production of raw material used for construction. Strengthening of existing structures is one way through which the above predicaments can be addressed. In this experimental study full scale RC beam models of size (3000 × 150 × 175)mm of M20 grade concrete were considered to be strengthened for shear with near surface mounted (NSM) GFRP strips and understand the performance of the beam element. GFRP strips were embedded using epoxy in the grooves cut on the side faces of the beam oriented at 45° angle with respect to the beam axis and tested for single point loading. Load–deflection relationship of beam, ultimate load carrying capacity, cracking pattern and mode of failure were the findings of this experimental study.

***Full paper:** *International Conference on Interdisciplinary Approaches in Civil Engineering for Sustainable Development (IACESD-2023), Organized by Department of Civil Engineering, Jyothy Institute of Technology (JIT), Bengaluru, 7th & 8th July 2023*

Assessment of Periphery Free-Standing Masonry Wall for Structural Safety and Integrity

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ABSTRACT

All around the world, free-standing stone walls are extremely common. They are widely used as private land, household gardens, and industrial and commercial premises barriers. Free-standing walls are built between pilasters, which are rectangular projectile columns made of masonry blocks that offer extra support to the filling wall and base. The pilaster is built at predetermined intervals throughout the wall's length and cantilevered up from the foundation. Masonry units that stretch horizontally between pilasters are known as fillers. Freestanding walls are generally subject to lateral loads such as wind loads, ground pressure, and so on. This research studies the prevalence of several forms of cracks in free-standing masonry walls, which are caused by vegetation growth, differential settling, and other factors that causes the failure of the compound wall. Every filler wall between the pilasters is measured and surveyed to determine its deflection and height from the foundation. More deflection is observed along the length of the free-standing wall in the mid-region between the pilasters, and we may compare the deflection by imagining the free-standing masonry wall with the pilaster using survey data. According to the findings of this study, the brick wall is deflected due to vegetation growth and foundation sinking, and weather-ing action leads the wall to expand and compress, creating fractures.

Full paper: *International Conference on Interdisciplinary Approaches in Civil Engineering for Sustainable Development (IACESD-2023), Organized by Department of Civil Engineering, Jyothy Institute of Technology (JIT), Bengaluru, 7th & 8th July 2023*

Millet Storage Structures: A Structural Design of Bunker Bin

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ABSTRACT

In recent years, the production and consumption of millets have increased globally as they are considered as a health enhancing cereal. Nearly 97% of millet is produced in developing nations, and is a major crop in the semiarid tropical regions of Asia and Africa, particularly in India, Mali, Nigeria, and Niger. This crop is highly used due to its productivity and short growing season under dry, high-temperature conditions. It is crucial to collect data regarding the millets' storage system, nevertheless, since some of the conventional techniques for keeping millets in steel barrels are essentially hermetic and airtight. Commercially, multi-layered polythene hermetic bags are also available for small-scale grain storage.

These millets can be kept in containers like bunkers and silos as long as proper storage conditions are maintained. These conditions typically include low moisture levels, proper aeration, and protection from pests. Bins such as Bunkers are designed for a capacity of 1 lakhs and 3 lakhs by considering all the storage conditions and thus proper design of Bunkers help preserve the quality of millets by providing a controlled environment that minimizes exposure to moisture and external contaminants. The parameters such as unit weight of material, angle of internal friction, angle of wall friction and pressure ratio are considered and this influences the design of bunkers.

***Full paper:** *Proceedings of National Conference on "Millet Confluence 2023 – An Extravaganza of Ideas and Innovations", conducted by Padmashree Institute of Management and Sciences in Collaborations with KSCST, Bangalore, from 14th to 16th December 2023.*

Numerical Analysis of Earthen Embankment Resting on Soft Clay Deposit

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ABSTRACT

Construction of embankment on the soft soil deposit is the major concern in coastal areas as they are prone to stability and settlement problems. Soft clay being highly plastic in nature has high compressibility and very poor shear strength. Soft clay as foundation soil leads to many problems of excessive settlements and unacceptable deformations. Despite of this, there has been development of new cost-effective projects with the large economic and population growth. 2D finite element analysis is carried out to perform the parametric analysis using PLAXIS tool by considering the effect of embankment height, slope, and location of ground water as parameters. The main objective of this study is to determine the settlement and deformations of earthen dam. Since the undrained shear strength of marine clay is low, this restricts the construction of embankment in single stage, therefore stage wise construction method is adopted by Mohr's–Coulomb's criteria by considering undrained condition for soft clay and drained condition for embankment soil. Results are recorded in the form of horizontal and vertical deformations, total and effective stress, total and Cartesian strains. Thus, the detailed numerical analysis of the behavior of embankment resting on marine clay deposit and its variation with the parameters is depicted from the comparison of the output curves.

***Full paper:** *Lecture Notes in Civil Engineering, vol. 303, 2023*

Performance Evaluation of Earthen Embankment Underlain by Marine Clay Deposit with Ground Improvement Techniques—A Case Study of Mangaluru Region, Karnataka

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ABSTRACT

Marine clay is a natural soft soil deposit found in abundance in coastal areas. This soil is characterized by poor engineering properties with low shear strength. As, marine clay has high plasticity and compressibility, construction of embankment over marine clay is challenging as they undergo excessive settlement and also witness stability problems. In this study, numerical analysis of earthen embankment over marine clay deposit is analyzed using Plaxis 2D tool. The soil is obtained from Mangalore district, Karnataka, and tested to obtain engineering properties. The main objective of the study is to find the extent of settlement and amount of deformation that might occur if embankment is built on marine clay deposit of the adjoining area. The maximum settlement occurred due to prolonged induced loading and stability of embankment is being analyzed. The study aims to analyze the behavior of earthen embankment, factors governing safe construction of embankment, and properties of marine clay. The study is being extended to analyze the behavior of earthen embankment with different remedial measures to mitigate the upcoming geotechnical stability problems with the installation of basal reinforcement layer, stone columns, and sand columns. The results are recorded in the form of horizontal and vertical deformations, total and effective stress, total and Cartesian strains. Thus, for the earthen embankment, allowable settlement and enhanced performance of marine clay sub-soil after ground improvement are numerically analyzed for the economy, safety, and stability aspects.

***Full paper:** *Lecture Notes in Civil Engineering, vol 297. 2023*

Parametric and Stability Analysis of Landslide Near Somwarpet, Coorg District, Karnataka

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ABSTRACT

The landslides occur when gravitational force, pore water pressure, and other types of shear stresses within a slope exceed the shear strength (resistance to shearing) of the materials. Landslide is one of the most common problems in hilly and mountain areas (which causes transportation problem, repair of the structure, and medical cost due to injuries which are negative economic effect). The study and analysis of slope are essential in understanding their performance and in particular, their stability, reliability, and deformations. The aim of the present study is to analyze the typical slope by varying different soil parameters such as cohesion, angle of internal friction, unit weight, and slope geometry (angle and height). The stability of the slope (factor of safety) is analyzed using SLOPE/W. From the parametric analysis, it is observed that shear parameters (cohesion and angle of internal friction) of soil have a significant effect on the stability of landslides. Unit weight of soil in the landslide zone has less significance on the performance. Also, the present study includes a case study of a failed landslide in Kundalli near Somwarpet, Coorg District, Karnataka. The case study is undertaken to evaluate the key reason for the occurrence of landslides.

***Full paper:** *Lecture Notes in Civil Engineering, vol. 303, 2023*

Study on Soil–Panel Interaction on the Performance of MSE Wall

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ABSTRACT

The mechanically stabilized earth (MSE) wall is used as a substitute structure for conventional cantilever walls and gravity walls. Performance of the MSE wall mainly depends upon the backfill and foundation soil type and interaction between soil with facing panels. Parametric analyses using a two-dimensional FEM tool PLAXIS are carried out to investigate the influence of backfill soil stiffness, foundation soil stiffness, and panel–soil interface shear on MSE wall performance. MSE wall of height 16 m is considered for the analysis. The PLAXIS plate elements are used for the concrete panels. The soil zones are modeled as linear-elastic material with Mohr–Coulomb failure criterion. Five different backfill soils and three different foundation soils were considered in this investigation. The range of elastic modulus values for the backfill soil corresponds to the range of elastic secant modulus values computed at 50% of the failure deviatoric stress for three different soils compacted to different densities. To keep the numerical modeling simple, no attempt is made to simulate compaction effects by applying a transient surcharge pressure at each soil layer during construction. The effect of interaction friction coefficient ($R = \tan \delta / \tan \phi$) between backfill soil and concrete panel is considered in the analysis. The values of R used in the study range from 0.3 to 0.6. Extreme horizontal (Ux), vertical deformations (Uy), and total deformations (Ut) are obtained for backfill soil stiffness varying from 10 to 100 MPa and foundation soil stiffness varying from 10 to 1000 MPa.

***Full paper:** *Earth Retaining Structures and Stability Analysis. IGC 2021. Lecture Notes in Civil Engineering, vol. 303. 2023.*

Wind Analysis of Tall Reinforced Concrete Chimney Considering the Effect of Soil Structure Interaction

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ABSTRACT

The dynamic interactions between the tall chimney, underlying foundation, and the elastic soil beneath are the focus of this paper's thorough assessment. This collaboration, known as Soil-Structure Interaction (SSI), is based on the interactions between the features of the chimney and the soil. For tall reinforced concrete chimneys subjected to wind loads, Soil Structure Interaction (SSI) analysis is being carried considering the Raft foundation. Based on various material characteristics, three types of soil are taken into consideration in order to comprehend the significance of SSI. Chimneys of different elevations are selected for the parametric study. The raft thickness is being varied. Wind analysis is carried out in accordance with IS: 4998:2015, and the wind speed taken into account during the analysis is 55 m/s. The along wind force and across wind force is being calculated in the study. Three-dimensional finite element tool ABAQUS is used for the analysis based on the direct method of SSI. The lateral deflection and base moment of the tall chimney are evaluated through SSI analysis and compared with the response obtained from chimney with fixed base. Base moment decreases significantly with effect of SSI. Performance of chimney considerably depends upon the material characteristics of chimney, foundation and soil. When we considered the effect of SSI as height increases lateral deflection also increases due to flexibility of soil compared to fixed condition..

Full paper: *International Conference on Sustainable Infrastructure: Innovations, Opportunities and Challenges, , NIT Surathkal. April 20th & 21st, 2023*

Dynamic Analysis of on-shore Wind Turbine considering the effect of Soil-Structure Interaction

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ABSTRACT

The number of huge wind turbines is rising as a result of increased demand for an alternative form of energy worldwide. Since softer soils might affect the dynamic behavior of wind turbines, this study examines the impacts of dynamic interaction between the foundation and underlying soil. The impact of Soil Structure Interaction (SSI) on the behavior of an onshore wind turbine with a gravity-based foundation is evaluated. For the analysis of onshore wind turbine, the Finite Element tool ABAQUS is being used. Dynamic analysis is being carried out considering the horizontal axis of the turbine. The behavior of wind turbines under the different height of the tower to shell thickness of tower ratio (H/t) is compared. The outcomes show that SSI incorporation in wind turbine analysis will increase the settlement of the foundation for different depths of the soil profile and increases the displacement at the top of the tower. Fatigue Damage calculation based on FE Analysis was performed in ABAQUS using the mean fatigue load, The damage index for every 1m height of the tower was found to be less than 1. Hence, it was concluded that the tower is safe under fatigue.

Full paper: *International Conference on Sustainable Infrastructure: Innovations, Opportunities and Challenge , NIT Surathkal. -April 20th & 21st, 2023*

Two-Dimensional Finite Element Modelling of Underground Tunnel and its Effects on Settlement of Adjacent Structures

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ABSTRACT

Due to rapid increase of the population in the urban areas, it is being inevitable to introduce metro rail network. These metro rail networks are constructed by tunnelling in subsurface region due to the scarcity of surface land. In the presence of soft soil deposits many structures will be constructed over the deep foundations. There will be adverse effect on the adjacent structures and its foundations due to vibration developed during the boring of tunnels. Latitudinal and vertical shifts are very likely to result from excavation activities in soft soils. Hence, it is necessary to study the effect of tunnelling on the adjacent structures in order to determine the settlement of surface and subsurface soil. The main objective of the study is to investigate the total settlement of surface and subsurface soil and its impact on the existing structures due to the excavation of tunnel. Analysis of vertical and lateral movement of soft soil due to excavation of tunnel is carried out by Finite element modelling (FEM) using PLAXIS 2D. The results highlight the risks associated due to tunnelling and its effect on the substructures of the adjacent buildings.

Full paper: *International Conference on Sustainable Infrastructure: Innovations, Opportunities and Challenges, NIT Surathkal. April 20th & 21st, 2023,*

Proportioning the Backfill Soil as per IRC Specifications for the Reinforced Earth Retaining Wall

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ABSTRACT

One of the major components of reinforced earth retaining wall is backfill soil. Enhancing the soil quality stands out as a cost-effective engineering strategy to address a variety of soil-related challenges. The objective of this study is to determine the characteristics of the backfill soil such as Plasticity Index, Gradation, Compaction Characteristics and Shear parameters by con-ducting experimental investigations, and to compare it to the existing provi-sions in IRC: SP-58. The backfill soil is redesigned in different proportions to find an optimal combination according to the recommendations in the code by mixing the original backfill soil with other materials like Manufac-tured Sand and Quarry Dust. The results of the conducted tests presented an optimum combination for the backfill soil which is Natural Soil + 15% Man-ufactured Sand + 20% Quarry Dust.

*__Full paper:__ *Indian Geotechnical Conference, 2023*

Settlement of Adjacent Structures due to nearby Deep Excavation– A Numerical Investigation

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ABSTRACT

Cities that are highly urbanized face a constraint when it comes to finding new space to accommodate various demands. Consequently, architects are resorting to incorporating underground structures within their designs to ad- dress the increasing need for commercial, residential, and industrial spaces. The construction of subterranean facilities is frequently accomplished by means of deep excavations. Inadequate lateral support during deep excavations, leading to detrimental effects on nearby structures. These consequences may include dimin- ished load-bearing capacity, settlements, and lateral displacements of adjacent premises. Addressing these challenges through engineering practices, an effec- tive parametric analysis is essential to safeguard the stability and safety of sur- rounding developments. Hence the primary objective of this study is to investi- gate how various parameters impact the effectiveness of diaphragm wall-sup- ported deep excavations. The various parameters considered in the analysis are; stiffness and spacing of anchors, thickness and axial stiffness of diaphragm wall and location of water table. To achieve this, the Finite Element tool PLAXIS 2D is being utilized to analyze the support system and evaluate its impact on nearby structures when undertaking deep excavation. The horizontal displacements, bending moments and the ground settlement behind the diaphragm wall due to adjacent deep excavation, are being analyzed in the study. It is being observed that, performance of the diaphragm wall highly depends on the stiffness of the anchors used in the analysis and location of water table.

***Full paper:** *Indian Geotechnical Conference, , IIT Roorkee. 2023*

Performance Evaluation of Onshore Wind Turbine Under Various Support Conditions Considering The Effect of Soil Foundation Structure Interaction

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ABSTRACT

The traditional approach of seismic analysis of structures assumes that the structure is fixed at its base, omitting the effect of soil-structure interaction (SSI). The main objective of the present study is to Creating a three-dimensional Onshore Wind Turbine System that incorporates soil-structure interaction and to examine the onshore Wind Turbine behavior while taking impact of SSI during seismic excitations into account. The results in terms of tip displacement, foundation settlement, tower base moments and foundation stresses for the wind turbine resting on gravity foundation are compared and discussed. The results of ABAQUS numerical analysis showed that the inclusion of SSI has a significant impact on the foundation settlement and tower tip displacement on the seismic behaviour of wind turbine system. The research's conclusions suggested that, when the SSI effect is taken into account, the seismic response in terms of the variance of foundation settlement and tower tip displacement increases in all three cases of earthquakes (El-Centro, Bhuj, Kobe). It is concluded that by adopting SSI in the analysis of gravity foundation, the tower tip displacement of the superstructure(tower) and foundation settlement can be maximized significantly.

*__Full paper:__ *Indian Geotechnical Conference, IIT Roorkee, 2023,*

Wind and Time History Analysis of Tall Reinforced Concrete Chimney Considering the effect of SoilFoundation-Structure Interaction

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ABSTRACT

The dynamic interactions between tall chimney, underlying foundation, and the elastic soil beneath are the focus of this paper's thorough assessment. This collaboration, known as Soil-Structure Interaction (SSI), is based on the interactions between the features of the chimney and the soil. For tall reinforced concrete chimneys subjected to wind loads, and seismic loads Soil Structure Interaction (SSI) analysis is being carried considering the annular raft foundation. Based on various material characteristics, three types of soil are taken into consideration in order to comprehend the significance of SSI, Chimneys of different elevations are selected for the parametric study. The raft thickness is being varied. Wind analysis is carried out in accordance with IS: 4998:2015, and the wind speed taken into account during the analysis is 55 m/s. Along wind force and across wind force is being calculated in the study. Three-dimensional finite element tool ABAQUS is used for the analysis based on the direct method of SSI. The lateral deflection and base moment of the tall chimney are evaluated through SSI analysis and compared with the response obtained from chimney with fixed base. Base moment decreases significantly with effect of SSI. Performance of chimney considerably depends upon the material characteristics of chimney, foundation and soil. When we considered the effect of SSI as height increases lateral deflection also increases due to flexibility of soil compared to fixed condition. Time history analysis is done for 275 height chimneys, having raft thickness 3.5 m and well graded soil. The soil-structure interaction models are comprehensively analyzed to assess the performance of chimney raft soil system under two earthquake records.

***Full paper:** *Indian Geotechnical Conference, IIT Roorkee, 2023,*

Heat Retentivity of Expansive Soils: An Empirical Study

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ABSTRACT

Sand, being an abundant and eco-friendly material, has the potential to serve as a cost-effective alternative for thermal energy storage systems. In India, with its diverse geography and soils, it is essential to assess the heat storing capacity of different soils for use in such systems. This study envisages the thermal energy storage capacity of sand, and is compared with clays having varying liquid limits. The cubic prototype comprises a stainless-steel solder pot consisting of lead embedded with the tungsten coil for heating of the sample within. 25mm thick glass wool for insulation has been provided. Mineral insulation sensors were connected to a 4-channel data logger to record the results. The results indicate that sand has the highest thermal inertia, while clay soil has a higher specific heat and volumetric heat capacity than sandy soil for the same moisture content and soil density. Additionally, the thermal diffusivity of the soils varies with moisture content and texture. This study focuses the heat storing capacity of sand and other types of soils such as Kaolinite, Montmorillonite, and other diffused layer soils. Samples of sand and clay were subjected to different intensities of heat, and their storage properties were measured. The results shows that black cotton soil with liquid limit of 74% has the highest heat retentivity among the three types of soil and sand samples tested. Whereas Black cotton soil having liquid limit of 66% has heat retentivity almost equal to that of the sand sample having specific gravity being same as that of the soil(G=2.71).

***Full paper:** *Indian Geotechnical Conference, IIT Roorkee, 2023,*

Geotechnical Studies for Landslide Susceptibility

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ABSTRACT

Landslides are one of the critical geological processes, which causes enormous damage to civil engineering structures and also a threat to human life to the greatest extent. Most of the landslides (slope failures) were caused due to man-made activities like building roads, grading slope and poorly planned drainage patterns, etc. It can cause high mortality and injuries from rapidly flowing water and debris. In the Kodagu district, Karnataka state, India, 87 villages were identified as 'vulnerable' to floods, landslides due to debris including logs which has blocked free flow of rainwater. In the present research investigation, the undisturbed representative samples were collected from areas where major landslides have occurred. The dominant clay minerology of the soil samples was determined using XRD and Free swell ratio techniques. In-situ density tests were conducted at strategic locations describing the areas where landslides have occurred. Falling head permeability tests were conducted on the undisturbed soil samples obtained from the test location to understand the drainage characteristics. Using the test data, factors which caused typical landslides that occurred were analyzed. The analysis provides useful solutions to the causes of failure and preventive measures to be established in order to limit landslides to a minimum state.

***Full paper:** *Indian Geotechnical Conference, IIT Roorkee, 2023,*

Parametric Study on Effect of Clay Content on PreConsolidation Stress

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ABSTRACT

Due to paucity of good sites for construction, it is now imperative to go for marginal lands which are marginal for construction, unless the ground is improved by mechanical or physico-chemical process. Clay mineralogy is one of the most important factors influencing the engineering behaviour of fine-grained soils by a physicochemical process. In addition to clay mineralogy, stress history is also important in demonstrating improved performance of foundations and superstructures built on it. The behavioral research of settlement analysis using the standardized consolidation testing technique of fine-grained soils with varied clay mineralogy is a huge problem since it involves soils from all over the world. In the present experimental investigation artificial mix proportion were prepared by adding pure clay minerals like Kaolinite and Bentonite with inert sand (< 425 μm sieve) in various quantities ranging from 10% to 50% by weight of clays to represent kaolinite and montmorillonite dominant soils. Index properties, compaction Standard Proctor and Modified Proctor Test (IS Light and Heavy) and one-dimensional consolidation test were conducted on the Kaolinite-Sand and Bentonite-Sand mixtures as per BIS specifications. For one-dimensional consolidation test, pressure applied varied from a seating pressure of 6.25 kPa to 1600 kPa. From the consolidation test results, preconsolidation stress (σp) were determined by different methods documented in the literature. Very useful correlations of σp with pressure, clay mineralogy, index properties and compaction energy imparted were developed. The σp values from the current experimental investigation were compared to σp values of natural soil, which might be valuable information for developing a preliminary foundation design.

***Full paper:** *Indian Geotechnical Conference, IIT Roorkee, 2023,*

Evaluation of Surface Soil Moisture using Remote Sensing and Field Studies

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ABSTRACT

Soil moisture (SM) is an important quantity to examine in terms of agriculture, meteorology, and hydrology to understand the evaporation cycle and drought mechanisms. This study aims to estimate surface soil moisture in arid areas using Sentinel-1A SAR data. In order to collect soil samples from sampling grids that are synchronized with Sentinel-1A passes, study area is divided into 80 grids, each measuring 10m by 10m. Six SAR images were collected from Copernicus Open Access Hub website. The Vegetation index (NDVI) was calculated using a Sentinel-2A image. The SNAP software was used to process the SAR images, and R studio was used to extract NDVI values and backscattered energy of each sample grid. In this study, an empirical equation was developed to model surface soil moisture using the dielectric constant and backscattering coefficients. The performance of the model was assessed using statistical indicators such as the coefficient of correlation, Nash-Sutcliffe Efficiency, and Root Mean Square Error, which yielded results of 0.85, 1.46, and 0.75, respectively.

***Full paper:** *International Virtual Conference on Developments and Applications of Geomatics*

Flood Frequency Analysis and Assessment of Submergence Level for the Mathikere Catchment - A Flood Resilient Region in Bengaluru

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ABSTRACT

Flooding is the overflow of water onto typically dry ground. Floods can occur as a result of severe rainfall, the arrival of ocean waves, the rapid melting of snow, or the failure of dams or levees. A few inches of water may be sufficient to cause severe flooding, or it may reach the roof of a home. The study area Mathikere catchment one of the flood prone areas, which is located south-west of Bengaluru, India (13.0334° N, 77.5640° E) and encompasses around 30 km² at an altitude of 925 m above mean sea level. Hydrological investigation carried out for the catchment, watershed delineated by SRTM 1 Arc-Second Global (30 meters) and LULC digitisation done by GIS platforms using the covered area of land use pattern runoff estimated by SCS curve number method, flood frequency analysis made through Gumbel's distribution and maximum probable flood discharge obtained, and IDF curve plotted for 6 hour rainfall intensity and for different return periods, finally submergence level for the catchment has been determined for various return periods by considering abnormal precipitation. This is crucial for assessing urban flood risk and determining disaster response decisions.

