

Original Article

# Comparative Study of Some Mechanical Properties of Composite Materials like Jute Fiber with Conventional Metals

R.Rajesh Kumar<sup>1</sup>, D. Kannan<sup>2</sup>, R.Ranjith Kumar<sup>3</sup>

<sup>1,2,3</sup>Mechanical Engineering Department, MAMSE, Siruganur, Trichy, Tamilnadu, India.

**Abstract:** This comparative study explores mechanical properties between jute fiber composites and conventional metals, focusing on key parameters such as tensile strength, flexural strength, impact resistance, density, fatigue resistance, corrosion resistance, cost, and environmental impact. Jute fiber composites are known for their lower density, corrosion resistance, and environmental friendliness compared to metals, but generally exhibit lower mechanical strength. Conventional metals, characterized by higher strength and varying degrees of corrosion resistance, are typically heavier and more costly. The study examines these factors to provide insights into material selection for diverse applications, emphasizing the trade-offs between performance, cost, and sustainability in engineering and industrial contexts.

**Keywords:** Jute fibre composites, conventional metals, mechanical properties, tensile strength, flexural strength, impact resistance, density, fatigue resistance, corrosion resistance.

## INTRODUCTION

A composite is combination of two materials in which one of the materials, called thereinforcing phase, is in the form of fibers, sheets, or particles, and is embedded in the other materials called the matrix phase. The reinforcing material and the matrix material can be metal, ceramic, or polymer. Composites typically have a fiber or particle phase that is stiffer and stronger than the continuous matrix phase and serve as the principal load carrying members. The matrix acts as a load transfer medium between fibers, and in less ideal cases where the loads are complex, the matrix may even have to bear loads transverse to the fiber axis.

The matrix is more ductile than the fibers and thus acts as a source of composite toughness. to protect the fibers from environmental damage before, during and after composite processing. When designed properly, the new combined material exhibits better strength than would each individual material. Composites are used not only for their structural properties, but also for electrical, thermal, tribological, and environmental applications. Composites are multifunctional material systems that provide characteristics not obtainable from any discrete material.

They are cohesive structures made by physically combining two or more compatible materials, different in composition and characteristics. In the broader significance; the combination has its own distinctive properties. In terms of strength to resistance to heat or some other desirable quality, it is better than either of the components alone or radically different from either of them. The composites are compound materials which differ from alloys by the fact that the individual components retain their characteristics but are so incorporated into the composite as to take advantage only of their attributes and not of their shortcomings, in order to obtain improved materials. Composite materials as heterogeneous materials consisting of two or more solid phases, which are in intimate contact with each other on a microscopic scale.

They can be also considered as homogeneous materials on a microscopic scale in the sense that any portion of it will have the same physical property. The following are some of the reasons why composites are selected for certain applications: High strength to weight ratio (low density high tensile strength) High creep resistance, High tensile strength at elevated temperature, High toughness.



## JUTE FIBER

Jute is a best fiber obtained from inner bast tissues of the plant stem. The fibers are bound together by gummy materials (pectinous substances) which keep the fiber bundles cemented with non fibrous tissues of jute bark. These encircling soft tissues must be softened, dissolved and washed away so that the fiber can be obtained from the stem. This is done by steeping the stems organisms (mainly bacillus bacteria) decompose upon temperatures and the type of water used. It has been found that the presence of higher the tenacity of fiber In this research, a unidirectional type of fabric weave having a count of 20 x 12 (for yarns of 245 302 Tex) is investigated. 20 x 12 indicates 20 in number larger yarns in the wrap direction and 12 in number smaller yarns in the weft direction per inch are used. Jute fiber is 100% bio-degradable and recyclable and thus environmentally friendly. It is a natural fiber with golden and silky shine and hence called The Golden Fibre. It is the cheapest vegetable fiber procured from the best or skin of the plant's stem.



retting is 80 °C retting. The rate for optimum temperature and is 100% as water water knoin F.

Figure 1: Jute Fiber

## LITERATURE REVIEW

Proposed the using tamarind kernel powder from different areas in Thailand (Uthaithani, Ang Thong, and Nakhon Sawan) as a thickening agent for printing polyester with disperse dye in comparison to the commercial tamarind kernel powder from India as presently used in textile printing was examined. All tamarind kernel powder samples presented high polysaccharide and protein contents. The obtained result indicated that the properties as colour values, colour strength (K/S), overall fastness properties, handling, and sharpness of printed polyester fabric were good to very good levels. Only slight differences were observed between two places of tamarind kernel powder (Thailand and India) utilized for thickening agent Tamarind seed gum or tamarind kernel powder (TKP) is derived from these seeds of *Tamarindus indica* Linn. The effect of tamarind kernel powder (TKP, 0-2.7% w/w), gum arabic (GA, 0-18% w/w) and maltodextrin (MD, 0-27% w/w) on droplet size, rheological properties, Potential, encapsulation efficiency and the stability of W/O/W emulsions from methyl gallate. The result shows that increasing GA and MD reflected to small droplet size. The viscosity was directly related to GA, MD and TKP. The higher concentration of MD and GA reflected to lower creaming layer.