***Full paper:** IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT), 2023*

Evaluation of Infiltration Models in an Agricultural Catchment Using Guelph Permeameter in Mysore District

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ABSTRACT

Infiltration process has a significant impact on many hydrological aspects of agricultural watersheds, including runoff generation, soil erosion, irrigation planning and management, contaminant transport, vadose zone hydrology and ground water management. Modelling of infiltration process in catchment scale is extremely complex, because it is influenced by numerous factors such as rainfall, soil physical properties, vegetative cover, various tillage practises, etc. Studies that emphasise the importance of infiltration modelling in agricultural catchments using guelph permeameter are minimal. The main goal of this research is to estimate and compare infiltration models that are used to measure infiltration rates in agricultural catchment located in Baradanapura village of Mysore district, Karnataka state, India. For this investigation, field infiltration experiments were conducted using a Guelph permeameter at a depth of 15 cm in 37 locations throughout the catchment of area 216 ha. Two infiltration models, Philip's and Kostiakov, were chosen for this study to test their dependability in catchment scale with measured values of infiltration rates. Parameters of two infiltration models were estimated using linear regression analysis. Statistical performance measures such as Coefficient of determination (R2), Root mean square error (RMSE), Mean absolute error (MAE), and Nash Sutcliffe efficiency (NSE). Similarly, visual comparison methods such as box plots, Taylor's diagrams and scatter plots are used to evaluate model performance. Results indicates that Philip's model performed well for silty clay and sandy loam soils and were in good agreement with observed data. From this study it can be inferred that dominance of Philip's model will highlight the effect of soil texture on Sorptivity(s) and transmissivity factor(k) of Philip's equation. Efficiency and reliability of Philip's model in predicting infiltration rates for this study area and that will be helpful in irrigation system planning and management.

***Full paper:** *Surface and Groundwater Resources Development and Management in Semi-arid Region. Springer Hydrogeology. Springer, pp. 57-78 , 2023*

Quantifying Surface Soil Moisture Variability Through Synergistic Applications of Sar And Machine Learning Techniques

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ABSTRACT

Soil moisture is a significant component in the movement of water and heat energy between land surface and atmosphere. The primary goal of the study is to employ SAR data and machine learning techniques to model the Surface Soil Moisture (SSM) in Black-eyed pea cropland. The study area site is located in Bommenahalli village of Mysuru district, Karnataka. For the purpose of collecting soil samples in time with Sentinel-1A Pass, plot was divided into 36 sampling grids. Sentinel -1 A GRD data pre-processed using SNAP software. Surface roughness, dielectric constant and backscattered energy were used as input features to model SSM using Random forest(RF), Support Vector Regression (SVR) and Backpropagation Artificial Neural Network (BPANN). We observed that BPANN outperformed SVR and RF by accurately predicting soil moisture with RMSE= 0.077, bias = -0.01, and R= 0.963

***Full paper:** *2023 IEEE India Geoscience and Remote Sensing Symposium (InGARSS), 2023,*

Flood Hazard Mapping Using Gis-Enhanced Multi-Criteria Decision Analysis in Kushalnagara Taluk, India

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ABSTRACT

Floods have inflicted severe damage on lives and environments. With changing climate and land use, flood severity has increased. The study was intended to evaluate flood hazard map using, Raster analysis techniques and analytical hierarchy process. The study area is Kushalnagara which is located in Kodagu district. The effective flood affecting parameters like slope, flow length, drainage density, precipitation, soil texture, river proximity and land use and cover data are used in developing flood hazard map. According to the outcomes, approximately 18.79% of the area is classified as having a high flood risk, while 21.81% of the area is categorized as having a very high flood risk. This data aids proactive planning and preparedness. Early flood prediction systems can be implemented, enhancing flood management to minimize harm.

***Full paper:** 2023 IEEE India Geoscience and Remote Sensing Symposium (InGARSS), 2023,*

A Collateral Study on Optimization of Pre-Engineered Building with Tubular Sectional Connection

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ABSTRACT

Over the recent years, innumerable upheaval has been done in the field of steel construction industry, out of which pre-Engineered buildings (PEB) are one of the most remarkable ones. Pre-Engineered buildings are typical steel structures which are pre-fabricated and the designs are pre-determined which are contemplated to be more cost efficient, because of the tapered sections being utilized, in accordance with its bending moment requirement. These types of structures will not only be cost effective and environmentally friendly but also more flexible, thus eradicating the failure due to sequel of seismic forces. PEBs are generally industrial structures, which are designed for enormous spans. In this research work, the variation of structural behaviour of PEBs when it's been embraced with considerably increased spans (30 m, 60 m and 90m) are compared and studied. In general, hot rolled tapered I-sections are used in erection of a PEB. Due to the inadequacy in connection configurations available, Pre- Engineered light weight cold form steel structures with tubular steel sectional connections are not well renowned. An attempt is also been made to bring out tubular sectional connections for the beam- rafter junction in all the PEBs deigned for 30 m, 60 m and 90m using E350 steel. Typical connections are proposed for both main frames and the gable frames of the PEB. The outcome of this study appears to be contended for at both the junctions in 30 m span and 60 m span, but 90 m main joint fails, due to the substantial bending moments developed across the major axis. So, these set of connections can be adopted for PEBs up to a moderate span, which helps in reducing the weight of steel that is been utilized in the construction, which successively foster sustainability.

**Full paper:* *IOP Conference Series: Earth and Environmental Science, vol. 1130, 2023*

Analysis of Skew Bridge-Slab Under IRC Vehicle Loading

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ABSTRACT

Skew slab bridges are essential in mountainous areas because topographic restrictions prevented changing the alignment of the road also, crossings of roads and railroads. In simple supported bridges, the effect of skew may typically be ignored up to 15 degrees of skew, and the bridge can be constructed as a right-angled bridge. The behaviour of skew slab bridges more than 15 degrees is complicated hence the study on the behaviour of skew-bridge slab under IRC vehicle loading is carried out. About 70 different deck slab models are analyzed in STAAD Pro software with varying width from 1 to 4 lanes, and span lengths of 7.5m and 12m with for skew angles 0° to 50° in increment of 10°.The vehicle loads and positioning of vehicles are done as per IRC-6:2017 standard specifications. The results show that the bending moment and deflection in near edge beams decreases with increase in skew angle. In farer edge beam the bending moment increase till skew of 30° and deflection increases after skew of 30°. The longitudinal bending moment decreases with increase in skew angle. Transverse bending moments are prominent at near the corners that at the centre. The torsion moments are more concerned in slabs with small width and large span. Deflection decreases at all the parts of the slab as skew increases. The maximum deflection in free edges of the slab shifts towards the obtuse corners.

***Full paper:** *IOP Conference Series: Earth and Environmental Science, vol. 1130, 2023*

Stability of Laminated Composite Plate with Natural Fiber Core and Containing Irregular Imperfections Subjected to in-Plane Static and Dynamic Loads

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ABSTRACT

In this manuscript, the static and dynamic stability of laminated composite panels with a core of Aloe vera fibers reinforced with epoxy are evaluated using finite element method. Two kinds of ply orientations are considered: cross-ply and angle ply laminates of Glass/Epoxy. The plates are subjected to in-plane normal and shear loads. The dynamic load is applied in the form of rectangular pulse loads. Imperfections are incorporated in the plates which are irregular in nature. The effect of imperfection in the plates, ply orientation and the type of loading on the static and dynamic stability of these plates are examined. It is observed that the use of Aloe vera fibers in the laminated composite plates reduces the dynamic buckling load by 42% when subjected to in-plane shear loads compared to 9.8% when subjected to in-plane normal loads.

***Full paper:** National Conference on Sustainable Development of Smart Cities Infrastructure (SDSCI – 2023) NIT Kurukshetra, pp. 77-80, 2023*

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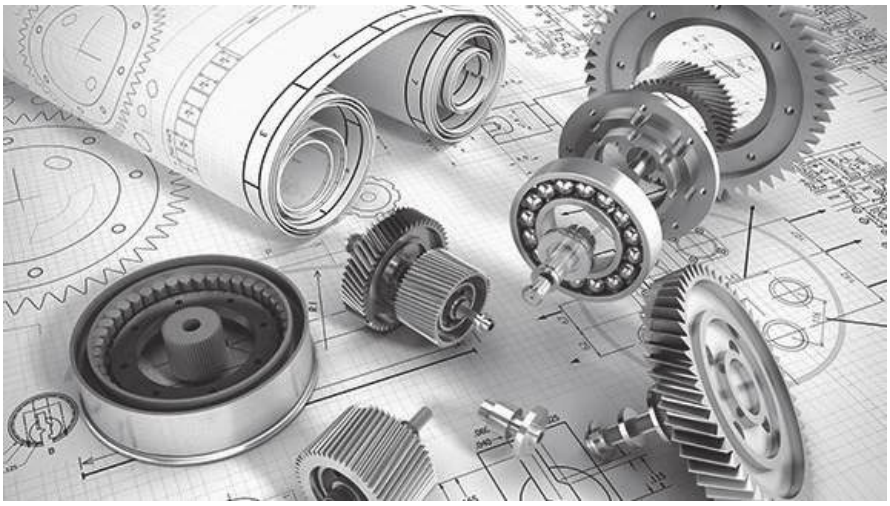

Carbon-Graphene-Epoxy Sandwich Dielectric for Improved Dielectric Response To Humidity

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ABSTRACT

A sandwich structure of carbon-epoxy laminate with graphene nanoplatelets is used for increasing the AC conductivity, dielectric constant and sensitivity towards moisture. The Quasi Fickian distribution of moisture absorption of epoxy is retained with the inclusion of carbon fibers and graphene nanoplatelets of 1 weight percent. The effect of relative humidity (RH) over a range of 30–90% on AC conductivity and capacitance has been investigated. Use of carbon fibers with graphene nanoplatelets significantly enhances the electrical conductivity and dielectric constant as compared to carbon-epoxy laminate without graphene nanoplatelets. The two parameters reveal linear dependence on humidity in the low frequency range of 100–1000 Hz. The AC conductivity increases at the rate of 2 nSm−1/% RH in laminate with carbon fiber and it increases to 50 nSm−1/%RH with the incorporation of graphene nanoplatelets. The increase in AC conductivity from 100 Hz to 1000 Hz is in the range of 0.1 to 0.2 μS/m with carbon fibers and it increases from 1 to 4 μS/m with the inclusion of graphenenanoplatelets. Increase is AC conductivity from 1 kHz to 10 MHz is by five orders of magnitude, with a steep increase around 5 MHz in both laminates. The incorporation of graphenenanoplatelets helps to increase the dielectric constant by 2.4–2.8 times as compared to epoxy with carbon fiber. The swelling in the laminates estimated after 96 h of exposure to 90% RH is observed to be less than 0.05%. The use of graphenenanoplatelets improves moisture sensitivity of the carbon-epoxy laminate.

***Full Paper:** *Journal of Materials Research and Technology, vol. 27, pp. 1711-1723, 2023*

Characterization And Optimization of Abrasive Water Jet Machining Parameters of Aluminium/Silicon Carbide Composites

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ABSTRACT

Due to the complexity of high temperature and cutting tool wear, most machined components are still facing problems in terms of harder functional fillers that reinforce aluminium matrix composites. Conversely, abrasive water jet machining (AWJM) incredibly useful for the cutting of anisotropic and non-homogeneous metal matrix composites. In this research article, silicon carbide (SiC) particulates were utilized as reinforcement in the AA6026 matrix material (AA6026/SiC) and machined using AWJM under different process parameters namely SiC loading, traverse speed and stand-off distance. Two different compositions of SiC (4, and 8 wt%) were considered to fabricate AA6026 composites using the stir casting. In addition, outputs have been examined, e.g., surface roughness, material removal rate, and kerf angle. An optical microscope, scanning electron microscope, Brinell hardness tester and universal testing machine have been used to characterize the matrix material AA6026 and its composites. Microstructural analysis revealed that the inclusion of SiC particulates in AA6026 affects the very fine grain size of the composite. Furthermore, the 8 wt% composite exhibits the evolution of the Al-Si eutectic phase during solidification. Processing of these composites was performed using the L27 orthogonal geometry, successfully improving the parameters of the abrasive water jet process. The output response shows that reducing the SiC load improves the surface roughness under the key parameters of traverse speed and stand-off distance. However, increasing the SiC loading increases the material removal rate and kerf angle under the key parameters, namely traverse speed, and stand-off distance.

***Full Paper:** *Materials Research Express, vol. 10, no. 11, pp. 1155-05, 2023*

Numerical And Experimental Study of Vibrations Caused By Defects In Fan Blades

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ABSTRACT

Damage monitoring of rotating blades is becoming increasingly important, because blades in many applications like turbine engines, marine propellers, and turbo engines are exposed to high temperatures, high strains, and severe vibrations. Due to continuous operations of these blades fatigue cracks can emerge after an hour of service, these causes a blade failure and can potentially ruin an entire engine. The damage identification of blades by vibrational analysis is discussed in this paper, numerical analysis is carried out using ANSYS Workbench program to simulate a FEM model, and results are compared to the experimental analysis, where fault simulation machinery equipment used to know the vibration responses of a healthy and defective blades. Multiple distinct peaks were observed at the blade resonance region in case of blades having a defect when compared to healthy blades showing one distinct peak in the blade resonance region which helps in analysis helps in understanding the damage detection of blades early, reducing the likelihood of catastrophic accidents.

***Full Paper:** *Journal of Mines, Metals & Fuels, vol. 71, no. 6, 2023.*

Effect of Hybridization on Camphor Soot Embedded Palmyra Fiber Reinforced Nylon Nano Composites

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ABSTRACT

In the present study, camphor soot-filled palmyra fiber-reinforced nylon-6 hybrid nanocomposites (CPFNnC) were prepared using a twin-screw extruder with different wt% of CPFNnC (0, 3, 6 or 9 wt%). These composites were characterized to study their thermal, mechanical and rheological properties. Thermogravimetric analysis showed a marginal increase in thermal stability with 6 wt% CPFNnC. Differential scanning calorimetry curves showed a slight increment in the melting point in CPFNnC, while degradation temperature decreased with fiber content. Dynamic mechanical analysis indicated a maximum storage modulus for 6 wt% CPFNnC at 803 MPa compared with fiber-free nylon-6 (696 MPa at 25 ◦C). Tan δ for 3 wt% CPFNnC showed a better damping effect due to the existence of palmyra fibers. Creep results indicated that CPFNnC containing 6 wt% fibers has a minimum depth impression of 0.124 mm compared with fiber-free nylon with 0.146 mm. Scanning electron microscopy revealed a uniform distribution of modified palmyra fibers in the matrix and brittle fracture was observed in the CPFNnC. Compared with fiber-free nylon-6, the tensile strength, flexural strength and density of the CPFNnC increased with increase in fiber content; however, the impact strength was reduced and a lower melt flow index was found.

***Full paper* :** *Functional Composites and Structures, vol. 5, no. 4,pp. 045-003, 2023*

Magnesium Alloys as Extremely Promising Alternatives for Temporary Orthopedic Implants – A Review

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ABSTRACT

Mg alloys are emerging as potential and very promising alternatives for replacing permanent metallic implant materials such as steels and titanium in applications where the implants need to be removed following healing through revision surgery. Use of Mg alloys for implant application is seen as a game changer and Mg alloys are almost perfect materials for the future in both engineering and biomedical applications. Present review therefore focuses on highlighting significance of Mg alloys in biomedical field and risks of using permanent metallic implants particularly when the implants are no longer required after the injury is healed. In this review, importance of orthopedic implants in present scenario, serious concern related to accidents that are causing permanent disabilities, demand in orthopedic implant market worldwide, potential applications of Mg based materials and their compatibility in biological environment is presented and discussed. In addition, degradation rate, major reactions associated with Mg based materials and effect of alloying elements on implant performance are also discussed based on in-vivo results. Recent advances in development of Mg alloys through various techniques and their performance in in-vitro conditions are also outlined. Possible ways to eliminate the limitations of Mg alloys include alloying, melt purification, surface alterations, surface modifications, chemical treatment, secondary processing etc. are discussed. Challenges and opportunities for Mg alloys to become ideal implant material is also addressed.

***Full Paper:** *Journal of Magnesium and Alloys. vol. 11, no. 8, pp. 2688-2718, 2023*

Experimental Investigations on Condition Monitoring of Spur Gear Using Empirical Mode Decomposition Method During Dry And Wet Conditions

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ABSTRACT

Vibration analysis in gearbox condition monitoring is vital for ensuring the dependability, safety, and optimal performance of rotating machinery. Vibration analysis is one of the major techniques in the monitoring of mechanical components. In this study, the vibration data were taken for healthy and defective conditions (dry & wet conditions) using vibration sensors positioned at various locations. These datasets were imported to MATLAB for feature extraction and analysis. The gear fault-related features in the vibration signals are extracted by Empirical Mode Decomposition (EMD). Further, features like RMS, kurtosis, and skewness were extracted. The extracted features were classified in MATLAB classification algorithms like Support Vector Machine (SVM). Amongst different SVM algorithm for Dry condition the most accurate algorithm was medium Gaussian SVM with accuracy of 92.1% and weighted KNN with accuracy of 81.6%. For wet condition most appropriate algorithm were Medium Gaussian SVM with an accuracy of 94.4% and weighted KNN with accuracy of 89%. The confusion matrix plot will be used to distinguish between the classifiers.

***Full paper:** *Journal of Propulsion Technology, vol. 44, no. 5, pp. 1263-1274, 2023*

Design And Development of Helium Assisted Quadcopter With Object Recognition

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ABSTRACT

Aim of this research is to enhance the characteristics of quadcopter and implement drone-based monitoring. The function of the research is the performance of a helium-based drone to advance and maximize the flight time as current capacity of lithium polymer batteries poses a threat to low cycle life. In addition, it carries out object detection on drone videos using Tensor Flow object detection API which acts as an infrastructure to surveillance. The study found that, by strategically placing helium gas on a drone has different performance effects on the flight time, battery consumption and manoeuvrability. It also established to track and recognize static and dynamic objects with deep learning-based computer vision SSD algorithm. Object detection is a key part of realization for any drone complete autonomy, while Unmanned Aerial Vehicles (UAVs) are very active area of this field. In order to explore the performance of the highly sophisticated drone, we have carried out experiments to solve functional problems and compare with established technologies

*__Full paper:__ *In AIP Conference Proceedings, vol. 2766, no. 1, 2023*

Free Vibration Characteristics of Carbon And Glass Fiber Hybrid Polymer Composite With Titanium Di-Oxide (TiO_2) Powder As Filler

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ABSTRACT

Composites play a significant role in the modern designing materials due to their few kind properties like formability, temperature process, and cost-effective nature. Composite materials are generally used in different areas such as automotive and aircraft industry, space vehicles, and machine elements due to its high strength to weight ratio, high resistance to failure in dynamic conditions. This paper deals with the fabrication of carbon, glass-epoxy hybrid composites having a composition of 60-40% with Titanium Di-Oxide (TiO2) Nano-powder as a filler material, varying with the percentage of 0.5%, 1%, 2% by weight. The fabrication of the hybrid composite plates according with the ASTM standards. Tensile test and flexural tests are performed to determine the mechanical properties of the composites having various percentage fillers. Modal analysis for vibration analysis using Fast Fourier Transform (FFT) is done and compared to the numerical results, which is obtained from Ansys software.

***Full paper:** *Journal of Mines, Metals & Fuels, vol. 71, no.2, 2023*

Spur Gear Fault Detection Using Design of Experiments And Support Vector Machine [SVM] Algorithm

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ABSTRACT

In this research, the primary objective is to ensure the appropriate functioning of transmission components, particularly the gearbox, which is highly prone to wear due to carrying the load directly. Condition monitoring and predictive maintenance of the gearbox are essential to prevent failures that can result in downtime and costly repairs. To simulate the wear in a controlled manner, tooth breakage and pitting were artificially induced using EDM. The raw vibration data obtained from an accelerometer sensor were then imported to LabVIEW software via a data acquisition system and analyzed in time and frequency domains at varying speeds and loads. The time-domain analysis included metrics such as “RMS and kurtosis,” while the frequency-domain analysis involved features such as "order spectrum." Additionally, time–frequency domains, such as "DWT and CWT," were utilized to provide a more comprehensive analysis of the gearbox's health. To classify the results obtained, support vector machining was used. The results obtained from the analysis provide a more in-depth understanding of the predominant types of wear in gearboxes and can be used to develop effective condition monitoring and predictive maintenance strategies to improve the reliability and lifespan of transmission systems.

***Full paper:** *Journal of Failure Analysis and Prevention, vol. 23, no. 5, pp. 2014-2028, 2023*

Design And Development of The Multipurpose Agricultural Mobile Bot

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ABSTRACT

The agriculture sector in India plays a crucial role in the country's economy, employing a significant portion of the population. However, it faces challenges like low productivity, labor shortages, and climate change. This review paper explores the potential of using robots in Indian agriculture to overcome these issues by improving efficiency, reducing labor costs, and promoting sustainability. The paper highlights various tasks where robots can be utilized, including crop monitoring, planting, harvesting, and pesticide spraying. It acknowledges the benefits of employing robots, such as increased productivity and reduced labor costs, but also identifies challenges like high costs, limited technology access, and the need for skilled operators. The paper suggests that policymakers should support and invest in the adoption of robotic technologies to revolutionize the agriculture sector in India, enhancing its resilience and sustainability.

***Full paper:** International Journal of EngineeringResearch in Mechanical and Civil Engineering, vol. 10, no. 9, pp 01-08, 2023*

Modelling of AGRO–BOT

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ABSTRACT

The main intention behind the development of thisidea and solution is to support the backbone of our country, which weighs 58.7 percent of the workforce in India, was employed in agriculture and around 30 percent of the workforce in the world. Automation will improve the lives of people working on the land and help them make better decisions. This document provides detailed information about the work and activities carried out by AGRO-BOT along with effective use of time to ensure increased productivity of the respective crops.

***Full paper:** *International Journal of InnovativeScience and Research Technology, vol. 8, no. 4, 2023*

Real-Time Image Processing Review Paper: Methods, Techniques, and Applications

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ABSTRACT

In modern days, Image processing is now of utmost importance, especially in real-time scenarios where errors in contemporaneous image processing could have disastrous results; the research and analysis methods of real- time image processing is therefore of extraordinary importance. Real-time image processing research and analysis methodologies are consequently of the utmost significance. This article's main aim is to provide an overview of the current state of real-time image processing research (Applications), useful methods, and practice.

***Full paper:** International journal of scientific research in engineering and management, vol. 7, no. 4, 2023*

Studies on Tensile Fracture and Two Body Wear Behavior of Al/Si3N4–Al2O3 Nanocomposites Prepared by Powder Metallurgical Route

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ABSTRACT

The tensile fracture and two body wear behavior of [Al/Si3N4/Al2O3]P nanocomposites were examined in the present investigation. The nanocomposites were prepared by using aluminum powder as matrix and Al2O3, Si3N4, and mixed composition of Al2O3 and Si3N4 reinforcing particles with varying compositions of 1%, 2%, and 3% each through powder metallurgical (PM) technique. Tensile characteristics and two body wear behavior of pure and fabricated samples were examined by performing tensile and dry sliding tests, and their results were correlated with microstructure, fracture, and worn surface morphology using scanning electron microscopy. Results revealed the improved tensile strength (203.38 MPa), hardness (56.6 HV), and lowest wear rate (1.14 × 10–6 mm3/N-m at 5 N) of pure Al reinforced with 2 wt.% Si3N4 and Al2O3 (M2) attributing the agglomeration, cluster formation, and better diffusion of nanoparticles in the matrix material as compared to all other sample conditions where porosity, inhomogeneity, and improper bonding were observed. On revealing the SEM fractographs, the failure mode of M2 sample transformed into ductile failure mechanism with respect to other compositions where brittle and mix-mode fracture was observed to be prominent fracture mechanism.

***Full paper:** *Metallography, Microstructure, and Analysis, vol. 11, no. 4, pp.580-594, 2023*

Effect of Different Rolling Techniques on Fatigue Crack Propagation in 5052 Al Alloy

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ABSTRACT

In the present study, the fatigue crack propagation in 5052 Al alloy processed through different cryogenic rolling methods has been investigated in detail. The solution-treated 5052 Al alloy was subjected to different cryogenic rolling methods such as cryorolling (CR), cryo groove rolling (CGR) and cryo groove rolling followed by warm rolling (CGW). The CR, CGR and CGW processed samples exhibit threshold stress intensity value (ΔKth) of 4.88, 6.5 and 5.5 MPa m1/2, whereas ST sample possesses ΔKth of 3.75 MPa m1/2. The formation of UFG grains of size 125–200 nm as observed through the TEM images along with improved elastic strength of the cryo deformed samples are responsible for the improvement of ΔKth.

***Full paper:** *Metallography, Microstructure, and Analysis, vol. 12, no. 1, pp. 62-73, 2023*

Microstructure Evolution and Fracture Toughness Behaviour of Cryorolled LM6 Al Alloy

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ABSTRACT

In the present work, the effect of cryo-rolling on the processed LM6 alloy samples has been studied. The solution treated (ST) sample of LM6 alloy has been processed through cryo-rolling with reduction of its thickness with values such as 30%, 40%, and 75%. One of the key material properties i.e., fracture toughness has been studied and equivalent energy fracture toughness ( ) is being evaluated according to the ASTM E 992 standard. The microstructure evolution after processing through cryorolling (CR) has been carried out with the help of optical microscopy and Scanning Electron Microscopy (SEM). Then, the calculated values of fracture toughness parameter i.e., equivalent energy fracture toughness (is being correlated with the microstructure evolution after processing of LM6 alloy. It was found out that there is an improvement in equivalent energy fracture toughness ( ) as the reduction values increases. The 75% CR sample showed great increment of 67% as compared to ST alloy sample. The microstructure evolution also signifies the mix-mode fracture visualized through Scanning Electron Microscopy (SEM) and as the reduction values increase, the ductile fracture zone dominance increases on brittle fracture zone indicating there is improvement in fracture toughness of the ultra-fined grain LM6 alloy due to the grain refinement, dislocation strengthening and grain boundary strengthening.

***Full paper:** *Key Engineering Materials, vol. 941, pp. 83-89, 2023*

Occupancy Grid Map for a Multi-Robot System Using LiDAR

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ABSTRACT

The multi-robot system is employed to map the different parts of the indoor environment because it maps more quickly than a single robot. Two robots are used in the multi-robot system, each robot is equipped with 2D LIDAR and made to drive in an environment to develop occupancy grid maps. However, the main challenge in multi-robot mapping is to combine the occupancy grid map data from various robots into a single global map. Numerous studies have been conducted on ways to estimate the relative robot poses before or during the mapping process in multi-robot mapping. However, with map merging, the robots create local occupancy grid maps on their own without being aware of how they relate to one another. The next step is to find points where the local maps overlap to combine them. After finding the overlap between the two maps, the merging algorithm is implemented to combine the maps. Results from experiments with two robots are presented.

Full paper: *SN Computer Science, vol. 4, no. 2, pp. 196-200, 2023*

Effect of Filler Materials on Abrasive Wear Performance of Glass/Epoxy Composites

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ABSTRACT

When creating polymer-based composites, plain weave fabrics andmicron-sized fillers offer bidirectional strength and reducedvoids/inhomogeneity. In the present work, It was investigated howglass fabric reinforced epoxy composite (G-E) performed during threebody abrasive wear with and without ceramic fillers (SiO2, Al2O3,graphite, and fly ash cenospheres). In experiments, loads of 20 N and40 N were applied at various abrading distances of 500 m, 1000 m,1500 m, and 2000 m. According to the results of sand abrasive weartest, the specific wear rates of G-E based composites are sensitive tofibre and filler/matrix adhesion. Under all tribo-test settings, the SWRfor all particulate G-E composites decreases in the following order: G-E> Gr/G-E > SiO2/G-E > Al2O3/G-E > fly ash cenosphere/G-E.Furthermore, the specific wear rate of the fly ash cenosphere filled G-Ecomposites were found to be lower than the G-E and other fillermaterials filled G-E composites. There was 38.7% reduction in thespecific wear rate at 40 N, 2000 m in fly ash cenosphere filled G-Ecomposite. As per the evidence of scanning electron microscope imagesof worn-out surfaces, mechanisms such as ploughing, fibre breakage,fibre pull-out, fibre thinning, and a network of microcracks caused thewear in composites.

***Full paper:** *Tribology in Industry, vol. 44, no. 1,pp. 111, 2023*

Mechanical Properties and Abrasion Resistance of 3D Printed Lightweight CF-Reinforced PLA/ABS Composites Using Design of Experiments

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ABSTRACT

The present research work is to evaluate the three-body abrasive wear behaviour of composites of Polylactic Acid (PLA) and Acrylonitrile Butadiene Styrene (ABS) reinforced with Short Carbon Fibres (SCFs), fabricated by fused deposition modelling (FDM). Commercially available polymers for applications in 3D printing, PLA, PLA/SCFs and ABS/SCFs composites made by FDM were investigated. Dry sand abrasion tester having rubber wheel is used for implementing three-body abrasive wear experiments. Taguchi design of experiments is adopted for developing the experimental design and optimisation of parameters. Hardness, impact strength, specific wear rate (K_s) and worn surface morphologies of these samples were compared. The incorporation of SCFs raised the K_s of thermoplastic composites. These outcomes could be explained by the SCFs significantly reducing final elongation at break, which is a crucial aspect of abrasive wear performance. Micro-cutting, plastic deformation and matrix pitting are the main wear processes in neat PLA/ABS. The wear mechanisms in case of SCFs reinforced composites are ploughing, micro-cutting, fragmentation of wear debris, and severe weakening of the fibre surface and delamination. When fiber reinforcement is added to any matrix, the wear behaviour of polymer-based composites will alter. In this study, SCFs reinforcement was used to improve the mechanical characteristics of PLA/ABS polymers. However, effects of SCFs on specific wear rate of PLA/ABS composites are not always positive.

***Full Paper:** *In International Symposium on Lightweight and Sustainable Polymeric Materials, Singapore, pp. 173-187, 2023*

Experimental Investigations on the Effect of Carbon Nanotubes and Nanoclay Additives on Thermo-Kinetics and Mechanical Characteristics of Acrylonitrile Butadiene Styrene (ABS)

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ABSTRACT

Thermoplastic materials are gaining precedence in a practical world because of their high rigidity, lightweight, and corrosion resistant characteristics. These qualities, thermoplastics can be used in a variety of applications. The current study examines the effects of Multiwall Carbon Nanotubes (MWCNT) and Nanoclay additives on the thermo-kinetics and mechanical characteristics of ABS. The effect of these additives on thermal characteristics of ABS is evaluated using simultaneous TGA and DSC tests in nitrogen atmosphere at three heating rates. The kinetics are evaluated using Flynn Wall Ozawa and Kissinger models. The experimental findings showed that the addition of MWCNT and Nanoclay enhanced the activation energy by 72.85% with Flynn Wall Ozawa and 65.23% with Kissinger models, therefore resulted in improved thermal stability of blended mixture. The effect of additives on mechanical characteristics of ABS is examined by subjecting the samples for hardness and impact tests. The outcome showed that the inclusion of MWCNT and Nanoclay has increased the hardness number from 67.2 to 70.4 and decreased the impact strength from 8.335 to 4.985 kJ/m^2.

Full Paper: *In International Symposium on Lightweight and Sustainable Polymeric Materials, Singapore: Springer Nature Singapore. pp. 291-303, 2023*

Experimental Investigation of Tribological Characterization of Bio-Nanolubricants

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ABSTRACT

The growing environmental concerns in recent years have led to the acceptance of vegetable oil bio-based lubricants as an acceptable replacement for petroleum-based lubricants. In this article, we analyze the tribological properties of three different bio-nano-lubricants with ZrO2, TiO2, and ZnO as additives, and explain how the nanoparticles diffuse into mixed vegetable oils. Lubricant samples are prepared by mixing two different vegetable oils, such as castor oil and sunflower oil, in different ratios, then dispersing the nanoparticles in the mixed oil and sonicating to ensure homogeneity of the mixture using a magnetic stirrer. The viscosity is determined using a Redwood viscometer. Measurement of the flash point and ignition point is done with the Pensky–Martin Closed Cup Tester. All friction and anti-wear properties of lubricating fluids are measured using a four-ball tester according to ASTM D 4172–92. Results are compared with several mineral oils. The use of nanoparticles significantly improves friction and wear properties compared to other types of mineral oils. The results of this study also showed superior levels of other attributes, including viscosity, when compared to mineral oil-based lubricants.

***Full paper:** *In International Conference on Inventive Material Science Applications, Singapore, Springer Nature Singapore. pp. 1-11, 2023*

Comparison of Fault Detection Data from Defective Ball Bearings Using Artificial Neural Networks

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ABSTRACT

This paper tries to integrate artificial neural networks with the data sets acquired from the experimental set-up and compares which classifier is the best one that gives more accurate result. The data sets acquired from an experimental test rig which consists of defective ball bearing is analysed with the help of different classifier algorithms of artificial neural network. It was found that the 10% random set of data have given more accuracy than all other data sets subjected study in this proposed work. This method can be effectively used not only for data sets obtained from vibration analysis but also can be extended to all datatypes acquired from various experimental set-ups.

***Full paper:** *In International Conference on Future technologies in Manufacturing, Automation, Design and Energy, Singapore, Springer Nature Singapore. pp. 589-598, 2023*

Numerical Investigation of Heat Transfer Characteristics for Various CPU Designs

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ABSTRACT

Due to the rise in demand of computers with high computing power, there is significant advancement in electronic components inside the CPU cabinet every 6 months. The life of these electronic components is greatly affected by their working temperatures. Therefore, it is necessary to maintain the temperature of these devices within acceptable limits. Forced air cooling inside the CPU cabinet is a widely used technique for this purpose. Heat sinks are another way of increasing the heat transfer rate. The present study analyses the effect of different probable improvement cases implemented in the basic CPU cabinet. These improvement cases include changing the position and number of fans, changing the type of heat sink, and changing the inlet cross section. By making use of commercially available CFD softwares like Ansys Fluent and Icepak, the cooling effect in the CPU cabinet is analysed.

***Full paper:** *5th National Conference on Recent Advancement in Physical Sciences (NCRAPS-2023), no.48, 2023*

Performance Evaluation of Automotive Plastic Fuel Tank Using Finite Element Analysis

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ABSTRACT

The requirement in an automotive industry is to have lightweight, safe and efficient systems. A Fuel tank is oneof important systems which feeds the engine of the vehicle. In current era where the transition is taking place fromconventional steel tank to the plastic fuel tank, it is required to have a safe structural container for the fuel. In case of hybridvehicles where the engine is run by battery as well as fuel, it is challenging for the plastic fuel system to resist the highinternal vapor pressure due to overheating of fuel. To overcome with this difficulty, rectangular tank geometry with variousbead configurations and stiffening pillars is considered in an approach to study their effect in reducing tank deformations.The approach relies on determination of the tank behavior in terms of displacement and von mises stress for the appliedtest pressure. CATIA modelling tool is used to build the CAD model of the Fuel Tanks and FE model preparation is carriedin Altair HyperMesh pre-processing package. Ansys Mechanical APDL is utilized to solve these models. Results obtainedshowed that stiffeners inside the fuel tank have improved the structural strength to avoid failure due to large deformationsby fulfilling the industrial requirement for automotive fuel tank.

Full paper: *AIP Conference Proceedings. vol. 2399. no. 1. 2023*

Erosion Wear Behaviour of Particulate Filled Aramid Fiber Reinforced POM Based Composites

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ABSTRACT

Polymer based hybrid composites offer balanced strength/stiffness, improved fatigue/impact resistance, fracture toughness, reduced weight and/cost. These composites can be used to meet the specific design requirements in a more cost-effective way than that of mono-composites. This research article mainly focuses on preparation, mechanical properties and erosion behaviour of silicone rubber (SR) modified polyoxymethylene (SR/POM) blend with reinforcements namely polytetrafluoroethylene (PTFE), aramid fibers, and molybdenum disulphide. Mechanical test results indicated that there is marginal increase in hardness with the addition of hybrid reinforcements in SR/POM blend. The maximum values of tensile, flexural strength and impact strength was measured for SR/POM blend with PTFE/SAFs reinforcing agents. Addition of hybrid reinforcements enhanced all mechanical properties except % elongation of break. The SR/POM blend sample with 5 wt. % PTFE, 15 wt. % aramid fibers and 2 wt. % MoS2 exhibit the greatest tensile modulus (2990 MPa) and excellent flexural modulus (3385 MPa). Erosion test results revealed that these hybrid SR/POM based composites showed semi ductile erosion behaviour, with maximum erosion rate at 45° impingement angle. Finally, eroded surfaces of SR/POM and their hybrid composites were characterized using scanning electron microscope.

*Full paper: *In AIP Conference Proceedings, vol. 2747, no. 1, 2023*

Mechanical and Wear Behavior of Halloysite Nanotubes Filled Silk/Basalt Hybrid Composites Using Response Surface Methodology

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ABSTRACT

The aim of this study is to develop bio-friendly light weight polymer nanocomposites for load bearing applications and to evaluate the influence of halloysite nanotubes (HNTs) on mechanical as well as wear behavior of silk fiber (SF) and basalt fiber (BF) reinforced epoxy (Ep) composites. HNT filled biocomposites were fabricated using vacuum bagging technique. The Box-Behnken design (BBD) of experiment with Response surface methodology (RSM) was used to conduct the dry-sliding wear tests on a pin on disc apparatus. Tribo-mechanical properties and worn surface micrographs of hybrid composite samples were analyzed. Hardness, tensile strength and wear resistance behavior of SF + BF/Ep hybrid composites were substantially improved with the incorporation of HNTs. It was observed from the confirmation test that there is a strong agreement between the experimental findings as well as the predicted values, with a minimum reported error of <5% for HNT-SF + BF/Ep hybrid nanocomposites. SEM micrographs of the worn-out surface of HNT filled SF + BF/Ep composite exhibited fiber breakage, pulverized matrix, good interfacial bonding and fractured fibers. The novelty of the current research work is the development of eco-friendly polymeric composites for wear resistant and structural applications. The effect of hybridization (fibers—silk and basalt, fillers—HNTs) on the tribo-mechanical properties of polymeric composites were investigated for the first time. The study showed that the mechanical as well as the tribological properties of SF and BF reinforced epoxy composites were enhanced with the addition of nanofiller.

Full paper: International Symposium on Lightweight and Sustainable Polymeric Materials, Springer Nature Singapore, pp. 387-402, 2023

Superior Mechanical Properties of Aluminium Matrix Composites Fabricated through Modified Matrix Encapsulated Feeding Method

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ABSTRACT

Aluminium matrix composites (AMCs) play a vital role in constructing aircraft, marine and automobile components. The major issue in manufacturing of AMCs through stir casting method is a localized ceramic particles agglomeration. In current research, metal castings have been prepared with 97.5 wt% of aluminium alloy (AA 7075) and 2.5 wt% of nano-alumina (n-Al2O3) particles through a modified matrix encapsulated feeding technique. The tensile strength, microhardness and dry sliding wear behaviour of n-Al2O3 reinforced AA 7075 composites were measured following ASTM standards. The ultimate tensile strength of the developed AMCs varies from 280 to 315 MPa, which is 12.5% higher than unreinforced AA 7075 alloy. Yield strength increases from 140 to 158 MPa, whereas microhardness of the composites increases from 138 to 210HV. Due to homogeneous distribution of n-Al2O3, the overall wear resistance of n-Al2O3 reinforced AA 7075 composites increases up to 90% as compared to unreinforced AA 7075 alloy. Also, the addition of n-Al2O3 particles marginally reduces the network of microcracks and deep furrows in the worn surface. The microstructural and elemental studies are also performed through scanning electron microscopy and X-ray diffraction.

Full paper: Transactions of the Indian Institute of Metals, pp.1-10, 2023

Tribological Behavior of Polymeric Systems In Lubricated Surfaces or Conditions

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ABSTRACT

Recent advances in mono- and multiphase polymeric composite systems offer unique possibilities for controlling the friction force and wear loss under self and boundary-lubricated sliding and rotating/rolling contact conditions. In particular, multiphase polymeric composites can be tailored to meet the needs of aero/automotive moving surfaces by enabling them to operate in lower viscosity oils/water. The research progress on studying the wear-and-tear behavior of polymeric micro/nanocomposites filled with fiber and micro- or nanofillers under lubricated conditions and the role of solid lubricant in improving the tribological properties of sliding contact interfaces and abrasive wear is reviewed. Controlling the dispersion, size, shape, orientation, and density of the filler, researchers were able to modify both the width and the height of the boundary lubrication regimes and thus achieve lower friction and wear at sliding and rotating contact interfaces. In this review article, an overall understanding of multiphase micro- and nanocomposites, in particular particulate nanofillers, wear of polymers, and the effect of various fillers on tribological properties of selected thermoset/ thermoplastics has been discussed. This detailed review is limited to micro- and nanofillers and their influence on the tribological properties of various polymer matrices.

Full paper: Tribology of Polymers, Polymer Composites, and Polymer Nanocomposites, pp. 357-399, 2023

Thermomechanical And Viscoelastic Properties of Biodegradable And Biocompatible Polymer Nanocomposites

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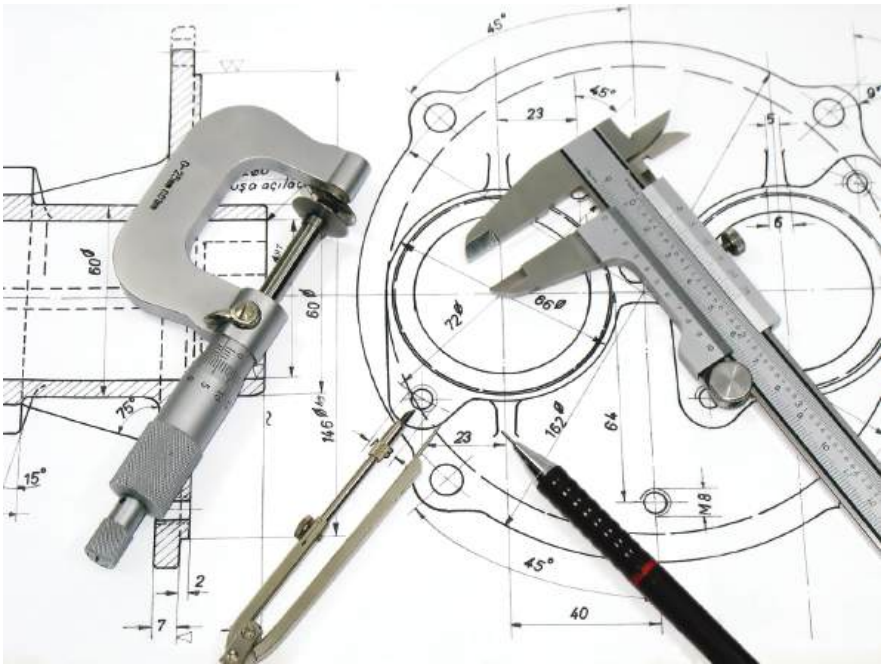
ABSTRACT

Due to the ongoing depletion of fossil fuels, which have been the primary sources of monomers from which the vast majority of synthetic polymers are derived, biodegradable and biocompatible polymeric composites (BBPCs) have received a great deal of attention in recent years. The use of biodegradable and biocompatible polymers is expanding due to their ability to reduce toxic and nondegradable waste materials. Traditional polymers such as polypropylene, polyethylene, and polystyrene are nonbiodegradable, making reuse and recycling difficult. As a result, massive amounts of nonbiodegradable waste are generated all over the world. Biodegradable polymers have been widely used in medical and packaging applications because they are typically made from renewable materials that biodegrade when discarded. Producing biodegradable composites with the addition of environmentally friendly nanofillers is increasingly being regarded as the "next-generation materials" for improving some of the properties and performance of biodegradable polymers. Despite growing interest in biodegradable and biocompatible polymer research, most studies focus on their preparation methodologies and characterization, with little attention paid to their thermo-mechanical and viscoelastic behavior. Thus, the potential of biodegradable and biocompatible polymer nanocomposites under various thermo-mechanical conditions, as well as their viscoelastic behavior, is reviewed in this chapter.

**Full paper: Biodegradable and Biocompatible Polymer Nanocomposites, 2023*

Department of Industrial & Production Engineering



Experimental Analysis on the Impact Behaviour of Graphite-Filled Glass Fibre Reinforced Epoxy Composites Subjected to Sea Water Ageing and Notch Depth

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ABSTRACT

The present investigation focusses on the analysis of effect of notch depth and sea water ageing on the impact behaviour of glass fibre reinforced epoxy composites filled with graphite particulates as the secondary reinforcement. The laminates of epoxy composites with different compositions are developed by varying graphite filler in the volume proportion of 0%, 4% and 8% vol. The epoxy composites fabricated are subjected to ageing in water for different time durations of 50 h, 100 h and 150 h. The specimens subjected to ageing are tested for impact strength according to ASTM D256 at different notch depth varying from 1 mm–4 mm in steps of 1 mm. It is evident from the experimentation that increase in impact strength is obtained for epoxy composites with increase in addition of graphite filler. It is observed that sea water aged specimens with 4-mm notch depth have resulted in enhanced impact strength of about 51% compared to 1-mm notch depth.

***Full paper:** *Journal of The Institution of Engineers (India): Series D, 7th August 2023*

Preparation & Characterization of Fiber Reinforced with Ceramic-Based Filler Polymer Matrix Composites for High-Temperature Applications

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ABSTRACT

The aim of this experimental study was to investigate the mechanical properties of epoxy polymer matrix composites reinforced with Synthetic fiber (S-glass) and ceramic filler, specifically Silicon Carbide (SiC), under different filler loading conditions. The combination of SiC as a secondary reinforcement with S-glass fiber was fabricated using the hand layup technique, incorporating filler loadings of 0%, 2.5%, 5%, and 7.5% by weight. Tensile testing was performed on samples prepared and cut according to ASTM standards at various temperature conditions. The results of the tests revealed that the addition of 7.5% SiC filler into the S-glass fiber reinforced epoxy composite significantly enhanced the tensile properties of the material, surpassing those of other composites under both normal and high temperature conditions. These findings suggest that as the SiC ceramic filler content increased in the composite, the mechanical properties exhibited proportional improvement, irrespective of the temperature conditions. This experimental research provides valuable insights into the characterization of mechanical properties in epoxy polymer matrix composites reinforced with Synthetic fiber (S-glass) and Silicon Carbide (SiC) ceramic filler. The study highlights the importance of filler loading in optimizing the performance of these composites, specifically in terms of tensile strength, across different temperature environments.