The higher encapsulation efficiency was found with increasing the concentration of GA and MD. The results suggested that the novel combination of TKP, GA and MD has a potential usage as wall material in phenolic encapsulation. Effects of addition of different levels of gums (xanthan, carboxymethyl cellulose and locust bean gum) on the pasting properties of tamarind kernel, potato and rice flour were studied by using Rapid Visco Analyzer (RVA). Tamarind kernel powder (TKP) varied significantly ( $P < 0.05$ ) from rice and potato flours with respect to its highest protein, ash and fat contents. The results of RVA analysis indicated that pasting properties of flour/gum mixtures

## FORMATION OF COMPOSITES

The basic engineering properties of composite material can be determined by either experimental stress analysis (testing) or theoretical mechanics (micromechanics). The micromechanics approach utilizes knowledge of individual fiber and resin properties and the proportionality of fiber to the resin lamina. A rule of mixture approach can be best used to drive the majority of a composite lamina property. When fabricating a composite material and

structure from dry fiber and pouring the liquid resin on fiber, the correct ratio of weight of fiber and resin are required.

## TESTING

### Tensile test:

The hybrid composite material fabricated is cut into required dimension using a saw cutter and the edges finished by using emery paper for mechanical testing. The tensile test specimen is prepared according to the ASTM D638 standard. The dimensions, gauge length and cross-head speeds are chosen according to the ASTM D638 standard. A tensile test involves mounting the specimen in a machine and subjecting it to the tension. The testing process involves placing the test specimen in the testing machine and applying tension to it until it fractures. The tensile force is recorded as a function of the increase in gauge length. During the application of tension, the elongation of the gauge section is recorded against the applied force.

Figure Tensile Testing Machine:



Figure 2: Tensile Testing Machine

### Standard dimension for tensile testing (ASTM D638) Laminate after Cutting required for Tensile Test

#### Compression Test:

When an axial load (by definition, columns are subjected to compression axial loads) is applied to a column, the column may fail because the stress in the column exceeds the yield stress of the material. For practical columns, however, this is seldom the cause of failure. A large compression load can cause the column to become unstable, resulting in a sudden lateral deflection of the column. This bowing of the column is called buckling. The purpose of the Euler buckling calculations is to compute the magnitude of the axial load that will create this instability in the column.

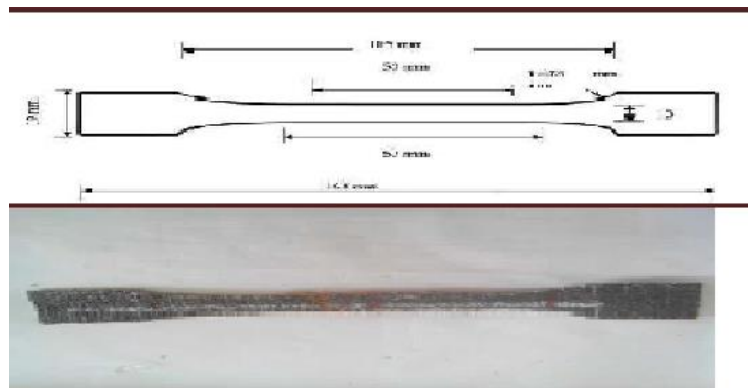


Figure 3: compression test



Figure 4: Figure Specimen for testing compression

### RESULT AND DISCUSSIONS

#### Variation of Tensile strength:

Tensile tests are carried out as per ASTM standards for Jute, Tamarind seed powder & plantgum. The percentage of the raw materials was varied at different levels and the results were plotted. The tests conducted showed that as the percentage of jute was increased in the composite, the tensile property increased exponentially.

S,No	Jute, Tamarind seed powder & plant gum in %	Tensile strength
1	40&60	372
2	50&60	460
3	60&40	599
4	65&35	657.1

#### Variations of compression strength

Compression tests are carried out as per ASTM standards for Jute, Tamarind seed powder & plant gum. The percentage of the raw materials was varied at different levels and the results were plotted. The tests conducted showed that as the percentage of jute was increased in the composite, the Compression property increased exponentially.