***Full paper:** *International Journal of Materials Science , vol. 4, no. 1, pp. 48-55, 2023*

Mechanical Investigation of S-Glass/Carbon Fibers Reinforced Epoxy Polymer Matrix Composites

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ABSTRACT

Fiber - based hybrid composite materials are used for variety of industrial purposes going on from automotive to many engineering fields such as structural, aerospace because of unique properties compared over conventional materials. Fiber based hybrid composites have greatly long-drawn-out o varying applications in today's automotive industry reason behind is due their light weight, high strength, stiffness and ease of repair. This work aims to create a novel type of hybrid composite made by reinforcing S-glass (satin type) & carbon (twill form) in an epoxy matrix. Pure and hybrid composites are made by manual laying with 0° orientation of each fiber layer and the action has been tested with different combinations of each layer of S-glass and carbon and finally with a hybrid subjected to different mechanical stresses. The fiber matrix for the hybrid is created in a 50:50 ratio. Pure samples of fiberglass and carbon fiber-epoxy composites were compared to hybrid samples. The results showed that the hybrid samples outperformed the pure forms of the composite in mechanical tests, due to the presence of carbon fiber on the end faces of the sample, which offers the hybrid form's superior mechanical properties.

***Full paper:** International Journal of Engineering and Advanced Technology (IJEAT), vol. 12, no. 4, 2023*

Mechanical Characterization of Fiber Reinforced Polymer Matrix Composite with Ceramic Filler as Secondary Reinforcement

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ABSTRACT

The present experimental work gives insight into characterizing the mechanical properties of Synthetic fiber (S-glass) with ceramic filler as Silicon Carbide used as secondary reinforcement with epoxy polymer matrix composites at different filler loading conditions. The ceramic filler as SiC with the s-glass fiber combination is fabricated by adopting hand layup technique, with filler addition of 0%, 2.5%, 5% and 7.5% wt. The physical and mechanical evaluation was done on the samples that were prepared and cut according to ASTM standards, namely density, tensile, impact, ILSS and Shore D hardness. The test results revealed, that with 7.5% wt. of SiC filler addition into the s-glass fiber reinforced epoxy composite, the mechanical abilities of the material system out performed in most of the cases, when compared at the other composites. This indicates, that as the SiC-ceramic filler addition was increased in the composite, the mechanical properties also increased proportionately.

***Full paper:** vol. 55, no. 01, 2023*

Fracture Toughness and Mechanical Characterization of Synthetic Fibres Reinforced Polymer Matrix Composites

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ABSTRACT

The advancement in composite materials has changed the view of engineering world as it has the capability to replace some metals for important applications. Currently, there is demand for the new materials of different grades due to their significant mechanical properties. In this paper, mechanical properties are studied on mono composites prepared using synthetic fibres namely Carbon, S- Glass and Kevlar fibres as a potential reinforcing materials been reinforced with epoxy polymer matrix composites. The composite plates were prepared with a conventional hand layup process followed by compression moulding. The specimens were tested for Density, fracture toughness, tensile, flexural, ILSS, hardness and impact properties. According to the findings, carbon fibre reinforced epoxy matrix composites have superior characteristics than other mono composites.

*__Full paper:__ *Eurpean Chemical Bulletin, vol. 12, no. 7, pp. 404-418, 2023*

Experimental Investigation of Fracture Toughness on Carbon/ S-glass Fiber Reinforced Thermoset Composites by Compact Tension Test Method

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ABSTRACT

The characterization of the fracture toughness of fiber-reinforced hybrid polymer composites is essential to understand their mechanical properties and to predict their fracture. It is used to evaluate a material's ability to resist crack growth and propagation under applied stress. It helps to understand the behavior of polymers and the influence of hybridization on crack energy, crack propagation and failure mechanisms. These studies will provide valuable insight into the crack propagation properties of fiber reinforced hybrid polymer composites and the damaging factors that can affect them. This is a great opportunity to further research and contribute to this field of study. This test was developed to study crack propagation and its factors in composites by performing fracture toughness experiment on composite samples by performing a compact tensile test on carbon and glass fiber reinforced epoxy polymer composites with fibers arranged longitudinally, transversely and under inclined conditions. The critical fiber and matrix energy release rates for tensile cracking were determined on pre-cracked specimens under plate loading conditions. After longitudinal stretching, damage progressed progressively in the form of translaminar fiber breakage in filament-containing materials. During the transverse stretching process, fiber-matrix separation caused deformation of the materials within the layers, and irregular fiber breakage was observed during the angular stretching process. The highest critical fracture energy release rate was found in the hybrid polymer matrix composite, with the maximum value in the longitudinal tensile state.

***Full paper:** *Innovations, no. 73, 2023*

Effective Utilization of Waste Plastic Materials Using Pyrolysis Method

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ABSTRACT

The disposal of waste plastic is one of the key challenges to the environment which results in drastic pollution of the environment. One stratagem to bout plastic pollution is converting mountains of plastic garbage into something worthwhile. The paper presents a depth analysis for the reader about an efficient technique to yield an appreciable amount of crude oil and even macadam by the use of simple techniques of pyrolysis. Paper also set a primary heating device to carry out the operation of pyrolysis based on induction heating. Thus, this is an attempt to address the delinquency of waste plastic dumping and fossil fuel deficiency, thereby assisting in the preferment of an eco-friendly environment.

***Full paper:** *Materials Today: Proceedings, vol. 92, no. 1, pp. 338-343, 2023*

Modeling 4Ps of Toyota Way Principles in Msmes Supply Chain-an Empirical Approach

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ABSTRACT

Micro, Small & Medium Enterprises (MSMEs) have witnessed many remarkable contributions to the country's economy in the recent years. But, till now it suffers from profit, quality, efficiency and others issues. The previous contributions by researchers have enlightened on the MSMEs in the context of applying lean principles. This paper aim to guide MSMEs in embarking on transformation exercise by means of applying principles and tools of lean to its supply chain. And, also to establish the relationship between application and understanding of relevance of lean principle model for MSMEs. It is observed that to be successful in the market, competition is not between one company to another company but, between one supply chains to the other supply chain. Company's competitive strategy is best supported by balance between the supply chain responsiveness and efficiency. So, the scale of this paper is not just restricted to MSMEs but to its entire supply chain. In this epidemic situation, companies are facing a high risk of surviving in the market. The interlinked nature of the supply chain makes them vulnerable to wide range of risk, as the buying patterns of the consumers across the supply chain is changing rapidly due to unpredictable situation. So, to sustain in the market, competition is to see how efficiently the entire process is set by implementing lean principles. The exact need and area of implementation of 4Ps of Toyota way principles are done to entire supply chain of MSMEs Finally; gap that exists in applying and relevance of 14 Toyota way principles for the MSMEs in taking care and how, lean principles to become more effective during pandemic situation is reflected. A structured questionnaire was prepared on 4Ps of Toyota way, with its predefined attributes and data was collected from MSMEs through survey forms. The quantitative data collected was outlined to rank the 14 principles applied in the MSMEs supply chain, and also the extent of perceiving their relevance. The results reflected that all the attributes of each 4Ps model were appreciated by the respondents for their relevance, but still many of them lack in application

***Full paper:** *Materials Today: Proceedings, vol. 92, no. 1, pp. 284-290, 2023*

Three-Body Abrasive Wear Behavior of Rice Straw Fibers Reinforced PLA Composites

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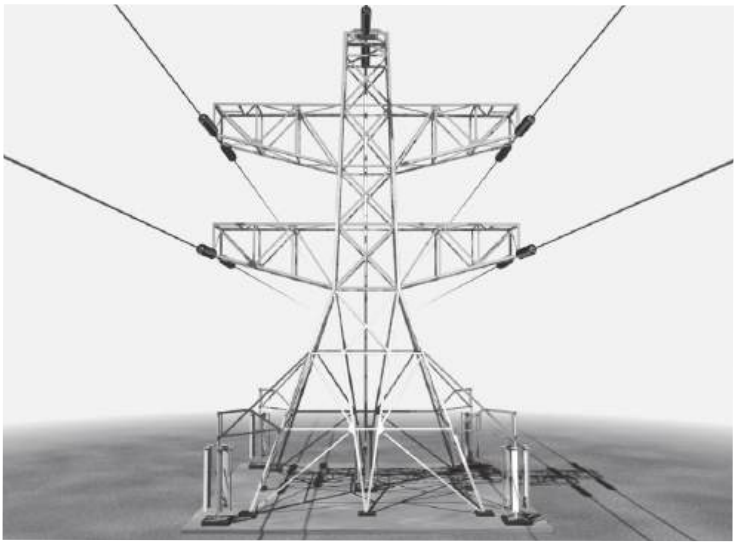
ABSTRACT

The current study focused on improving the abrasion resistance of rice straw fiber reinforced polylactic acid (PLA) composites. The effect of applied load and rice straw fiber loading on three-body abrasive wear behavior of PLA composites have been investigated. Rice straw fibers were treated with 2 wt% NaOH solution. Both the untreated and treated were produced by injection molding technique. Wear testing was performed on a dry sand/rubber wheel abrasion tester. According to the experimental results, fiber loading and applied load have a significant influence on composite wear loss. The results reveal that the abrasive wear loss of the composites decreases as fiber loading rises, whereas wear loss increases as applied normal load increases. SEM images were used to examine at the worn surfaces of the abraded samples to learn more about how the material was taken away. The treated fiber-reinforced PLA composites showed improvement in wear resistance than the untreated fiber reinforced PLA composites because the NaOH treatment of the fibers increased the fiber–matrix adhesion,

***Full paper:** *Materials Today: Proceedings, vol. 92, no. 1, pp. 322-326, 2023*

Department of Electrical & Electronics Engineering



Grey Wolf Optimization Based Fractional Order PID Controller In SSSC On Damping Low Frequency Oscillation In Interconnected Multi-Machine Power System

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ABSTRACT

Power System Oscillations followed by transient effects, adversely affects the stability in interconnected Power systems. This issue can be addressed using power oscillation damping controllers (PODC). For dynamic systems with varying system conditions, a robust PODC is required, which adjust the parameters as the system conditions changes. The robust PODC design is a multimodal optimization problem, which cannot be solved using conventional optimization techniques. An artificial Intelligence based grey wolf optimization technique (GWO) can be used for this purpose. This algorithm estimates the optimal control parameters of a fraction order PID based damping controller. A 4 machine, 2 area, 11 bus power system network with Static Synchronous Series compensator based PODC is considered in this research work. The performance of the PODC with GWO-FOPID controller under different system conditions are simulated and evaluated the performances indices under these conditions.

***Full paper:** *International Journal of Information Technology, vol. 15, 2023*

Multi Machine Stability Enhancement Using Fuzzy- Logic Based PSS Tuning With Shunt FACTS Device

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ABSTRACT

In Large power system network the dynamic behaviour of system is nonlinear in nature. Due to disturbance the system stability cannot be maintained, which leads to outage of power equipment. In order to restore the system parameter after perturbance, coordination control damping is essential. Coordination control damping can be achieved by using fuzzy based PSS and STATCOM in multimachine system for sever disturbance. Due to perturbance the system loss its synchronism and the system parameter deviate from the nominal value. With the effective damping control technique proposed in this article is to minimize the integral square error of speed deviation. Two area 4-Machine 11-bus test system considered and the simulation of proposed system is developed in Matlab/Simulink R2018a.

***Full paper:** *Indonesian Journal of Electrical Engineering and Informatics (IJEEI), vol. 11, no. 1. 2023*

Frequency Stability of a Wind-based Energy System by Virtual Inertia Controller of an Inverter Connected to Grid

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ABSTRACT

The dwindling inertia of the power system due to the incorporation of renewable energy sources is a vital concern. This is the genesis of the frequency volatility in a system. A non-linear controller formulated on fuzzy logic has been developed for mimicking the operation of a synchronous generator. This non-linear controller is proficient in utilizing the energy present in the rotating blades of the wind turbine and nourishing the requisite quantity of inertia in the system ensuring the alleviation of the frequency variation issues. The system's improved behavior is evaluated with this innovative controller in comparison with a traditional PD/PID controller for various transients such as sudden addition, deletion of large loads, and faults.

***Full paper:** *IETE Journal of Research, Taylor & Francis, Vol. 69, No. 2, March 2023*

Stability Testing and Restoration of A DEIG-Based Wind Power Plant with Indirect Grid Control Strategies

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ABSTRACT

In the current scenario, because of government policies, environmental factors, and technological improvements, there is a rapid growth in renewable energy sector. The emphasis is to obtain better system performance by effective resource utilization and providing security and reliability. This paper discusses the design and implementation of indirect grid control of a wind power plant by controlling the parameters in both grid and rotor side converters. The proposed system consists of Doubly Excited Induction Generator (DEIG) with Wind turbine system (WTS) and Mechanical and Electrical Power Controlling Systems (MPCS-EPCS). Various transmission line faults (symmetrical and asymmetrical faults) incur power imbalances in power grid. The developed MPCS and EPCS are helpful to perform grid monitoring and controlling under different types of faulty conditions. The MPCS monitors the effective source utilization and EPCS helpful for matching the grid energy levels under normal and faulty conditions. Modification in the converter topologies to minimize the impact of adverse effects of faults on the DEIG-WTS and to improve resiliency in the power grid is also discussed. To improve the stability and enhancing resource utilization to improve the efficiency of the overall system with the enhancement of fault voltage ride-through capability in DEIG-WTS under fault conditions are also considered. The stability of the system is tested under steady-state and dynamic-state conditions by applying faulty conditions in MATLAB/Simulink environment.

***Full paper:** *IETE Journal of Research*, Taylor & Francis, Vol. 69, No. 6, 2023*

Pragmatic Distribution Based Routing Cluster to Improve Energy Efficient Cluster lifetime for Wireless Sensor Networks

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ABSTRACT

Energy consumed by the sensor nodes are more sporadic in a sensor networks. A skilled way to bring down energy consumption and extend maximum life-time of any sensor present can be of evenly and unevenly distributed random area networks. Cluster heads are more responsible for the links between the source and destination. Energy consumption are much compare to member nodes of the network. Re-clustering will take place if the connectivity in the distributed network failure occurs in between the cluster networks that will affects redundancy in the network efficiency. Hence, we propose pragmatic distribution based routing cluster lifetime using fitness function (PDBRC) prototype is better than the existing protocol using MATLAB 2021a simulation tool.

***Full paper:** *INTL Journal of Electronics and Telecommunications, vol. 69, no. 2, pp. 353-360, 2023*

An Extensive Performance for Fault Positioning in Randomly Distributed Networks to Extend Cluster Lifetime in WSN's

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ABSTRACT

In distributed sensor networks, load balancing and minimizing energy consumptionisthe prime task. In the Existing protocols reconciliation of both metrics was not possible. Theproblem of a nonexistent sensor node in a randomly distributed network due to mobilitymaydisconnect the communication link and data are unavoidable. Many research authors haveproposed fault-tolerant mechanisms to achieve high data reliability, extend networklifetimeand minimize the fault in the node. A secured Energy cost-efficient multi-routing protocol isframed to accomplish a much more lifetime network. This Fault Positioning DistributedRandom Network protocol (FPDRN) paper proposes the simulation using MATLABperforming various cluster-based redundancy in fault sympathetic proficiency and comparesthem with the existing protocols using an applied mathematical model. Keywords: Fault positioning, Distributed, Cluster, Unique ID,Energy hole, fitness function, data reliability.

***Full paper:** Journal of Xi'an University of Architecture & Technology, vol. 15, no. 10, 2023*

Graph Theoretic Analysis of Power Networks

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ABSTRACT

The intensified interest in Graph Theory applied to the field of Power Engineering is due to its capability in predicting the behavior of electrical networks. A complex electrical network with many interconnected electrical elements and devices behaves differently to different inputs and its response which depends on various factors needs proper investigation. The use of Linear Graph Theory is significant in power system studies as it proves to be an excellent mathematical tool for deriving the representations of the electrical transmission network. This paper presents the modelling of standard test system using graph theoretical concepts and thereby formulating network equations using different reference frames. The approach used provides an easy analytical solution if applied to bulky power networks in real time.

***Full Paper:** IJERT, Vol. 12. no. 10, October-2023*

Collaborative Evaluation of Soc, Sop And Soh of Lithium-Ion Battery in an Electric Bus Through Improved Remora Optimization Algorithm and Dual Adaptive Kalman Filtering Algorithm

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ABSTRACT

Many countries are switched to electric vehicles (EVs) for public transportation, which increases the adoption of electric buses. Batteries are the key component in battery-operated electric vehicles and must be monitored for the system to operate efficiently. This work has proposed a joint estimation method to examine the battery states. The lithium-ion battery (Li-B) is initially designed through a first-order RC equivalent (FO-RC) circuit. To optimize the modelling parameters of a battery, an improved remora optimization algorithm (IROA) is proposed in this work. After detecting the optimum values for the parameters, the SoC is evaluated by a dual adaptive Kalman filteringalgorithm (DAKF). Then the SoH is estimated based on the predicted SoC of a battery, whereas the SoP is evaluated by considering current and voltage constraints during battery operation. After that, the battery's remaining useful life (RUL) is examined based on the estimated SoC. The proposed work is implemented on the MATLAB platform, and the results will be validated under varying operating conditions. The comparative analysis shows that the IROA provides optimum parameters near the actual parameters' actual values, thereby improving the prediction accuracy of battery states.

***Full paper:** *Journal of Energy Storage, vol. 79, 2023*

Performance Estimation of Lithium-Ion Batteries in Electric Vehicles

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ABSTRACT

The battery's State of Charge (SoC) is a crucial information for a vehicle's energy management system. However, the State of Charge accuracy is usually affected by temperature, driving cycles, and battery aging cycle. Therefore, traditional methods of estimating SoC cannot be implemented in the electric vehicles. Data-driven methods for SoC estimation using battery measurements have shown promising results. In this work, long short-term memory (LSTM) recurrent neural network and non-recurrent feedforward neural networks (FNN) are used for SoC estimation. Both of the neural networks are trained and tested for actual battery measurements input data and filtered measured data. 80% of the data is used for training the algorithm and about 20% is used for testing. The results obtained are compared to analyze the effect of using filtered data for training the algorithms and testing it. Further, the performance of the algorithms is compared by calculating Root Mean Square Error (RMSE) and Maximum Error indices.

***Full paper:** *International Conference on Emerging Trends and Technologies on Intelligent Systems, pp. 585–598, 2023*

A Distributed Cluster Based Protocol to Extend Lifetime using Fitness Function algorithm in Wireless Sensor Networks

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ABSTRACT

Cluster networks are very essential in the field of WS networks to cut down the energy ingestion in overall nodes present in distributed randomized networks. Clustering approach is more appropriate technique for energy efficient processes to extend their lifetime with a balanced network. The assortment of Cluster-Heads in a distributed network is the dominant task for all researchers. The major factors that influence sensor nodes are that they are malfunctioning due to power reduction, environmental hazards, interference, communication links, collisions, and a few more. Multi-hop communication is used to improve data gathering by reducing the distance among neighbouring nodes. To overcome and balance these problems, a distributed cluster-based routing protocol (DCBRP) using fitness functions as a prototype has been proposed by heuristic methodology. This new DCBRP protocol is simulated using a MATLAB tool and compared with the existing protocol based on performance evaluation metrics like packet delivery ratio, active nodes, throughput, and network life-time.

***Full paper:** 2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC) pp. 10-11, February 2023*

Department of Electronics & Communication Engineering

Study of Galvanic Charging-Discharging Properties of Graphene Nanoplatelets Incorporated Epoxy-Carbon Fabric Composites

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ABSTRACT

Polymer composites are increasing in demand in energy storage applications including in theelectronic as well as electrical industries due to the ease of processing of these materials withassociated advantages like light weight, corrosion resistance, and high mechanical strength. Inthis investigation, efforts are made to enhance the charging and discharging properties ofepoxy/carbon fabric composite by the addition of graphene nanoplatelets (GNPs) into the epoxy/carbon matrix. The performance of the composites with graphene platelets of 0.5 to 5 wt. % inepoxy were characterized and 1wt.% percolation threshold was observed poor performance ingravimetric charge and discharge characteristics were observed. Based on the percolationthreshold Epoxy-Carbon fabric (EC) composites and Epoxy-Carbon fabric with 1 wt. % of GNP(ECG1) composites were fabricated using a vacuum-assisted resin transfer molding technique.The electrochemical performance was studied using the Cyclovoltammetry test and 0.1 M ofNa2SO4as a supporting electrolyte. The Galvanostatic Charge-Discharge characteristics werecarried-out for EC and ECG1 at a scan rate of 80 sec, 300 sec, 4000 sec with 2 runs and 8 runs.The composite EC didn't not show GCD characteristics, but the symmetry of charge-dischargecharacteristics observed for ECG1 and same are discussed in this paper. These highly effective,and excellent characteristics demonstrate that Epoxy-GNP-CF composites may be promisingcomposites for practical energy storage applications.

***Full Paper:** *Journal of Polymer Materials, vol. 40, no. 1, pp. 93-96, 2023*

Optimizing Deep Learning Networks for Edge Devices with an Instance of Skin Cancer and Corn Leaf Disease Dataset

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ABSTRACT

Edge computing offers promising solutions for challenges related to latency, connectivity, scalability, cost, and privacy. However, the resource requirements of deep learning networks continue to pose difficulties for edge devices. Artificial intelligence (AI)-based agriculture and medical field applications demand a large network-sized model that involves more floating-point operations. This research work aims to address resource-constrained issues pertaining to edge devices using neural network optimization. The strategies used to accomplish neural network optimization comprise pruning, weight clustering, and quantization. With regard to deep learning models, these collaborative optimization techniques assist in reducing memory size and utilization. To illustrate our work, we used the Corn Leaf Disease and Skin Cancer Disease datasets and applied the necessary image preprocessing. The Convolution Neural Network (CNN) algorithm is employed to train the model using the preprocessed dataset. For the Corn Leaf Disease, the optimized CNN model utilized 5.1 MB of memory storage with a training accuracy of 81.92% compared to the trained model's 66 MB of memory storage and 83.38% training accuracy. This research work optimized the transfer learning models such as ResNet and MobileNet as accuracy was crucial, and observed that MobileNet not only results in good accuracy but performs well in-memory aspects as well compared to CNN and ResNet. To verify the reliability of the trained models in real-time, the GradCam algorithm is used in addition to accuracy. Using a memory profiler, we assessed the performance of the optimized model, and the inference was carried out on the arm-powered Raspberry PI edg

Full Paper: *SN Computer Science, vol.4, no. 793, 2023*

A Survey on Wireless Sensor Network (Applications and Architecture)

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ABSTRACT

Proliferation of wireless sensor network is due to the advancement in wireless networks, information technologies, miniaturization of sensors as well as convergence of MEMS technology, wireless communication and digital electronics. These wireless networks interface the physical world to the computing (virtual) world. In recent years, due to the availability of smaller, cheaper and intelligent sensors in a large scale has motivated to deploy the sensors in various applications such as smart city, smart home, smart grid, automated vehicles etc,. Sensor plays an important role in Internet of Things. This survey reports current research activities, applications, characteristics, architecture and case study of WSNs. In addition to this open research issues/ problems are discussed.Effort is emphasized on several application and architecture. The aim is to present a comprehensive study of the literature on the several aspect of wireless sensor network such as application and architecture

Full Paper: *International Journal of Communication Networks and Distributed Systems, vol. 30, no. 1, 2023*

Face Recognition Based Biometric Identification System With COVID-19 Detection

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ABSTRACT

In this paper face recognition system for the purpose of security is explored whose design is based on Raspberry Pi system. An add on temperature detection system also gives detection of COVID affected people.

With the COVID-19 pandemic, temperature checking before you enter a premise is a necessary step to ensure you are well and help keep others safe. One of the most common ways is to use a handheld digital thermometer to find out your own temperature and recording it on some kind of logbook placed near the front door. For a workplace, employees are encouraged to record their temperature twice a day.

***Full Paper:** International Journal for Research in Applied Science & Engineering Technology (IJRASET), vol. 11, no. 11, pp. 1528-1539, 2023*

Intelligent Headphones

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ABSTRACT

We have been showered by innumerable technologies with accuracy and precision to aid us in all walks of life. It is to be noted that certain technologies come hand in glove with complex problems. Regardless, some of these are so necessary to us that we have continued using them as a necessity none the less. Here the concern is the health, particularly the human audio systems -ear. Varieties of headphones are available in the market but none of them care for the wellbeing of the ears, with respect to the user expectation. The design of such gadgets should be in accordance with the gifted human sensors namely the ear drum; any deviation from these criteria will ultimately result in its deterioration. So our simplified approach to solve this problem is through an intelligent headphone which is not in any fixed pre- tuned form. Our project is a sensible gadget which operates entirely based on the ear's physical characteristics of the respective user. This works on the principle of echo & vibration of the diaphragm of headphone on the basis of sensed and measured intensities. Here the utilization of electromechanical process and back E.M.F of headphones are done.

***Full Paper:** *Journal of Survey in Fisheries Sciences (SFS), vol. 10, ni. 2, 2023*

Enhanced Performance Analysis of Lip Reading System with Improved SURF

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ABSTRACT

Lip reading is an approach for grasping spoken words/sentences .It is a methodology to grasp the spoken words by means of lip motion/gesture. The system should be robust for the variable images. Feature extraction is one of the main process in reading lips, because it plays a prominent role in classification of lip images. In Speeded Up Robust Feature extraction(SURF) for detecting accurate corners is cumbersome for more wrong prediction. In improved SURF accurate prediction of corners is possible with less wrong detection ratio. The paper summarizes improved SURF based on Harris corner detection and reduces false corner detection ratio by increasing threshold value. It effectively reduces computational aspects for descriptor component and time required to match the image.

***Full Paper:** *Journal of Emerging Technologies and Innovative Research (JETIR), vol. 10, no. 2, pp. 785-793, 2023*

A New Approach to Hand Gesture Recognition Using Combined Effect of CNN And HMM

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ABSTRACT

Gesture language is a communication language that involves hand gestures, body language and facial expression, used basically by the people who have hearing impairment. They communicate among themselves in sense of letters, words and sentences of interactive language to gestures. The most expressiveway to communicate among themselves is Sign Language. Here, proposed system will recognize the hand gestures and translates into textual words. The methodology consists of two phases, namely Model Creation phase a Recognition phase. Here, Convolution Neural Network(CNN) is used for building the model and Hidden Markov Model(HM M) .

***Full Paper:** *Journal of Emerging Technologies and Innovative Research, vol. 10, no. 2, pp. 780-784, 2023*

Machine Learning Approach to Detect Congenital Heart Diseases Using Palmar Dermatoglyphics

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ABSTRACT

The present article has proposed a machine learning method to detect congenital heart diseases (CHDs) such as atrial septal defect (ASD) and myocardial infarction (MI) based on the frequency of occurrence of palm patterns such as ulnar loop and whorl. The system has been developed based on SSD-MobileNet to detect ulnar loop and whorl patterns on palm image. The developed system has achieved an accuracy of 99.28% and 97.19% in the detection of ulnar loop and whorl respectively. Further, the work has been carried out to fix the threshold value on the number of ulnar loop and whorl patterns to detect CHDs such as ASD and MI. The receiver operating characteristic curve has been drawn and the area under curve is calculated for the detection of ASD and MI. These results have shown that the proposed method can be used as a screening model to detect ASD and MI.

***Full Paper:** International Journal of Medical Engineering and Informatics, vol. 15, no. 4, pp. 336-351, 2023,*

Achieving Optimal Scalability Network and Deployment Cost, and Improving Network Performance Based on Traffic Prediction in FiWi Network

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ABSTRACT

The Fibre Wireless (FiWi) access network is a next generation (NG) access network that is designed for high data rate, broadband multiple services, scalable bandwidth, and flexible communication. The reason for the increased demand for bandwidth is due to applications that are being implemented by services such as smart grid (SG), smart cities (SC), and the Internet of Things. As a result, issues related to the planning and scalability of the communications infrastructure has become the focus of interest. Thus, there is need for designing cost-effective large–scale FiWi networks considering the rise in user groups demand for more bandwidth. This paper proposes two optimization algorithms to provide cost-effective scalability and network performance based on dynamic resource allocation for FiWi network.

***Full Paper:** International Journal of Intelligent Systems and Applications in Engineering IJISAE, vol. 12, no. 9, pp. 475–482, 2023*

Minimizing Network Deployment Cost in Fiwi Using Optimal Onu Placement: A Performance Analysis of Two Nature-Inspired Algorithms

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ABSTRACT

Fibre Wireless (FiWi) access technology integrates the existing broadband access technology and wireless access technology to fulfil the users' demand for better Internet speed in "anytime anywhere" approach and cost-efficient manner. It is designed to make the best use of their advantages in terms of vast bandwidth, mobility, and cost effectiveness. However, there remain there remain several open and challenging issues that require concentrated research efforts to build such an access technology. ONU placement problem is one among these issues as Optical Network Unit (ONU) placement in FiWi plays a critical role in overall network deployment cost and resource optimization. Server methods using nature-inspired algorithms have been proposed in literature to find optimum ONU placement. In this paper, we present performance analysis of two such algorithms by considering different of scenarios for ONUs and wireless routers in a FiWi network. Finally, the present work carried out to compare throughput gain for the algorithms under varied ONU and router deployment.

***Full paper:** *Journal of Data Acquisition and Processing, vol. 38, no. 1, 2023*

Interplay of NOMA And GSSK: Detection Strategies and Performance Analysis

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ABSTRACT

Non-orthogonal multiple access (NOMA) was identified as a technology enabler for the fifth generation and beyond networks, due to the prominent advantages achieved when integrating NOMA with other wireless technologies. In this article, we investigate the interplay between NOMA and generalized space shift keying (GSSK) in a hybrid NOMA-GSSK (N-GSSK) network. Specifically, we provide a comprehensive analytical framework and propose a novel energy-based N-GSSK detector for the reliable realization of N-GSSK systems. The proposed receiver is energy-efficient and enjoys low complexity, as it exploits the energy of the received signals and does not require the knowledge of NOMA signals. To quantify its efficiency, we further investigate the performance of the proposed detector in terms of pairwise error probability, bit error rate union bound, and achievable rate. The accuracy of the developed mathematical framework is corroborated through Monte-Carlo simulations, which show that N-GSSK outperforms conventional NOMA and GSSK, particularly in terms of spectral efficiency.

***Full paper:** *IEEE Open Journal of Vehicular Technology, vol. 4, pp. 681-692, 2023*

A Novel Tunable Frequency Sinusoidal OTA–LC Oscillator Circuit for High Frequency Applications

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ABSTRACT

A novel OTA-LC oscillator circuit using four OTA's, one capacitor and one inductor which mimics as an RLC oscillator circuit is proposed. The total number of components used in the proposed oscillator circuit is less, and the design equations and g_m-control over the frequency of oscillation are attractive. In this paper, the proposed OTA oscillator design concept is validated with simulation and experimental results. The frequency of oscillation of the proposed LC-OTA oscillator using LM13700 OTA is from 19 kHz to 7 MHz with a peak to peak amplitude > 0.2 V for power supply of ±15 V. The hardware implementation of the proposed oscillator is made using CMOS OTA in 180 nm technology node and frequency of oscillation obtained in 30 kHz to 150 kHz range with amplitude > 0.2 V for power supply of ±0.9 V.

***Full paper:** *Journal of Active and Passive Electronic Devices, vol. 17, no. 2, pp. 123-133, 2023*

AI and IoT Based Garbage Classification for the Smart City Using ESP32 Cam

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ABSTRACT

Waste collection and segregation are some of the tasks that require immense human power and knowledge about waste materials to achieve accurate results. But with the growing population and increase in waste materials, it is becoming tougher for workers and organizations that work for waste collection to achieve perfection. To overcome the problem, the study tries to design a smart dustbin that is capable of segregating the waste materials by itself. It separates the waste into biodegradable and non-biodegradable waste. It is done using a combination of components like an ESP32 cam, an AI model, a motor, etc. This Artificial Intelligence (AI) model will be built using the CNN algorithm. The model is trained with many epochs and validated for higher accuracy and lesser loss value. The model will then be integrated into the dustbin along with other components. This dustbin is also capable of displaying the space availability of the dustbin through IoT. This results in easing the work of the workers in segregating the waste materials and looking for dustbins that are filled.

***Full paper:** *International Journal of Health Sciences*, vol. *6, no. 3, pp.* 4575–4585, 2023

Effect of Combining Nano- and Microfillers for the Assessment of Thermal Class of Glass Fiber-Reinforced Epoxy Composites for Outdoor Insulation

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ABSTRACT

The present work was taken up with the objective to develop a compact and reliable hybrid compositeinsulation, investigate the thermal properties of the developed composites, and correlate the experimental data withthe results of mathematical modeling. A composite materialmade of unidirectional glass fibers reinforced with epoxyresin and containing silica, alumina, and aluminatrihydratefillers was fabricated using the pultrusion technique. Thermogravimetric analysis (TGA), thermal conductivity, andcoefficient of thermal expansion (CTE) were conducted onthe developed composites. The energy of activation wasestimated from the thermograms using mathematical models to assess the thermal class of the composites. Thoughthe G-E composite is typically classified under class-Finsulation, the study has established that the uniquefiller combination has a higher temperature index ranging between 156 ◦C and 166 ◦C. The improvement inthermal performance was observed when each filler ispresent in a weight percentage of 10%. The hybrid composites have excellent thermal conductivity (0.43 W/mK),a low CTE (22.1 µm/m ◦C), and hence useful forhigh-temperature insulation applications such as circuitbreakers, vacuum interrupters, transformers, and switchinggears.

Full Paper: *IEEE Transactions on Dielectrics and Electrical Insulation, vol. 30, no. 6, pp. 2896-2904, 2023*

Investigation on Electrical Conductivity and EMI Shielding Efficiencyof Modified Epoxy-Exfoliate Graphite Composites

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ABSTRACT

The use of epoxy-graphene composites byadvanced processing techniques and three roll mill dispersions resulted in 40 dB of electromagnetic interference(EMI) shielding efficiency in the range of 8–18 GHz. Sinceac conductivity did not increase up to 5 wt.% of graphenenanoplatelets (GNPs), the polymer matrix was modifiedwith eight layers of woven carbon fabric to increase the acconductivity. The use of carbon fabric resulted in enhanced

ac conductivity of 70 S/m and EMI shielding efficiency of60 dB at 8 GHz, which slowly decreased to 50 dB at 18 GHz.Further enhancement in the ac conductivity of the composite to 90 S/m was realized by the integration of 1 wt.% ofgraphene to the epoxy matrix with carbon fabric. The EMIshielding efficiency of the composite improved to 80 dBat 8 GHz, and 70 dB at 18 GHz. Significant enhancementof EMI shielding efficiency was achieved owing to thehigher ac conductivity. Absorption was the dominant EMIshielding mechanism due to the inherent ac conductivity ofcarbon layers which also helped in the minimal increase ofattenuation by reflection.

***Full Paper:** *IEEE Transactions on Dielectrics and Electrical Insulation, vol. 30, no. 6, pp. 2559-2566, 2023*

Design and Analysis of Microstrip Wideband Filter

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ABSTRAC

This paper deals with the study on conventional wideband bandpass filter (BPF) and the bandpass filter designed using the split ring resonator structure. The proposed design using the SRR consists of 3 SRR on which the filter is mounted. This is designed using the HFSS software. The material with in the dielectric constant of 4.36 and the loss tangent of 0.01 is used for the substrate material. The substrate height is varied with the dimension of 4.9 x 2.9 kept constant. The result observed for the BPF on SRR with increase substrate height has shown better results better return loss characteristics as compared to the other design.

***Full Paper:** 3rd International Conference on Intelligent Technologies (CONIT), 2023*

Functional Verification of Clock Domain Crossing in Register Transfer Level

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ABSTRACT

Numerous million-transistor systems running with multiple asynchronous clocks at frequency as high as multiple gigahertz have been made possible by diminishing component geometries and more complicated designs. Multiple interfaces are available on SoC systems, some of which employ standards with wildly divergent clock frequencies. Many contemporary serial interfaces are by nature asynchronous with the rest of the chip. To address the issue of clock skew across big processors, significant SoC sub-blocks are increasingly being designed to operate on separate clocks. Partition-based implementation and verification have typically been the primary emphasis of design approaches. These divisions are frequently based on clock domains. The cross-clock domain crossing (CDC) signals present a special and difficult verification difficulty. The verification of clock domain crossings cannot be done using conventional functional simulation. Although correct clock domain implementation and verification have received little attention, static timing analysis (STA) is a crucial component of the timing confinement strategy. Conventional techniques offer an impromptu partial verification that is laborious, error-prone, and manual. Designs may contain functional flaws that are not discovered until the end of the design cycle or worse still, during post-silicon testing, if the sources of potential mistakes are not addressed and confirmed early on. At this point, correcting mistakes would be quite expensive. Chips are reportedly "dead in the water" in some large system households as a result of CDC issues.

***Full Paper:** International Conference on Recent Trends in Electronics and Communication (ICRTEC), 2023*

Wireless Detection Systems Using Matrix-Oriented Diffusion

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ABSTRACT

The Matrix Oriented Diffusion (MOD) method pro- posed in the research aims to decrease the energy consumption of nodes in wireless detection systems by using a matrix-based approach for diffusion. By optimizing the use of energy in the nodes, the MOD method can improve the overall performance and prolong the lifespan of the system. In the MOD method, small clusters are formed based on a virtual matrix that is structured according to the routing fidelity. The virtual matrix allows for efficient and effective diffusion of information within the clusters, leading to the reduced energy consumption of the nodes. By organizing the nodes in this manner, the MOD method improves the efficiency of the wireless detection system and minimizes energy waste. In the MOD method, clusters are utilized to handle the large amounts of data generated by the sensing nodes, which can result in faster processing and reduced energy consumption. By grouping nodes together into clusters, the MOD method enables more efficient management of data floods and reduces the burden on individual nodes. This leads to improved overall performance and a longer lifespan of the system.

***Full paper:** *International Conference on Smart Systems for Applications in Electrical Sciences (ICSSES), pp. 1-6, 2023*

A Survey on Terahertz Devices-A cutting edge Technology

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ABSTRACT

Technological advances have unfurled the previously unused terahertz frequency band for numerous promising applications. It has a special position in the spectrum between infrared and microwave rays that makes it acquire unique features of safety, broadband, penetration, and low energy. In this paper, we portray a diverse survey on salient features of THz band and its wide range of applications beyond fifth generation (B5G) and towards the 6G communication systems. First, we present various features of THz bands and how it is applicable to 6G networks. Next, we discuss the limitations of THz technology followed by the state of art recently proposed techniques to overcome those limitations. Further, we discuss a broad range of THz applications in different domains such as spectroscopy, biomedical and military applications. Finally, we present the recent advancement in different THz detectors and their comparisions. Moreover, we present a review on the challenges for Terahertz range communication identified in existing research and discuss some future research directions.

***Full paper:** *International Conference on Recent Trends in Electronics and Communication (ICRTEC), 2023*

Optimal Status Updates in Cognitive Radio-Enabled IoT Networks: An Age of Information Approach

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ABSTRACT

Age of information (AoI) is a performance metric which can be used to measure the freshness of time sensitive information such as health monitoring packets, which are medical information captured by body sensors. We consider a cognitive radio (CR)-enabled internet-of-things (IoT) network, where timely status updates over both primary and secondary links are critical. In such a setup, status updates by primary transmitter (PT) and secondary transmitter (ST) have to be designed in an efficient manner. To this end, we derive an expression for the overall average age of information (AoI) of the network, and formulate an optimization problem based on AoI to find optimal status updates. We show that the formulated optimization problem is convex. Further, we reformulate the AoI minimization problem in the asymptotic scenario of high signal-to-noise ratio, and derive a closed form expression for the optimal PT status rate with a predefined threshold on ST status rate as a constraint. We validate our analysis through numerical techniques.

Full paper: *11th International Conference on Internet of Everything, Microwave Engineering, Communication and Networks, (IEMECON), 2023*

Energy-Efficient Ant Colony Task Assignment Based Spectrum Sensing for Cognitive Radios

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ABSTRACT

In this paper, we discuss the energy efficiency (EE) of an ant colony task assignment-based cooperative spectrum sensing (CSS) algorithm for cogntive radios. The main idea in this technique, called the 2EACRAC2S algorithm, is that a secondary (SU) participates in the CSS procedure only when the path loss between itself and the primary user (PU) exceeds a threshold. Otherwise, it does not carry out SS and refrains from sending the decision to a fusion center (FC), which saves energy. The FC uses the AND fusion rule to combine the decisions from active SUs. Expressions for the achievable throughput, energy consumption and EE of the 2EACRAC2S algorithm are derived. Results based on numerical techniques show that the 2EACRAC2S outperforms CSS technique, in terms of EE.

***Full paper:** *ICRTEC 2023 - Proceedings: IEEE International Conference on Recent Trends in Electronics and Communication Upcoming Technologies for Smart Systems, 2023*

WARM WOMB: A Wireless Real-time Monitoring System for Neonatal Care in Resource-Limited Settings

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ABSTRACT

To ensure the well-being of preterm babies and help them adjust to the outside environment, it is crucial to provide a nurturing environment similar to that of the womb. The neonatal intensive care unit (NICU) is designed specifically for monitoring and caring for the health conditions of premature babies. However, in rural areas, many hospitals lack NICU facilities, which means parents often have to travel to multispecialty hospitals in case of emergencies. Unfortunately, the cost of NICU care in these hospitals is often prohibitively high. To address these challenges, we propose a solution called Wireless Artificial Real-time Monitoring WOMB (WARM WOMB). This innovative system aims to provide effective care for low-risk premature babies in abnormal conditions. It features a compact and cost-effective infant incubator that helps maintain the baby's temperature at levels similar to that of the mother's womb. Additionally, the WARM WOMB system incorporates advanced monitoring capabilities. The hardware of this proposed system has been tested under various conditions to analyze its functionality. By integrating temperature regulation, vital sign monitoring, weight tracking, and real-time video capturing, the proposed WARM WOMB design offers a comprehensive solution for neonatal care. Its primary focus is on addressing the specific needs of premature babies and enhancing their overall care.

**Full paper:* *International Conference on Recent Advances in Science and Engineering Technology (ICRASET) 2023*

Neuro-Predict: A Comprehensive Approach for Alzheimer's Disease Prediction and Development of a Medical Assisting Kit

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ABSTRACT

The "NeuroPredict" system aims to address Alzheimer's disease (AD) by providing early prediction and diagnosis using a Convolutional Neural Network (CNN) model on MRI images. With an 80\% accuracy rate, the proposed NeuroPredict system offers a robust solution. Exploratory Data Analysis (EDA) is emphasized to uncover patterns and trends within the AD dataset, contributing to research advancements. Additionally, the system introduces "MemorEyes," a low-cost hardware kit to assist AD individuals. Smart spectacles display pictures of loved ones with details, reminders for exercise and medication, and a smart wristband for live location tracking. Caretakers receive alerts, promoting proactive prevention and personalized support for early-stage AD patients. To ensure accessibility, NeuroPredict offers a user-friendly web application for clinicians and researchers. The user can easily upload MRI images, run predictions using the CNN model, and access detailed reports and visualizations, even without technical expertise. The proposed NeuroPredict focuses on early prediction, proactive prevention, and personalized care and aims to significantly impact AD patients' lives and help in neurodegenerative disease research.

***Full paper:** *International Conference on Recent Advances in Science and Engineering Technology (ICRASET) 2023*

Real-Time Artificial Mood-tracking and Health-monitoring System (RAMAHS) for people with mental illness and their Caregivers

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ABSTRACT

Mental health has always been important and issues related to it have always been dangerous. Government has launched a lot of programs and campaigns for the awareness and for the help related to mental health. In this fast developing world, the big thing is technology which is used literally everywhere. Over the past few years there have been numerous developed technologies that could help people struggling with mental disorders. Along with the patients with mental illness, caregivers also face mental stress and health issues due to the stress faced by them on being with the family members with mental health disorders. In this paper, we discuss the various issues of mental health and the stress faced by their caregivers and the technology that is currently in use to monitor the patients with mental disorders. Existing health monitoring system lacks the monitoring of the mood swings of the patient and also the support for the caregiver. Here, we propose a real time artificial mood-tracking and health monitoring for both people with mental disorders and wide mood swings and their caregivers using various sensors. The proposed methodology is more accurate and unique as it monitors the brain chemical - dopamine level of the patient using biosensor, along with other vital health parameters and also provides measures to handle the worse situations.

Full paper: *International Conference on Recent Trends in Electronics and Communication (ICRTEC), 2023*

A Novel scheme for IoT based Real Time Monitoring of Biodiesel Quality

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ABSTRACT

Biodiesel is a sustainable solution to mitigate the adverse environmental impacts and escalating price associated with conventional fossil fuels. The biodiesel quality plays a vital role in applicability as the extend of replaceability of fossil fuels with biodiesel depends on its quality. The present work deals with development of IoT based real time monitoring of quality parameters such as pH and density of waste cooking oil biodiesel. A novel prototype of IoT based real time monitoring of biodiesel quality, QCBIoT is developed. The calibrated QCBIoT is capable of predicting pH and density of liquids including biodiesel with an average deviation of 1.82% and 2.78%, respectively.

***Full paper:** *International Conference on Recent Trends in Electronics and Communication (ICRTEC), 2023*

A Survey on Terahertz Devices-A cutting edge Technology

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ABSTRACT

Technological advances have unfurled the previouslyunused terahertz frequency band for numerous promising applications. It has a special position in the spectrumbetween infrared and microwave rays that makes it acquire unique features of safety, broadband, penetration, andlow energy. In this paper, we portray a diverse survey on salient features of THz band and its wide range of applications beyond fifth generation (B5G) and towards the 6G communication systems. First, we present various features of THz bands and how it is applicable to 6G networks. Next, we discuss the limitations of THz technology followed by the state of art recently proposed techniques to overcome those limitations. Further, we discuss a broad range of THz applications in different domains such as spectroscopy, biomedical and military applications. Finally, we present the recent advancement in different THz detectors and their comparisions. Moreover, we present a review on the challenges for Terahertz range communication identified in existing research and discuss some future research directions.

***Full paper:** International Conference on Recent Trends in Electronics and Communication (ICRTEC), 2023*

Simulation of Reconfigurable FET circuits using Sentaurus TCAD Tool

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ABSTRACT

This chapter introduces the basic tool flow of the Sentaurus technology computer-aided design (TCAD) tool and explores the device characteristic simulations and circuit-level simulations using the single-gate reconfigurable field-effect transistor (SG-RFET) device. Various analog and digital circuits are demonstrated using the SG-RFET device, which provides insight for the new researchers to propose new device architectures to mitigate the existing challenges. The device current-voltage characteristics are simulated for a different gate and channel length. A unity gain analog buffer amplifier with resistive load is implemented using the SG-RFET device, which shows the possibilities of analyzing the circuit behavior in Sentaurus TCAD using new device architectures and materials.

Book Chapter: *Book Chapter in Sub-micron Semiconductor Devices: Design and Applications, 2023*

Department of Computer Science & Engineering

Trust Management for Deep Auto Encoder Based Anomaly Detection in Social Iot

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ABSTRACT

Social IoT has gained huge traction with the advent of 5G and beyond communication. In this connected world of devices, the trust management is crucial for protecting the data. There are many attacks, while DDOS is the most prevalent BotNet attack. The infected devices earnestly require anomaly detection to learn and curb the malwares soon. This paper considers 9 IoT devices deployed in a Social IoT environment.We introduce a couple of attacks like Bash lite and Mirai by compromising a network node. We then look for traces of malicious behavior using AI algorithms. The investigation starts from a simple network approach - Multi-Layer Perceptron (MLP) then proceeds to ML - Random Forest (RF). While MLP detected the malicious node with an accuracy of 89.39%, RF proved 90.0% accurate. Motivated by the results, the Deep learning approach - Deep autoencoder was employed and found to be more accurate than MLP and RF. The results are encouraging and verified for scalability, efficiency, and reliability.

***Full paper:** *International Journal of Advanced Computer Science and Applications (IJACSA), vol. 14, no. 1, 2023*

Intelligent Shipping Using Tinyml

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ABSTRACT

This work highlights the potential of Tiny Machine Learning (TinyML) in the global shipment industry, providing an innovative solution to track the status of packages and shipments in real-time. This work includes the IoT and AI technologies to provide real-time package tracking, allowing users to monitor the status of their shipments from anywhere at any time. The primary goal of this work is to offer an easy-to-use solution for customers to monitor their package status, including whether they are moving, stationary, impacted, thrown, picked up, or placed in the wrong position. The use of TinyML enables the use of low-power MCUs, reducing the overall power consumption of the tracking devices, while IoT and AI offer several benefits, such as improved speed and efficiency of package tracking, reduced network latency, and increased security. Overall, this work demonstrates how the integration of AI, machine learning, and IoT can provide an innovative solution to package tracking, improving the efficiency and accuracy of the shipment industry.

***Full paper:** International Research Journal of Modernization in Engineering Technology and Science, vol.5, no. 6, pp. 4254-4258, 2023*

Crime Analysis and Prediction Using Machine Learning

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ABSTRACT

In recent years the data science is data analyzing techniques that used to analyze crime data previously stored from various sources to find patterns and trends in crimes. In additional, it can be applied to increase efficiency in solving the crimes faster and also can be applied to automatically notify the crimes. However, there are many data science techniques. In order to increase efficiency of crime detection, it is necessary to select the data science techniques suitably. This project reviews the literatures on various data science applications, especially applications that applied to solve the crimes. Survey also throws light on research gaps and challenges of crime data science.

***Full paper:** *International Research Journal of Modernization in Engineering Technology and, vol. 5, no. 6, 2023*

Implementation of Smart Bus Tracking System with Google Map API

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ABSTRACT

In light of the growing need for flexibility in monitoring physical properties and protecting personal data, the importance of addressing the safety concerns associated with public transportation systems has become evident. This paper presents a proposed solution in the form of a real-time bus tracking and monitoring device. By implementing this device, it aims to mitigate the hazards and enhance the overall safety of public transportation systems.. This research proposes the integration of a real-time bus tracking system that connects bus position data to a central server for processing and extracting transit information. The system leverages technologies such as Django, JavaScript libraries, and Google Maps Platform APIs to enable users to track buses in real-time, search for bus-specific details based on their source and destination, and view all bus routes.Results show that users can easily track their vehicle location via their mobile phone through the internet.

***Full paper:** International Journal of Engineering Science and Computing IJESC, vol. 13, no. 6, 2023*

Analyzing Multipartite Correlation in Quantum Channel

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ABSTRACT

For the long-distance quantum communication repeaters are must that will regenerate the original signal appropriately until it reaches the destination receiver without any loss in the quantum data. Qubits measured will collapse to one state even earlier in superposition, because of no cloning theorem decoder of data will be aware if there are any third party in communication has changed the information or else data is modified in-between. More number of users are trying to access the shared channel with multipartite correlation having add drop multiplexing each with different wavelength synchronized with atomic clocks so distinct time division can be done for multiple users over a common channel for quantum information transmission. Each different wavelength information is dedicated to a specific receiver for point-to-point communication, transceivers are used as end user equipment where desired information can be obtained for processing.

***Full paper:** International Journal of Research And Analytical Reviews, vol. 10, no. 2, 2023*

AI Based Inventory Management System Using Odoo

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ABSTRACT

This study focuses on the development and implementation of an AI-based inventory management system using the Odoo platform. The system utilizes artificial intelligence techniques to optimize inventory control, improve forecasting accuracy, and enhance decision-making processes. By integrating machine learning algorithms, the system can analyse historical data, identify patterns, and generate accurate demand forecasts. It also incorporates advanced analytics to optimize inventory levels, minimize stockouts, and reduce carrying costs. The Odoo platform provides a robust and flexible framework for implementing the AI-based inventory system, enabling seamless integration with existing business processes and ensuring scalability. Overall, this solution empowers businesses to achieve efficient inventory management, streamline operations, and enhance customer satisfaction.

***Full paper:** International Journal of Scientific Research in Engineering and Management, vol. 07 no. 8, 2023*

Progression of Radio Access Network towards Open-RAN

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ABSTRACT

The advent of 5G technology has revolutionized communication, propelled by the transformative concept of Open Radio Access Network (ORAN), which aims to reshape the communications sector. ORAN's innovative architecture emphasizes openness, interoperability, and virtualization, standing in stark contrast to the closed nature of traditional Radio Access Network (RAN) designs. Guided by principles of disaggregation and virtualization, ORAN separates hardware components and enables adaptable, scalable network functions. By dismantling vendor lock-in, ORAN fosters collaboration, diversity, and innovation among stakeholders. Disaggregation drives multi-vendor interoperability, creating a competitive market where network operators can select components from various manufacturers, enhancing flexibility. Virtualization further bolsters performance by transitioning from hardware to software-based solutions, im- proving costefficiency, scalability, and agility. ORAN's strategy enhances network flexibility, allowing operators to swiftly meet changing demands and introduce new services. Through its virtualized architecture, dynamic resource allocation optimizes resource usage, enhancing user experiences. ORAN emerges as a transformative force in telecommunications, challenging conventional closed RAN models and offering a dynamic vision for the future of communication technology.

**Full paper:* *International Research Journal of Engineering and Technology (IRJET), vol. 10, no. 8, 2023*

Deep Regularization Mechanism for Combating Class Imbalance Problem in Intrusion Detection System for Defending DDoS Attack in SDN

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ABSTRACT

Integration of deep learning into Intrusion Detection Systems (IDS) for Software Defined Networking (SDN) is an emerging field of research. Most of the datasets used to build IDS are highly imbalanced, especially in the case of DDoS attacks, which account for a larger percentage of malicious samples than normal traffic. As a result of a class imbalance, the classification result is distorted since deep learning is limited in its ability to generalize and is misled into favoring the majority class. This study aims to confront the problem of class imbalance by introducing a new deep regularization mechanism that allows the learning model to unlearn biased information. Unlike the existing system, the proposed mechanism integrates two multi-layer neural networks to extract shared information and biased distribution. The first learning model generalizes the data distribution to classify network traffic as normal or attacks class. On the other hand, the second model is integrated with the embedding layers feature of the first model, which learns the bias distribution and then it regressively instructs the first network not to learn this biased information. The proposed regularization scheme is evaluated on the most recent and highly imbalanced network dataset CIC-DDoS2019. The proposed scheme is compared with different supervised learning classifiers executed on the same dataset in the experiment, balanced with the smote technique. The proposed model outperforms other learning techniques and reached an overall precision, recall, and F1-score of 96.71, 97.14, and 96.92%, respectively.

***Full paper:** *Journal of Computer Science, vol. 19, no. 3, pp. 334-344, 2023*

Detecting Auto Insurance Fraud Through MachineLearning Approaches

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ABSTRACT

The global insurance industry comprises a vast number of companies, exceeding a thousand in number. Currently, the industry is actively adopting an efficient fraud management system. We propose a solution for the insurance organizations where the insurance company agents can track the predicted fraud percentages of the claims made.The insurance agent has the provision to fill up the form with the details related to the claim. The pre-trained machine learning model utilizes the form data as input to determine the authenticity of the claim, predicting whether it is fraudulent or legitimate. A two way classification of the claim is brought about by the model as to whether the claim is a fraud or a not fraud. The insurance companies can use the output to assist them in deciding whether the claim is fraud or not. The machine learning model is structured on the Decision Tree algorithm.

***Full paper:** *Journal of Emerging Technologies and Innovative Research, vol. 10, no. 9, 2023*

Peer to Peer Decentralized Ride-Sharing using Blockchain Technology

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ABSTRACT

Peer-to-peer (P2P) ride-sharing platforms have gained significant popularity due to their ability to optimize resource utilization, reduce costs, and improve user experiences. However, conventional ride-sharing platforms often face challenges such as centralized control, lack of transparency, and limited trust among participants. This abstract presents a unique solution to address these issues by leveraging blockchain technology for P2P ride-sharing. Our proposed system utilizes the inherent characteristics of blockchain, such as decentralization, immutability, and transparency, to establish a trust less environment for all participants. By incorporating smart contracts, which are self-executing codes on the blockchain, we enable automated execution and enforcement of ride-sharing agreements, ensuring fair and secure transactions. In our proposed system, ride-sharing participants, including drivers and passengers, directly interact with each other through a decentralized peer-to-peer network. The blockchain acts as an immutable ledger, recording vital information like ride details, payment transactions, and driver/passenger ratings. This transparent and tamper-proof record of data enhances accountability, minimizes disputes, and fosters trust among all participants.

***Full paper:** *Journal of Emerging Technologies and Innovative Research JETIR, vol. 10, no. 10, 2023*

Energy Efficient Data Migration Concerning Interoperability Using Optimized Deep Learning in Container-Based Heterogeneous Cloud Computing

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ABSTRACT

Cloud computing generates a proper computing platform and facilitates optimizing with the utilization of infrastructure resources, increases flexibility, and decreases deployment time. Interoperability is one of the major challenges to be studied for ensuring seamless access and sharing of services and resources. Containers have developed into the most dependable and lightweight platform for virtualization to deliver cloud services that offer flexible sorting, scalability, and portability. This paper presents energy-efficient data migration approach using hybrid optimized deep learning in a heterogeneous cloud. Simulation of the cloud is carried out with Physical Machines (PM), container, and Virtual Machines (VM) in the cloud. Migration application is done with proposed Taylor Lion-based Poor and Rich Optimization (Taylor Lion-based PRO), wherein load is found by Actor Critic Neural Network (ACNN). Moreover, objective functions utilized are agility, migration time, predicted load, demand, transmission cost, resource capacity, energy consumption, as well as reputation. Here, Taylor Lion-based PRO is formed by hybridization of the Taylor series along Lion Optimization Algorithm (LOA), and Poor and Rich Optimization (PRO). Furthermore, the performance of data migration concerning interoperability is carried out with three performance metrics, like load, resource capacity, and energy consumption of 0.006, 0.364, and 0.281.

***Full paper:** *ELSEVIER Advances in Engineering Software(SEIE-Q1), vol. 183, 2023*

Transpiling RTL Pseudo-code of the POWER Instruction Set Architecture to C for Real-time Performance Analysis on Cavatools Simulator

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ABSTRACT

This paper presents a transpiler framework for converting RTL pseudo code of the POWER Instruction Set Architecture (ISA) to C code, enabling its execution on the Cavatools simulator. The transpiler consists of a lexer and parser, which parse the RTL pseudo code and generate corresponding C code representations. The lexer tokenizes the input code, while the parser applies grammar rules to build an abstract syntax tree (AST). The transpiler ensures compatibility with the Cavatools simulator by generating C code that adheres to its requirements. The resulting C code can be executed on the Cavatools simulator, allowing developers to analyze the instruction-level performance of the Power ISA in real time. The proposed framework facilitates the seamless integration of RTL pseudo code into the Cavatools ecosystem, enabling comprehensive performance analysis and optimization of Power ISA-based code.

***Full paper:** *Computer Science Software Engineering, 2023*

Critical Analysis of Life Span Improvement Techniques in Energy Constraints Edge IoT Devices

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ABSTRACT

IoT edge computing facilitates data to be processed at a location closer to the place where it is generated. Placing computing closer allows for faster and more reliable service to the users. It also benefits latency-sensitive applications. These benefits are overshadowed by the risk of energy drain in edge IoT devices. Many works have been proposed to improve the life span of edge IoT devices. These works target either computation or communication overhead reduction to minimize energy consumption. This survey does a critical analysis of existing solutions and presents the research gap. In addition to the identification of research gaps, the survey also presents possible solutions at a higher level to address these gaps.

***Full paper:** *S N Computer science, vol. 4, no. 221, 2023*

Plant Disease Detection Using Image Processing And Machine Learning

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ABSTRACT

Article History: Accepted: 15 Nov 2023 Published: 30 Nov 2023 Our Plant disease detection project presents a Convolutional Neural Network (CNN) model for the classification of plant diseases based on image data. The dataset comprises images of various plant diseases and healthy plants obtained from the "PlantVillage" database. The images are preprocessed by resizing them to a standard size and applying augmentation techniques. The CNN model is built using the Keras library and consists of multiple convolutional layers followed by pooling, batch normalization, and dropout layers. The model is trained using the Adam optimizer and evaluated on a test set. The training and validation accuracy and loss are plotted over the epochs to analyze the model's performance. The trained model achieves a certain accuracy on the test set, indicating its potential for accurately identifying plant diseases. The saved model can be utilized for real world applications in plant disease detection and management, providing valuable assistance to farmers and researchers.

***Full paper:** International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol. 9, no. 6, pp. 174-180, 2023*

StudyZen"- An Application for Collaborative Learning and Resource Sharing

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ABSTRACT

The use of calculating technology for literacy hasbeen observed in colorful ways. In the once many decades, electronic literacy ore-learning had been espoused and usedby public seminaries and university scholars in numerous corridor of the world. E-Learning exploits interactive technologies and communication systems to ameliorate the literacy experience. It has the implicit to transfigure the waywe educate and learn across the board. It can raise norms, and widen participation in lifelong literacy. It can not replace preceptors and speakers, but alongside being styles it can enhance the quality and reach of their tutoring. Resource aggregation being a major challenge to scholars,approaching instructors every time in case of a mistrustfulness would be another challenge. Assembling andaligning the cluttered materials at one place would be helpful, which else would be a daunting task, especially if thematerials pile up without proper isolation. A platform for participating and penetrating materials in a doable manner would be of great use to the students. However, that would bean added advantage, If the same platform provides backing to scholars.

***Full paper:** *International Journal of Scientific Development and Research (IJSDR), vol. 8, no. 8, 2023*

Photon: A Cross Platform P2P Data Transfer Application

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ABSTRACT

Modern computing requires efficient and dependable data transport. Current solutions like Bluetooth, SMS (Short Message Service), and Email have their restrictions on efficiency, file size, compatibility, and cost. In order to facilitate direct communication and resource sharing amongst linked devices, this research study offers a cross-platform peer-to-peer (P2P) data transmission solution that takes advantage of P2P networks' features. The system enables cost-effective and high-performance data transport by using the compute, storage, and network resources of the participating devices. Simple file sharing, adaptability, dependability, and high performance are some of the important benefits. The examination of the suggested solution is presented in this paper and includes discussion of the P2P architecture, data transfer mechanisms, performance assessment, implementation issues, security concerns, and the potential difficulties that needs to be addressed. The research intends to validate the efficacy and potential of the suggested cross-platform P2P data transfer solution, delivering better efficiency and dependability for users across various platforms, through practical investigations and comparisons with existing approaches.

***Full Paper:** *Computer Science Networking and Internet Architecture, vol. 1, 2023*

A Review on the Analysis of Behavioral Pattern of Students During Pandemic COVID-19

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ABSTRACT

The widespread of (covid-19) has become the major reason for many physical illnesses in addition to psychological encounters to the whole world. The psychological challenges brought in due to the Covid-19 pandemic have resulted in decrease in the learning curve of students to a very large extent risking the academic ability of students due to psychological/mental health. Hence it is a challenge to identify valid cues for disorientation in the learning ability of the student at the right time and to suggest necessary support and guidance. This paper aims to describe about the work done so far and analyzes the future challenges to be addressed based on the learning curve of a student and gives an insight of how a student can be identified to be psychologically disturbed.

Full paper: *International Conference on Recent Trends in Electronics and Communication (ICRTEC), 2023*

Real Time Question Paper Generator Using ML

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ABSTRACT

Contemporary technologies enable teachers to store exam questions in computer databases. Exams are used to measure student learning, which is an essential component of the education system. The development of exam question papers has long drawn attention due to the need to maintain secrecy and adhere to different blooms taxonomy levels. It is a challenge, to address the issue of how these technologies might assist teachers in automatically creating a variety of sets of questions in real time, avoiding repetition, duplication from prior exams while still following the quality of complexity as per blooms level. Hence the idea is to automate the process of generating the exam question papers effectively and efficiently in real time. The system has the ability to instantly generate well-structured and engaging questions with the help of the Naive Bayes algorithm, a randomization technique, and Bloom's taxonomy for varied complexity of marks and levels respectively. Thus, generation of Question paper in real time makes the task of a course instructor considerably simpler and precise when compared to the conventional methods of generating Question paper, which is quite a tedious process and difficult to always maintain secrecy.

***Full paper:** *International Journal of Scientific Development and Research (IJSDR), vol. 8, no. 8, 2023*

A Review on feature selection and Classification of Cardiovascular Disease using Machine Learning

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ABSTRACT

Cardiovascular disease has emerged as the leading cause of death in recent years, with a significant number of individuals unknowingly affected by this condition. Cardiovascular disease (CVD) disrupts the proper functioning of our heart and blood vessels, often resulting in death or physical disability. Thus, the timely and automated detection of CVD can potentially save numerous lives. Various studies have been conducted with the aim of accomplishing this goal, yet there remains scope for enhancing performance and dependability. This research represents another stride in pursuing this objective. The objective of this paper is to provide an overview of the progress made thus far and assess the future hurdles that need to be tackled, taking into account the obtained results. Additionally, it offers insights into the features and algorithms that should be considered for the early detection of cardiovascular disease (CVD).

*__Full paper:__ *International Conference on Mobile Networks and Wireless Communications (ICMNWC), 2023*

Blockchain Technology and Supply Chain Management in a Charity Donation System: A Literature Review

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ABSTRACT

From the history India is being particularly susceptible to natural disasters because of its climatic characteristics. Nowadays, people are becoming very eager to contribute to society. During the disaster many people are struggling for their basic needs. We have many charitable organizations and NGO's they require funds to improve society. Donors are more interested in donating either funds or materials during the disaster. In India one of the major problems is civil supply tracking. Goods supplied by the donors can be taken away by strangers. This will affect the needy people as well as donors who have no trust in the system and to decrease the frauds, we came up with a new technology called Blockchain. In this paper we study about the system that makes the entire process more transparent and reliable.

***Full paper**: International Conference on Recent Trends in Electronics and Communication (ICRTEC),2023*

Comprehensive Dashboard for Alzheimer's Disease Through Machine Learning

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ABSTRACT

In today's world, personal monitoring of health is given the topmost priority as the number of people becoming health conscious is seeing a spike day by day. Mental health tops the list when the overall health of a person is considered. Being fit mentally helps the population to be physically fit by which one can be of some service to society. Many times, unaddressed mental health problems influence public health in many ways like employment, poverty, local economy, safety, etc. In the proposed work, a comprehensive dashboard is built for Alzheimer's disease in the form of an interactive web UI. Machine learning algorithms are used in disease prediction and content-based filtering is used to provide precautionary steps for users based on their inputs. This work is based on the OASIS-2 longitudinal dataset, which is a collection of 150 records and covers the subjects of age groups between 60 and 96. The proposed system also provides statistical data based on user input mainly for healthcare professionals through visualization.

***Full paper:** *International Conference on Advances and Applications of Artificial Intelligence and Machine Learning, 2023*

An Implementation of Gesture-Controlled Autonomous Drone

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ABSTRACT

Recently, there has been an increase in the integration of good devices and platforms like unmanned Aerial Vehicles (UAVs) and drones into the universal network of the net of Things (IoT). Unmanned aerial vehicles (UAVs) that are autonomous use navigation and control software that is powered by artificial intelligence (AI) and do not need a human pilot to fly them. As technology is advancing day by day, the trend to replace humans with robots & other devices like drones and unmanned Aerial Vehicles (UAVs) will be implemented and will be kept up for quite a long time. Essentially, an associate degree autonomous drone could be a flying vehicle that may be remotely controlled or fly autonomously using software-controlled flight plans that work in conjunction with onboard sensors and a worldwide positioning system (GPS). This work to boot explores the technical efforts toward facultative safe UAV operations exploitation associate degree autonomous nano drone, whereas taking into thought varied challenges like security, precision, and varied challenges thanks to the restrictions of the autonomous drone.

*__Full paper:__ *Smart Technologies, Communication and Robotics (STCR), 2023*

Energy Efficient Smart Street Lighting System

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ABSTRACT

Modern Street lighting systems utilize a significant amount of power because of their outdated, inefficient architecture. Energy-efficient systems that are simple to maintain and have good administration become a primary concern for smart cities. We set building a smart street lighting system as our primary goal in order to achieve these goals, notably with solutions like dynamic delay of sensing mechanisms, the combinations of sensors (LDR, IR, and PIR) with adaptive control agents, and web technologies with cloud-based solutions. And also, it makes sure the power consumption is reduced to maximum feasible solutions without affecting street lamp experience. This system supports automation to its core encouraging routine things to get auto done from software solutions. The prototype system's results were found to be encouraging, and sample data and statistics indicated potential. Using street lighting technologies can expand potential for the future. When used in conjunction with appropriate sensors, the technology enables remote streetlight output monitoring, fault detection, energy performance monitoring, and, in the future, real-time notifications for city-wide issues.

***Full paper:** 2022 International Conference on Artificial Intelligence and Data Engineering (AIDE), 2023*

Deep Learning-Based Card-Less Atm Using Fingerprint And Face Recognition

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ABSTRACT

In recent years, there has been a growing need for more secure and convenient methods of authentication for ATM transactions. To address this need, we propose a cardless ATM transaction system that uses biometric authentication through facial and fingerprint recognition. Our system uses a Convolutional Neural Network (CNN) to validate the user's identity based on their uploaded face and fingerprint image datasets.The system's authentication process involves three stages: face recognition, fingerprint recognition, and validation of the user's identity. In the face recognition stage, the system extracts and analyzes the user's facial features, while in the fingerprint recognition stage, it extracts and analyzes the user's fingerprint features. The CNN model used in this system is trained on a large dataset of face and fingerprint images to ensure high accuracy and reliability of the biometric authentication.

Full paper: *International Research Journal of Modernization in Engineering Technology and Science, vol. 5, no. 6, 2023*

Depression Classificationon Social Media Posts Using Deep Learning

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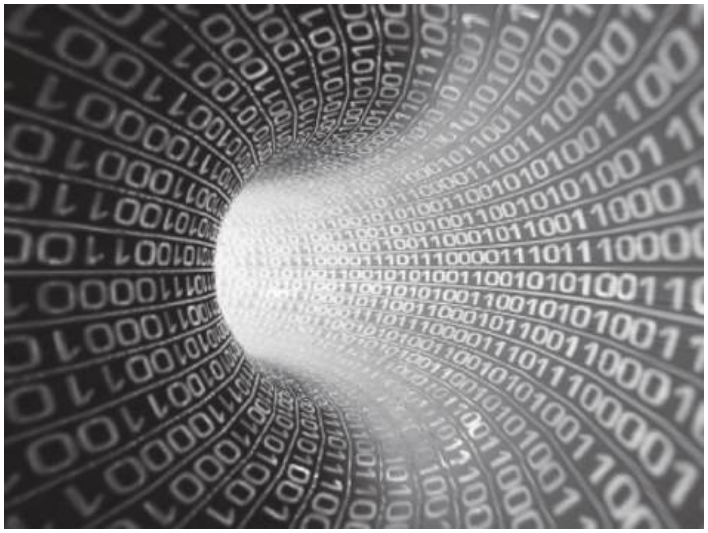
ABSTRACT

To use a hybrid methodology of Convolutional Neural Networks (CNN) and Long Short-Term Memory(LSTM), Natural Language Processing(NLP) techniques like Word encoding, tokenization, and factorization to recognise words that conveys emotional responses of depressive symptoms and connected sentiments, we propose a novel approach for recognising posts on social network that are still indicative of anxiety. By analysing the nearby environment of phrases, deep learning isused to accurately predict sentiment in words and eliminate false-positive.This research used information that was harvested from well social networking site Kaggle. Labels are used to gather posts around same subject collectively when the information is evaluated. The negative class provides postings from those other, randoms, whereas the positive class has comments across different clusters addressing hopelessness and self-harm. As a result of the variety in the negative class, it is possible to claim that the data set is representative of anactual situation. The proposed method can be used in a variety of contexts, such as the identification of possibly harmful behaviors on provided by social media services that are popular among young people.

**Full paper:* *14th International Conference on Advances in Computing, Control, & Telecommunication, 2023*

Department of Information Science & Engineering



Critical Analysis of Life Span Improvement Techniques in Energy Constraints Edge IoT Devices

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ABSTRACT

IoT edge computing facilitates data to be processed at a location closer to the place where it is generated. Placing computing closer allows for faster and more reliable service to the users. It also benefits latency-sensitive applications. These benefits are overshadowed by the risk of energy drain in edge IoT devices. Many works have been proposed to improve the life span of edge IoT devices. These works target either computation or communication overhead reduction to minimize energy consumption. This survey does a critical analysis of existing solutions and presents the research gap. In addition to the identification of research gaps, the survey also presents possible solutions at a higher level to address these gaps.

Full paper: SN Computer Science, vol. 4, no. 221, 2023

Analysis of Bitcoin Price using ML Algorithm

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ABSTRACT

After the recent ups and downs in cryptocurrency values, bitcoin is now more frequently seen asvaluable investment. Due to its extreme volatility, there is a stronger requirement for precise forecasts that support investment decisions. Although many studies have employed machine learning to provide more precise predictions of the Bitcoin price, very few studies have concentrated on the viability of using different modeling techniques to sample the data structures and different features. We can sort the price of bitcoin into two main classes such as the daily price and the high-frequency price, then use ML algorithms to anticipate the cost at various frequencies. The fundamental trade highlights obtained from a digital money trade are used for 5-minute span cost expectation, while a collection of high- dimension highlights including property and organization, exchanging and market, consideration, and gold spot cost are used for daily price prediction. At the everyday cost forecast of Bitcoin with high-layered data, measurable methods like strategic relapse and direct discriminant examination are utilized, beating more perplexing AI calculations. AI models, for example, Irregular Timberland, XGBoost, Quadratic Discriminant Examination, Backing Vector Machine, and Long Transient Memory are seen to beat measurable strategies for the 5-minute stretch value expectation of Bitcoin.

Full paper: *GRENZE International Journal of Engineering and Technology, vol. 9, no. 2, 2023*

Fog-Removal in Single Image using Various Methods: A Survey

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BSTRACT

The images which are taken in foggy weather/bad weather are not expressed clearly therefore they are not very comprehensible. The images that are taken in that environment will be reduced in quality to a great degree, the reason is that because the scattering of light in the atmosphere will reduce the clarity and visibility of a single image. Because of fog, the images are in low contrast whereas in case the haze in the atmosphere will affect the clearness and precision of the image. The pictures taken in this condition will not only affect the visibility but also complicate the post-processing of the image required for the implementation of numerous computer vision algorithms. Hence it is important to eliminate fog from the image. So, firstly density of fog is estimated and based on that, image defogging can be done.

***Full paper:** *Grenze International Journal of Engineering & Technology (GIJET), vol. 9, no. 1, 2023*

Energy Aware Reliable Routing Model For Sensor Network Enabled Internet of Things Environment.

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ABSTRACT

Wireless sensor networks (WSNs), which are facilitated by the internet of things (IoTs), can be difficult to improve the lifespan of the network target area. Although the hotspot issue (i.e., the cluster head closest to the base station fails quickly) is mitigated by the clustered-based routing technique, it still has an important effect on the network's lifespan and target area. However, improper distribution of load between cluster heads has been shown to negatively impact network lifespan efficiency, so even though unequal clusters have been utilized successfully to tackle the hotspot issue, further work is needed. This study provides an energy-aware reliable routing (EARR) model for resolving the hotspot as well as load balancing issues simultaneously. To extend the lifespan of the network, the EARR model effectively minimizes energy consumption by the cluster heads using enhanced multi-objective optimization parameters. Further, EARR provides improved routing optimization metrics to improve data delivery with energy efficiency, less delay, and packet loss. The results of the experiments demonstrate that the EARR model provides excellent throughput and lifespan efficiency with low delay and communication overhead.

***Full paper:** *Indonesian Journal of Electrical Engineering and Computer Science, vol. 32, no. 3, pp. 1678, 2023*

Application of Artificial Intelligence to Corelate Food Formulations to Disease Risk Prediction: A Comprehensive Review

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ABSTRACT

Clinicians and administrators are applying Artificial Intelligence (AI) Techniques widely as the promising results of their applications in healthcare have been established. The meaningful impact of the AI applications will be limited unless it is coherently applied with human diagnosis and inputs from specialist clinician. This will help to address limitations and take advantage of the promises of the AI techniques. Machine Learning is one of the AI techniques that finds high relevance in medicine and health care. This review provides an overall glimpse of current practices and research outcomes of the application of the AI techniques in healthcare and medical practices. It further describes Machine Learning Techniques in disease prediction and scope for food formulations for combatting disease.

***Full paper:** *Journal of Food Science & Technology, vol. 60, pp. 2350–2357, 2023*

A Novel Multimodal Hybrid Classifier Based Cyberbullying Detection for Social Media Platform

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ABSTRACT

Platforms for social networking such as Facebook and Twitter, as well as others, provide a great number of benefits, but they also come with a great number of drawbacks. Cyberbullying is one of the problems that may occur on these social sites. The effect that cyberbullying has on the lives of its victims is incalculable. It is quite subjective, and the approach that each individual would take to this differs greatly. For those who are bullied, the message may seem natural, but for others, it may be intimidating. The ambiguity that may be found in cyberbullying texts makes it very difficult to locate the bullying material. The use of textual postings has been the subject of a significant amount of study, which has been recorded. In this work Extreme Learning Machine (ELM) based cyberbullying detection is proposed. Convolutional Neural Network (CNN) is used to classify emoji posted in the tweets. The text, hashtag, emoji datasets are preprocessed, and features are extracted. ELM classifier is used to detect the cyberbullying. This work achieves accuracy of 99.41, precision of 92.76, recall of 90.17, and f1-score of 91.64.

Full paper: *Data Science and Algorithms in Systems. CoMeSySo 2022. Lecture Notes in Networks and Systems, vol. 597. 2023*

Fusion of Various Sentiment Analysis Techniques for an Effective Contextual Recommender System

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ABSTRACT

In recent years, Recommendation Systems (RSs) have become a vital component of numerous websites and online applications in a variety of domains. Consider, for instance, the e-commerce websites where RSs predominate. In part, the problem of information overload is mitigated by these RSs. However, RSs still have a few issues, such as data sparsity, which leads to another issue known as cold-start. The cold-start problem occurs when the user-item matrix is incredibly sparse. Additionally, RSs has a problem known as the long-tail problem, in which the system is incapable of providing suggestions due to insufficient or invalid ratings for often purchased products. The cold-start problem can be solved by providing recommendations based on captured user preferences and user feedback. User attitudes can be gleaned from the analysis of textual user reviews of purchased products. Sentiment analysis(SA), also known as opinion mining, is the study of people's opinions, feelings, judgments, feedbacks, and emotions conveyed through written language regarding entities and their features. Usually these sentiments are derived and based out of various contexts. A context in sentiment analysis is a mood-based natural attribute.

***Full paper:** *In Proceedings of the 16th Innovations in Software Engineering Conference (ISEC '23). Association for Computing Machinery, New York, NY, USA, Article. vol. 8, pp. 1–8, 2023*

Named Entity Recognition: A Review for Key Information Extraction

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ABSTRACT

Named structure identification is the venture to perceive hints of the flexible indicator from textual context attached to prearranged denotation types which include the company, person, location, and many others. Named structure identification usually gives out the inspiration to lots of natural dialects packages like answering questions, summarization of text, and translation of devices. This paper makes an immense survey of variously named entity recognizers in contrast with some of observation which gives statements on previous work from the belief of interest currently supported dialects and adopted documentary genre concern. In addition, some of the approaches are suggested for highlighting the named structure recognition and its classification (NERC) based on the machine learning concepts.

***Full paper:** *Third Congress on Intelligent Systems. Lecture Notes in Networks and Systems, vol 608. 2023*

Wavelet-Based Method For Enhancing The Visibility of Hazy Images Using Color Attenuation Prior

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ABSTRACT

Image processing may be used in the majority of computer vision applications, including those for remote sensing, aerial photography, and vehicle navigation. Images taken outside in bad weather could suffer from degradation. Therefore, it is essential for these applications to enhance the degraded images before processing them. The contrast and saturation that are lost due to scattering must be restored to improve the hazy image. To address this issue, a novel model is built for enhancing a single hazy image efficiently and effectively. Using multilevel wavelet transforms, the image is first decomposed into two frequency domains - the low-frequency domain and the high-frequency do-main. Later, it is dehazed only in the low-frequency domain using the Color Attenuation Prior (CAP). Soft-thresholding operation is carried out in the high-frequency domain to remove any residual noise. Additionally, texture detail in this domain can be improved by using the estimated transmission obtained during the dehazing of the low-frequency component of the image by CAP. Extensive tests were performed on images from the RESIDE and HazeRD datasets to assess the efficiency of our method. Results of tests show that our approach dehazes faster and enriches the hazy image more effectively than other existing dehazing techniques.

**Full paper:* *2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC), Mysore, pp. 1-6, 2023*

Gesture Based Virtual Assistant for Deaf-Mutes Using Deep Learning Approach

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ABSTRACT

Roughly 5% of people around the world are deaf-mutes which imply they face difficulties in interacting with normal people, sign language is communication media for them. Gestures made through hands are one of the nonverbal communication modalities used in sign language. In order to communicate among themselves, the speech and hearing impaired utilize sign language as they have an understanding of conventional sign language. However, they are unable to interact with the outside world because most people are not aware of the presence and use of sign language. This technology tries to break down the hurdle between the disabled and everybody else in the world by identifying and converting hand signals into text in English and Kannada languages which are further translated into speech. Convolutional Neural Networks, Tensor flow, Deep Learning, Python text-to-speech module pyttsx3 and OpenCV are among the concepts used. A webcam captures the hand motions and is processed using the OpenCV python library, which is eventually interpreted by the deep learning algorithm called Convolutional Neural Network which generates rational languages. To map these rational languages to their pre-defined datasets we make use of deep learning, and to satisfy this requirement neural networks are used in conjunction with the Tensor Flow Library. Once the gesture is recognized it will be displayed on the viewing screen and instantly converted to speech. This system acts as a two-way virtual assistant that helps in converting sign-to-text and speech and thus assists the disabled in the utilization of modern technologies for communication.

Full paper: *9th International Conference on Advanced Computing and Communication Systems (ICACCS)*, Coimbatore, *pp. 1-7, 2023*

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of
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Temperature and Humidity Prediction Using IoT and Machine Learning

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ABSTRACT

Predicting the weather, specifically temperature and humidity, has become smarter and more accuratewith the help of the Internet o f Things (IoT) and machine learning. In this paper, we discuss a new system that canmake reliable predictions about temperature and humidity using integrated IoT sensors, specifically the DHT11 forcapturing temperature and humidity readings, the MQ135 for detecting gases, and the NodeMCU as a microcontrollerfor data transmission. These sensors feed their data into AWS IoT for storage and further processing. Machine learningmodels, namely Decision Tree, Random Forest, Linear Regression, and LSTM (Long Short-Term Memory), areemployed to process this data, aiming to accurately predict future temperature and humidity readings.

***Full paper:** *International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), vol. 12. no. 9, 2023*

Flight Delay Arrival Prediction

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ABSTRACT

Flight delays have significant implications for both travellers and the aviation industry. In this project, we address the challenge of predicting flight delays by harnessing the power of machine learning regression algorithms. By analysing historical flight data and relevant influencing factors, we aim to provide accurate estimates of delay times for specific flights. The project begins with a comprehensive collection and pre-processing of relevant data, including departure and arrival times, weather conditions, airport congestion, and historical delay records. Feature engineering techniques are employed to extract valuable insights from the raw data, enhancing the predictive capabilities of the models. Several machine learning regression algorithms are explored, including Linear Regression, Support Vector Regression (SVR), and Decision Tree Regression. The selection of these algorithms is based on their suitability for capturing complex relationships and patterns within the data. Hyper parameter tuning and model evaluation are conducted rigorously to ensure optimal model performance. Evaluation metrics such as Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE) are employed to quantify the accuracy of the predictions The contribution to our calculation is columns of highlight vector like flight date, take-off delay, separation between the two air terminals, planned appearance time and so forth We at that point use choice tree classifier to foresee if the flight appearance will be delayed or not. Besides, we compare decision tree classifier and calculated.

***Full paper:** *International Advanced Research Journal in Science, Engineering and Technology, vol. 10, no. 8, pp. 2394-1588, 2023*

Liver Cancer Segmentation and Classification

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ABSTRACT

Liver cancer is an illness that could be fatal and also one of the world's fastest growing cancers types.Lower death rates result through the early identification of tumors in the liver. By examining photos of tissue obtainedfrom a biopsy of this tumor, the goal of this research is to build a model that can assist clinicians in identifying the typeof tumor when it develops in the liver's area. To evaluate whether the tumor is malignant and requires therapy, a tissueexpert must put up the effort, take the necessary time, and gather the necessary experience. Therefore, a histologyspecialist can utilise this model to establish a preliminary diagnosis. Convolutional neural networks (CNNs), which cantransmit knowledge, will be used in this study to suggest a deep learning model.

***Full paper:** International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), vol.12, no. 9, 2023*

Smart Translation for Physically Challenged People Using Machine Learning

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ABSTRACT

Our project's goal is to create a deaf person's communication system. Two phases make up this project. (1) It converts the audio message into sign language, and (2) it converts images into text/speech. In the first category we are going to consider takes audio as input, convert this audio recording message into text and display the relevant Indian Sign Language images or GIFs which are predefined. By using this system, communication between normal and deaf people gets easier. In the second category we are going to collect the images and train images using CNN and display the result.

***Full paper:** *The International Journal of Innovative Research in Science, Engineering and Technology, 2023*

Chronic Kidney Disease Prediction and It's Stages Prediction and Diet Recommendation Using ML

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ABSTRACT

Chronic Kidney Disease (CKD) is characterized by the gradual deterioration of kidney function over an extended period, often spanning months or even years. Effectively redicting this condition holds immense significance within the realm of medicine. To address this, an automated tool employing machine learning techniques has been proposed. This tool aims to assess a patient's kidney health, facilitating early prediction of CKD and thereby enabling
more precise medical interventions. The outlined system functions by extracting pertinent features linked to CKD. Subsequently, a machine learning process takes over, automating the classification of chronic kidney disease into various stages based on the degree of severity. The primary goal is to harness machine learning algorithms to analyze medical test records and generate tailored dietary recommendations for CKD patients. These recommendations are aligned with the patient's potassium levels, which are computed from blood tests. The intent behind this dietary guidance is to impede the advancement of CKD.

***Full paper:** *The International Journal of Innovative Research in Science, Engineering and Technology, 2023*

AI Based System for Fake Profile Detection on Matrimonial Websites

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ABSTRACT

Nowadays, finding your soul partner sometimes involves using matrimonial services. However, the prevalence of false accounts on these platforms has grown to be a serious problem for both consumers and service providers. For the authenticity and dependability of matrimonial services, the identification of false profiles is a serious issue. The approach described in this study uses AI to spot phoney matrimonial site profiles. To find and report problematic accounts, the system makes use of social network analysis tools and machine learning algorithms. The suggested approach can enhance the legitimacy and dependability of marriage-related websites by lessening the possibility of fraudulent operations.

***Full paper:** *The International Journal of Innovative Research in Science, Engineering and Technology, 2023*

Fusion of Various Sentiment Analysis Techniques for an Effective Contextual Recommender System

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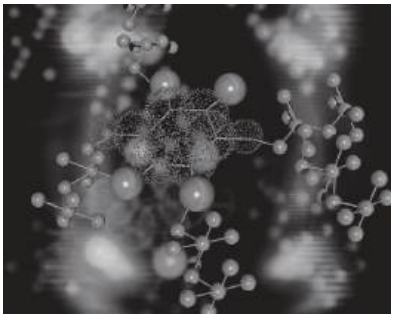
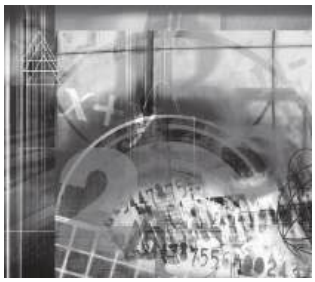
ABSTRACT

In recent years, Recommendation Systems (RSs) have become a vital component of numerous websites and online applications in a variety of domains. Consider, for instance, the e-commerce web-sites where RSs predominate. In part, the problem of information overload is mitigated by these RSs. However, RSs still have a few issues, such as data sparsity, which leads to another issue known as cold-start. The cold-start problem occurs when the user-item matrix is incredibly sparse. Additionally, RSs has a problem known as the long-tail problem, in which the system is incapable of providing suggestions due to insufficient or invalid ratings for often purchased products. The cold-start problem can be solved by providing recommendations based on captured user preferences and user feedback. User attitudes can be gleaned from the analysis of textual user reviews of purchased products. Sentiment analysis(SA), also known as opinion mining, is the study of people's opinions, feelings, judgments, feedbacks, and emotions conveyed through written language regarding entities and their features. Usually these sentiments are derived and based out of various contexts. A context in sentiment analysis is a mood-based natural attribute. Collaborative filtering (CF) method is by far and away the most popular and widely used algorithm for RSs to date. Collaborative filtering is a way for generating automatic predictions (filtering) about a user's interests by collecting preferences or taste data from a large number of users. In this study, we combine the functionality of a CF algorithm with contextual information extracted from user input. The varied situations are then assessed for sentiment using distinct attributes. Our model is known as FusionSCF. This study utilises two e-commerce datasets: Amazon.com and Flipkart.com. We predict and recommend products to users based on a combined weighted rating and sentiment score. We execute a lexicon-based sentiment analysis utilising several text classification methods for Natural Language Processing. The results reveal that the proposed contextual information sentiment-based model outperforms the conventional collaborative filtering technique. In the final phase of our work, we also explore the consequences of fake reviews on our filtering system. Also using a metric "genuinity index", we convey how reviews can be classified to genuine ones.

***Full paper:** *ISEC '23: Proceedings of the 16th Innovations in Software Engineering Conference, no. 8, pp 1–8*, 2023

Department of Basic Sciences





Sucrose Assisted Chemical-Free Synthesis of Rgo for Triboelectricnanogenerator: Green Energy Source for Smart-Water Dispenser

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ABSTRACT

Nowadays, the entire world is interconnected with millions of sensor networks, and powering such numerous sensors requires uninterrupted, reliable next-generation green energy sources. Herein, an economical, novel nanocomposite-based triboelectricnanogenerator (NC-TENG) is designed using reduced graphene oxide (rGO), synthesized through a simple, chemical-free one-step method in polyvinyl chloride (PVC) matrix. The NC-TENG with different rGO filler quantities is fabricated and characterized for structural, surface, and electrical properties. The NC-TENG with 0.2 g (0.79 wt%) of rGO generated maximum open circuit voltage, short circuit current, and power. The humidity-related study revealed the sensitivity behavior of the device in the relative humidity range of 60–100%. Further, the NC-TENG shows battery-free applications demonstrated through charging commercial capacitors, powering LEDs, and a digital watch. Also, the device is employed as a self-powered active sensor to convey the English alphabet and numerals in terms of Morse code. In addition, NC-TENG is integrated with the Arduino controller board to work as a smart-water dispenser. Thus, this work will serve as a comprehensive pathway for the fabrication of NC-TENG utilizing green synthesized rGOnanofillers in PVC matrix as a synergistic material, which find potential application as a flexible, self-powered multipurpose smart sensor.

***Full paper:** *Nano energy*, *vol. 106, 2023*

Design, Synthesis, Characterization, and Analysis of Antimicrobial Property of Novel Benzophenone Fused Azetidinone Derivatives through In Vitro and In Silico Approach

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ABSTRACT

A sequence of novel 2-(4-benzoyl-2-methyl-phenoxy)-N-(3-chloro-2-oxo-4-phenyl-azetidin1-yl)-acetamide analogues 9(a–n) were synthesized by multistep synthesis. The newly synthesized compounds were well characterized, and their antimicrobial activities were carried out by disc diffusion and broth dilution methods. Further, all the novel series of compounds (9a–n), were tested against a variety of bacterial and fungal strains in comparison to Ketoconazole, Chloramphenicol, and Amoxicillin as standard drugs, respectively. Compounds 9a, 9e, and 9g as a lead molecule demonstrated a good inhibition against tested strains. Further, molecular docking studies have been performed for the potent compounds to check the three-dimensional geometrical view of the ligand binding *to* the targeted proteins.

***Full paper:** *Current Issues in Molecular Biology, vol. 45, no. 1, pp. 92-109, 2023*

Biogenic Synthesis of Orthorhombic A-Moo3 Nanoparticles for Photocatalytic Degradation and Electrochemical Sensing

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ABSTRACT

One-step solution combustion method was used to synthesize α-MoO3 nanoparticles using ammonium molybdate tetrahydrate as the molybdenum source and rain tree pod extract as the green fuel. Spectroscopic techniques such as powder X-ray difraction (PXRD), scanning electron microscopy (SEM), and transmission electron microscopy with selected area electron difraction paterns were used to describe the morphological and structural properties of the as-synthesized molybdenum oxide nanoparticles. Furthermore, an assessment of the synthesized α-MoO3 nanoparticles encompassed their performance in degrading methylene blue dye under visible irradiation, revealing an impressive dye removal efciency of 98% upon exposure with high degree of recyclability. Additionally, these α-MoO3 nanoparticles were explored for their sensing capabilities with regard to dopamine. This current synthetic endeavor holds the promise of ofering fresh insights into the development of nanomaterials tailored for multifaceted, enduring applications in environmental remediation and biomedical contexts.

***Full paper:** *Journal of Materials Science: Materials in Electronics, vol. 34, no. 2226, pp. 1-15, 2023*

Microwave Radiation Assisted Synthesis of Nife2o4-Cofe2o4 Nanocomposites for Photocatalytic and Photoelectrochemical Water Splitting Applications

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ABSTRACT

Microwave radiation assisted method is emerged as a promising method due to its environmental friendliness, less time and no need toxic or harsh reagents. Herein, we report the synthesis of a $NiFe_2O_4$-$CoFe_2O_4$ nanocomposites by microwave radiation assisted method and its characterisation using various methods. X-ray Diffractogram (XRD) studied revealed the spinel cubic structure of the $NiFe_2O_4$-$CoFe_2O_4$ nanocomposites having an average crystallite size of 34 nm. Tetrahedral (594 cm^{-1}) and octahedral (397 cm^{-1}) sites of $NiFe_2O_4$-$CoFe_2O_4$ are identified by Fourier Transform Infrared (FTIR) spectroscopy as it is having the typical vibrational frequencies. UV–Visible diffuse reflectance (UV–Vis DRS) spectrum indicated that optical bandgap is less for nanocomposites compared to individual components. Transmission electron microscopy (TEM) images show the spherical nature of the nanocomposites. The photocatalytic degradation study of microwave-assisted $NiFe_2O_4$-$CoFe_2O_4$ nanocomposites is investigated under visible light irradiation against the Rose Bengal and Methylene blue dyes. The developed nanocomposites exhibited enhanced photoelectrochemical hydrogen due to higher charge separation and faster charge transfer at the interface.

Full paper: Inorganic Chemistry Communications, vol. 160, 2023

New Approach to the Preparation of Cationic, Anionic, Neutral, and Gemini Sensors

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ABSTRACT

Electrochemical sensors are fast-response, high-accuracy, and low-cost equipment with a simple principle. They have been broadly utilized in electrochemical analysis to examine the properties of species which are electroactive. Frequently, surfactants are used in the fabrication of electrochemical sensors to improve the selectivity and sensitivity, which results in enhancement of the electrode's surface activity and electron transfer reaction. In this chapter, we have presented the types of surfactants, their structures and roles in the modification of electrodes for the determination of biomolecules, drugs, and hazardous materials

***Full paper:** *Book Chapter, 2023*

Spinach-Mediated Green Synthesized NiFe2O4 Nanoparticle-Based TriboelectricNanogenerator: A Smart Tollgate Controller

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ABSTRACT

Exploring eco-friendly techniques to synthesize nanoparticles for developing practical triboelectricnanogenerators (TENGs) with higher electrical output and efficiency is highly desired. Herein, an economical TENG is fabricated by utilizing spinach-mediated nickel ferrite (NiF) nanoparticles dispersed in polyvinyl chloride (PVC) matrix and aluminum as active energyharvesting, materials. The structure, surface, dielectric, and electrical properties of the NiF nanoparticles, nanocomposite films with different amounts of fillers, and devices made from them are described. The 0.6 g PVC-NiF TENG generated higher electrical output due to charge holding sites and charge transfer paths, which are attributed to the presence of the NiF nanoparticles, honeycomb structure and porosity of the nanocomposite film. The relative humidity and temperature influence the electrical performance of the optimized device, showing respective sensitive behaviors. Further, the device illustrates potential applications in charging capacitors, glowing light-emitting diodes, and powering an electronic calculator. Also, PVC-NiF TENG is employed as a biomechanical sensor, touch-sensing alarm system, and smart tollgate controller using an electronic interface. Thus, the reported work will serve as an all-encompassing route from the synthesis of nanofillers and embedding them in a PVC matrix as a synergetic nanocomposite material to the fabrication of TENGs for various battery-free electronic applications.

Full paper: ACS Applied Electronic Materials , vol. 5, no. 11, pp. 5885-5897, 2023

Preparation and Characterization of Down Converting Poly (Vinyl Alcohol)/ PANI@Cus Hybrid Nanocomposites for Optoelectronic Application

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ABSTRACT

A new avenue for modifying the physical and chemical characteristics of the semiconducting polymers is opened by the incorporation of conducting polymers coated with inorganic nanoparticles into the semiconducting host polymers. For the manufacture of polyaniline (PANI) composites containing copper sulfide (PANI@CuS) and subsequent introduction to polyvinyl alcohol (PVA), an in-suite polymerization process was used. In the current study, PVA/PANI@CuS hybrid nanocomposites (NCs) were prepared using an environmentally friendly solution casting technique with PANI@CuS concentrations of 0, 1, 2, 3 and 4 wt%. To assess their morphological, electrical, optical, and surface characteristics, the prepared polymer hybrid nanocomposites were put through a variety of analytical techniques. The molecular connection between CuS, PANI, and PVA is visible thanks to X-ray diffraction and FT-IR investigations. The refractive index rises from 1.40 to 1.73 while the band gap in the UV–Visible decreases from 6.17 to 3.43, providing information on the optical characteristics. Additionally, photoluminescence spectra exhibit a 150 nm Stokes shift towards higher wavelengths, opening up additional mopportunities for photovoltaic applications. The electrical characteristics were examined using a scanning electron microscope (SEM), and it was discovered that the conduction mechanism adheres to the Poole-Frenkel effect. The obtainedfindings demonstrate that the addition of PANI@CuS significantly improves the host polymer matrix's opto-electronic characteristics.

***Full paper:** *Chemistry of Inorganic Materials, vol. 1, 2023*

Design, Synthesis, Characterization And Analysis of Anti-Infammatory Properties of Novel N-(Benzo[D] Thiazol-2-Yl)-2-[Phenyl(2-(Piperidin-1-Yl) Ethylamino] Benzamides and N-(Benzo[D]Thiazol-2-Yl)-2-[Phenyl (2-Morpholino) Ethylamino] Benzamides Derivatives Through in Vitro and in Silico Approach

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ABSTRACT

A series of novel N-(benzo[d]thiazol-2-yl)-2-[phenyl(2-(piperidin-1-yl) ethylamino] benzamides 8(a–e) and N-(benzo[d] thiazol-2-yl)-2-[phenyl(2-morpholino) ethylamino] benzamides 9(a–e) derivatives were synthesized in good yield by coupling substituted 2-amino benzothiazoles 3(a–e) with N-phenyl anthranilic acid 4. Further, the obtained intermediate compounds substituted N-(Benzo[d]thiazol-2-yl)-2-(phenylamino) benzamides 5(a–e) was treated with 1-(2-chloro ethyl) piperidine hydrochloride 6 to yield the fnal derivatives 8(a–e) and with 4-(2-chloro ethyl) morpholine hydrochloride 7 to yield 9(a–e) derivatives. The purity of the synthesized compounds was judged by their C, H and N analysis and the structure was analyzed based on IR, 1 H, 13C NMR and mass spectral data. The compounds 8(a–e) and 9(a–e) were evaluated for anti-infammatory activity and among the series, compounds 8b and 9b with a methoxy group at the sixth position in the benzothiazole ring appended with piperidine and morpholine moieties, respectively, showed the highest IC50 (11.34 μM and 11.21 μM) values for COX-1 inhibition, whereas the same compounds 8b and 9b demonstrated excellent COX-2 SI values (SI=103.09 and 101.90, respectively) and even showed 78.28% and 69.64% inhibition of albumin denaturation. Further, molecular docking studies have been accomplished and supported for the potent compound to check the three-dimensional geometrical view of the ligand binding to their protein receptor.

***Full paper:** *Journal of the Iranian Chemical Society, vol. 20, pp. 861–873, 2023*

Economical Polypropylene-Based Triboelectric Nanogenerator for Self-Powered Biomechanical SensorApplication

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ABSTRACT

Triboelectricnanogenerators (TENGs) as self-powered devices are a promising solution for powering sensors of the ever-expanding Internet of things. However, this potential will be ulfilled only if robust and efficient TENGs are fabricated with economical materials. Herein, a simple and facile approach for fabricating flexible, economical polypropylene-based TENGs (PP-TENGs) using readil accessible, inexpensive, and rob st material is proposed. The "arch" and "sandwich" shaped structural esigns are configured, and their comparative electrical characteristics are studied. The arch shape PP-TENG is modeled to simulate the potential distribution and the charge transfer mechanism between the frictional layers. The PP-TENGs are activated by hand tapping, and their electrical characteristics, such as open-circuit voltage, short-circuit current, and output power, are studied. To demonstrate their practical utility, PP-TENG is used to charge capacitors and power light-emitting diodes. Further, the stored energy of a capacitor is utilized to power an electronic smartwatch and a digital calculator. In addition, the arch-shaped PP-TENG is employed as a self-powered biomechanical sensor, that is, capable of tracking signals induced by different human body motions. Thus, the present work demonstrates the simple fabrication and cost-effectiveness of PP-TENG for futuristic applications in batteryfree portable electronics and biomechanical sensors.

***Full paper:** *physica status solidis , vol. 220, no. 3, 2023*

Facile Synthesis of Multifunctional Bismuth Oxychloride Nanoparticles for Photocatalysis and Antimicrobial Test

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ABSTRACT

Nanotechnology provides a good opportunity to investigate and develop multifunctional nanoscale materials. Due to increased surface area and smaller size, nanomaterials are used as promising tools for many biological applications. Herein, a green approach is used to prepare bismuth oxychloride (BiOCl) nanoparticles using a hydrothermal method and tender jackfruit extract is used as a natural reducing agent. The synthesized nanoparticles were subjected to different spectroscopic techniques to characterize them. The crystallinity and phase composition were investigated by X-ray diffraction studies and confirmed the tetragonal structure of BiOCl. The surface morphology and elemental composition were studied using a scanning electron microscope (SEM) and energy dispersive spectra (EDS) analysis, and functional groups were identified by Fourier transform infrared spectroscopy (FTIR) analysis. The as-synthesized BiOCl nanoparticles showed superior catalytic activity toward the detection of methylene blue dye with high degree of recyclability.

***Full paper:** *Materials Science & Engineering, vol. 290, 2023*

One Pot Synthesis of Cuo-Nio Nanoparticles Using Aegle Marmelos Fruit Extract and Their Antimicrobial Activity

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ABSTRACT

In this study, bimetallic Copper oxide and nickel oxide nanoparticles (CuO-NiO NPs) were synthesized using a green approach that utilized Aegle marmelos fruit extract as fuel. The solution-combustion technique was found to be effective in the synthesis of CuO-NiO NPs. Phytochemical screening of the aqueous extract revealed the presence of terpenoids, alkaloids, glycosides, flavonoids, reducing sugar, and phlobatannin. X-ray diffraction analysis confirmed that the bimetallic CuO-NiO NPs had a face-centered cubic structure with a crystallite length of 15 nm. The surface morphology of the CuO-NiO NPs was analyzed using SEM, revealing that the particles were agglomerated, and the size of the NPs was estimated to range from 50 nm to 100 nm. EDX analysis showed the presence of elemental copper oxide and nickel oxide nanoparticles, with the weight percentage of Ni being comparatively higher than Cu. Elemental mapping indicated the distribution of copper, Nickel and oxygen. The synthesized CuO-NiO NPs were tested for their antimicrobial activity against Escherichia coli and Bacillus subtilis using an agar well diffusion approach, and they demonstrated a potent antimicrobial effect against bacterial pathogens. These findings confirm that green-synthesized nanoparticles have potential antimicrobial activity. Selection and peer-review under responsibility of the scientific committee of the International Conference on Applied Research in Engineering Sciences

***Full paper:** *Materials Today: Proceedings, vol. 89, no. 1, pp. 1-7, 2023*

Green, Nonchemical Route for The Synthesis of Mnwo4 Nanostructures, Evaluation of Their Photocatalytic and Electrochemical Performance

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ABSTRACT

This research article presents the synthesis of MnWO4 nanoparticles using a combination of MnCl2 and Na2WO4·2H2O as precursors, with water as the sole solvent for dissolution, eliminating the need for additional solvents. The synthesized materials underwent comprehensive characterization employing various analytical techniques, including X-ray difraction, scanning electron microscopy, UV–visible spectrophotometry, and Fourier Transform Infrared Spectrometry. The photocatalytic activity of MnWO4 nanoparticles for degrading the organic contaminant methylene blue in water was also investigated under visible light irradiation. Notably, a signifcant degradation of methylene blue was observed, with 98% degradation achieved within a 120-min irradiation period. Additionally, the material was subjected to electrochemical studies to assess its sensing capabilities and exhibited strong sensing activity by detecting nano-molar concentrations of nitrite solution

***Full paper:** *Journal of Materials Science: Materials in Electronics, vol. 34, no. 1791, 2023*

Influence of Copper Selenide Nanoparticles on Structural, Optical and Opto-electronic Properties of Polyinylalcohol/ Copper Selenide Composites

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ABSTRACT

Organic/inorganic nanocomposites (NC'S) are exceedingly promising materials for the development of optoelectronic devices. The production of NC'S based materials has many advantages mainly economical, development of foldable and huge area device fabrication. PolyVinylAlcohol (PVA) is a possible material possessing high dielectric potency, better charge holding capacity along with variable opto-electronic properties with dopant. Herein, we report the development of PVA-Cu2Se NC'S via thought focus integration of copper selenide (Cu2Se) NanoParticle (NP) in to PVA host matrix using aqueous solvent casting. The effect of NP concentration on structure, optical and opto-electronic properties have also been valued and considerably presented. The doped PVA films display increased light absorption in the near visible region and change in the position in the absorption edge. The energy band gap of PVA is reduced upon doping. The obtained outcome indicates that small bandgap PVA with better film-making capability and structural stability will address the concerns of conjugated polymers. The developed composite is of organized structure, which offers new functional hybrids for various optoelectronic applications.

***Full paper:** *AIP Conference Proceedings, vol. 2399, no. 1, 2023*

Facile Green Synthesis of Cerium Oxide Nanoparticles Using Jacaranda Mimosifolia Leaf Extract and Evaluation of Their Antibacterial and Photodegradation Activity

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ABSTRACT

In the present work cerium oxide nanoparticles were synthesized by solution-combustion method using Jacaranda mimosifolia leaf extract as a fuel. The phytochemical screening of leaf extract was carried out, revealing the presence of alkaloids, phenolics, flavonoids, steroids and reducing sugar. The synthesized nanoparticles were characterized by XRD, SEM, EDAX and Elemental mapping. The XRD and SEM analysis revealed that they are highly homogenous and symmetrical in morphology with almost spherical in shape. EDAX depicted the purity of nanoparticles and elemental mapping showed the spatial arrangement of atoms. The present report aims at the application of Cerium oxide nanoparticles as antibacterial agents against Escherichia coli and Bacillus subtilis. Further the photocatalytic activity of methylene blue was evaluated under visible light irradiation. 95% of dye removal was achieved within 60 min. This study shows that synthesized Cerium oxide nanoparticles act as antibacterial agents and potential photocatalysts for degradation of organic pollutants present in water bodies. Selection and peer-review under responsibility of the scientific committee of the International Conference on Applied Research in Engineering Sciences.

***Full paper:** *Materials Today: Proceedings vol. 89, no. 1, pp. 105-112, 2023*

Polyvinyl Alcohol-Based Economical Triboelectricnanogenerator for Self-Powered Energy Harvesting Applications

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ABSTRACT

Triboelectricnanogenerators(TENGs) have emerged as a promising alternative for powering small-scale electronics without relying on traditional power sources, and play an important role in the development of the internet of things (IoTs). Herein, a low-cost, flexible polyvinyl alcohol (PVA)-based TENG (PVA-TENG) is reported to harvest low-frequency mechanical vibrations and convert them into electricity. PVA thin film is prepared by a simple solution casting technique and utilized to serve as the tribopositive material, polypropylene film as tribonegative, andaluminum foil as electrodes of the device. The dielectric-dielectric model is implemented with an arch structure for the effective working of the PVA-TENG. The device showed promising electrical output by generating significant open-circuit voltage, short-circuit current, and power . Also, PVA-TENG is subjected to a stability test by operating the device continuously for 5000 cycles. The result shows that, the device is mechanically durable and electrically stable. Further, the as-fabricated PVA-TENG is demonstrated to show feasible applications, such as charging two commercial capacitors with capacitances 1.1 and 4.7 μF and powering green light-emitting diodes. The stored energy in the 4.7 μF capacitor is utilized to power a digital watch and humidity and temperature sensor without the aid of an external battery. Thus, the PVA-TENG facilitates ease of fabrication, robustness, and cost-effective strategy in the field of energy harvesting for powering lower-grid electronics by demonstrating their potential as a sustainable energy source.

***Full paper:** *Nanotechnology, 2023*

Influence of Copper Selenide Nanoparticles on Structural, Optical and Opto-electronic Properties of Polyinylalcohol / Copper Selenide Composites

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ABSTRACT

Organic/inorganic nanocomposites (NC'S) are exceedingly promising materials for the development of optoelectronic devices. The production of NC'S based materials has many advantages mainly economical, development of foldable and huge area device fabrication. PolyVinylAlcohol (PVA) is a possible material possessing high dielectric potency, better charge holding capacity along with variable opto-electronic properties with dopant. Herein, we report the development of PVA-Cu2Se NC'S via thought focus integration of copper selenide (Cu2Se) NanoParticle (NP) in to PVA host matrix using aqueous solvent casting. The effect of NP concentration on structure, optical and opto-electronic properties have also been valued and considerably presented. The doped PVA films display increased light absorption in the near visible region and change in the position in the absorption edge. The energy band gap of PVA is reduced upon doping. The obtained outcome indicates that small bandgap PVA with better film-making capability and structural stability will address the concerns of conjugated polymers. The developed composite is of organized structure, which offers new functional hybrids for various optoelectronic applications.

Full paper: *International Conference on Advances in Materials, Ceramics and Engineering Sciences (AMCES-2020), 2023*

Clitoriaternatea Flower Extract: Biopolymer Composite-Based Triboelectric Nanogenerator As A Self-Powered Smart Counter

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ABSTRACT

The development of biopolymers-based high-performance triboelectricnanogenerators (TENGs) for powering innovative electronics is crucial for green energy technologies. Herein, a novel TENG composed of polyvinyl alcohol (PVA) functionalized with electron-donating groups from *Clitoriaternatea*(CT) flower extract is proposed. The compatibility of composite film in energy harvesting devices is tested through various characterizations, including structural, surface, electrical, and bioassay. Interestingly, the enhanced tribopositivity of the composite is attributed to intermolecular hydrogen bonding between taraxerol and PVA, substantiated by Hartree-Fock-DFT calculated vibrational spectrum, frontier molecular orbital energy gap, and electrostatic potential maps. TENG with PVA-CT: Polyurethane generated an open-circuit voltage (VOC) of 14.8 times and shortcircuit current (ISC) of 32.7 times, more significant than PVA TENG and several bio/non-biodegradable tribonegative polymers. The long-term stability test of PVA-CT TENG is confirmed by an observation of constant VOC for eight consecutive months. Additionally, humidity studies reveal that output increases with an increase in relative humidity of 30–100%. Further, the PVA-CT TENG is efficient in charging capacitors, powering LEDs, and acts as a self-powered smart counter. Overall, this study contributes new insights into developing eco-friendly synergistic materials for TENG fabrication and extending its applications in the Internet of Things, facilitating to build of futuristic smart cities.

***Full paper:** *Surfaces and Interfaces vol. 42, 2023*

Microwave and Combustion Methods: A Comparative Study of Synthesis, Characterization, and Applications of Nio Nanoparticles

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ABSTRACT

Synthesis of NiO NPs was achieved using microwave (MW) and solution combustion (SC) method, with the help of tender jackfruit extract as a green fuel. The efficiency of the two methods was compared by focusing on some of the important parameters like particle size, structure, optical property, photodegradation, supercapacitor, and sensing activity. Treatment of Nickel(II) nitrate hexahydrate solution with jackfruit extract, stable NiO NPs were obtained. Further, the characterization part involves PXRD, FTIR, UV, SEM, EDS analysis. PXRD patterns illustrate the FCC structure for NiO NPs for both methods and the crystallite size was obtained to be 3.9 nm and 3.8 nm. The FTIR spectra indicate the Ni-O stretching vibrations of synthesized NiO NPs. UV–Vis spectra shows the absorbance at 324 nm and 271 nm by SC and MW method, respectively. The bandgap energy of the MW method (2.3 eV) was more as compared to the combustion method (2.55 eV). Results of photodegradation experiments showed that MW synthesized NiO NPs were more effective as compared to SC synthesized NiO NPs against Rhodamine-B dye. Finally, impedance plots exhibit the supercapacitor activity and also NiO NPs showed excellent sensing activities.

***Full paper:** *Inorganic and nano-metal chemistry, vol. 53, no. 6, pp. 527–538, 2023*

Dynamics of Unsteady Carreau Fluid in A Suspension of Dust and Hybrid Solid Particles with Non-Fourier and Fourier Fluxes

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ABSTRACT

The use of heat transfers in heat exchangers, nuclear cooling, solar collectors, and electrical devices is crucial nowadays. Hybrid nanofluid can be used in these applications to get the best results because it encourages efficient heat transmission compared to conventional fluid. The effect of radiation and an unsteady Carreau hybrid fluid in addition to non-Fourier heat flux over a shrinking sheet is discussed in this paper. Using similarity transformations, the newly developed system of partial differential equations (PDEs) is converted into a set of ordinary differential equations (ODEs), that are next numerically addressed by utilizing shooting approach and the Runge–Kutta (RK) method. Tables and graphs are used to present utilizing the computational findings for nondimensional temperature, velocity, heat transfer rate, and friction between fluid and hybrid nanoparticles. Additionally, for certain physical factors, the physical quantities in numerical values were also presented (such as the friction factor and local Nusselt number). We made a restricted case comparison between the current findings and the body of prior research. Our finding confirms that the temperature profile is strengthened by the heat generation parameter and the effect of radiation. The porosity parameter decelerates the momentum boundary layer thickness near the plate.

***Full paper**: International Journal of Modern Physics B, vol. 37, no. 29, 2023*

Dynamics of Brownian Motion and Nonlinear Mixed Convective Conditions on Thermophoretic Slip Flow Embedded with Non-Fourier Flux

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ABSTRACT

In this paper, the importance of mass and heat transfer characteristics of mixed convective conditions on nonlinear free convection flow embedded with non-Fourier flux and thermal radiation is numerically investigated. A partial Casson slip and mixed impact of thermophoresis and Brownian motion is considered at the elastic surface. To change the highly nonlinear partial differential equations into ordinary differential system, we used the similarity transformations and then the shooting method is employed to solve resulting equations. The significance of various physical parameters on the velocity, concentration and temperature profiles are investigated for both negative value of ferromagnetic interaction ($\beta 1=-0.2$) and positive value of ferromagnetic interaction ($\beta 1=0.2$). The governing physical aspects of coefficient of skin friction, the Sherwood and Nusselt numbers are obtained for various embedded parameters. Our findings concluded that the ferromagnetic interaction is positive and then more mass transfer rate is identified compared to the negative value of ferromagnetic interaction, but whereas in friction and heat transfer rate, it was completely mixed sense (i.e., different effects have different results). Brownian motion has less Nusselt number values in positive ferromagnetism compared to negative ferromagnetism and quite opposite behavior is observed in the presence of thermophoresis, this happened due to nonlinear flux and buoyancy.

***Full paper:** *International Journal of Science, Technology, Engineering and Management - A VTU Publication, vol. 3, no. 1, pp: 15-24, 2023*

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