S,No	Jute, Tamarind seed powder & plant gum in %	Tensile strength
1	40&60	1205.3
2	50&50	1210.2
3	60&40	1969.2
4	65&35	1995.7

### CONCLUSION

- Load v/s displacement curves were observed for various types of organic composites with different percentages of fibres and different natural binders. It was concluded that for 65% of fiber and 35% of natural binders gives maximum tensile and compression strength
- The combination of different natural fibers found to give better mechanical properties
- At first, proper fiber surface treatment should be developed and implemented
- Secondly, properties of composites are greatly depended on the volume percentages of fibers and resin
- The quality at fiber matrix interface should be improved
- The current challenge is to make them cost effective
- The efforts to produce economically attractive composite components have resulted in several innovative manufacturing techniques currently being used in the composites industry

### SCOPE OF FUTURE WORK

- The present project focused mainly on Tensile and Compression properties. Other mechanical properties can be tested for accurate requirement.
- Further, the properties of the composites can be enhanced by combination of other natural binders
- The raw materials have to be treated for removal of any impurities before actual use

### REFERENCES

- [1] Neha S.Vyavhare Department of Chemical Engineering, Faculty of Engineering, Burapha Maninder Kaur, corresponding author Kawaljit Singh Sandhu, and Jasmeen Kaur(aug.2013:)
- [2] Naresh Kumar Miryala, Divit Gupta, "Data Security Challenges and Industry Trends" IJARCCCE International Journal of Advanced Research in Computer and Communication Engineering, vol. 11, no.11, pp. 300-309, 2022, Crossref <https://doi.org/10.17148/IJARCCCE.2022.111160>
- [3] Rohini S. Kharwade, Neha S.Vyavhare, Sachin M. More, Manoharbai Patel Institute of Pharmacy ( Kudwa, Gondia, Maharashtra
- [4] Akhilandeswari, P., George, J.G. (2014). Secure Text Steganography. In: Sathiakumar, S., Awasthi, L., Masillamani, M., Sridhar, S. (eds) Proceedings of International Conference on Internet Computing and Information Communications. Advances in Intelligent Systems and Computing, vol 216. Springer, New Delhi. [https://doi.org/10.1007/978-81-322-1299-7\\_1](https://doi.org/10.1007/978-81-322-1299-7_1)
- [5] Department of Pharmacognosy & Phytochemistry, KLES's College of Pharmacy, Gadag582101, Karnataka (India): Dept. of Pharmacognosy and Phytochemistry, RME's College of Pharmacy, Gulbarga, Dept.of Pharmaceutics, RME's College of Pharmacy.
- [6] Mallikarjunaradhya, V., Mistry, J., Ganesh, A., & Kiruthiga, T. (2023, August). The smart analysis of cell damage and cancerous prediction using information clustering model. In 2023 *Second International Conference on Smart Technologies for Smart Nation (SmartTechCon)* (pp. 870-875). IEEE. | Google Scholar
- [7] Analysis of plant gums by Joy Mazurek, Maria Perla Colombin: School of Science and Technology, University of the Thai Chamber of Commerce,(Bangkok): Dwain, M.A. hu, b.,O'Donnell, A., H.W., wool, R.P., 2004. All natural composite sandwich beams for structural applications. *Compos.struct*63, 147 157.
- [8] Kushal Walia, 2024. "Scalable AI Models through Cloud Infrastructure" *ESP International Journal of Advancements in Computational Technology (ESP-IJACT)* Volume 2, Issue 2: 1-7. | Link
- [9] Shah A.N. Lacked sc. Mechanical properties of jute reinforced plastics. *Fiber science and technology* 1981; 15:4146.
- [10] Aková Ing. Eva [2013], "Development of natural fiber reinforced polymer composites", *Transfer inovácií*, vol.25.
- [11] Muthukumaran Vaithianathan, Mahesh Patil, Shunyeek Frank Ng, Shiv Udakar, 2024. "Comparative Study of FPGA and GPU for High-Performance Computing and AI" *ESP International Journal of Advancements in Computational Technology (ESP-IJACT)* Volume 1, Issue 1: 37-46. [PDF]
- [12] Kumar, S. M. Ahmed and V. K. Duleb, "English text compression for small messages," *ICIMU 2011 : Proceedings of the 5th international Conference on Information Technology & Multimedia, Kuala Lumpur, Malaysia, 2011*, pp. 1-5, doi: 10.1109/ICIMU.2011.6122737.
- [13] Khan Md. Nuruzzaman, Roy k. Juganta, Akter Nousin, Zaman Haydar D.,IslamTuhidul[2012], "Production and properties of short juteand short E-glass fiber reinforced polypropylene based composites", *Open journal of composite materials*,Vol.2,40-47.
- [14] Sridhar Selvaraj, 2024. "Futuristic SAP Fiori Dominance" *ESP International Journal of Advancements in Computational Technology (ESP-IJACT)* Volume 2, Issue 1: 32-37. | Google Scholar
- [15] Chanthati, S. R. (2024). How the power of machine - machine learning, data science and NLP can be used to prevent spoofing and reduce financial risks. Sasibhushan Rao Chanthati. <https://doi.org/10.30574/gjeta.2024.20.2.0149>
- [16] Ticoalu A., Aravinthan T. and Cardona F. [2010], "A review of current development.
- [17] Bhattacharya, S. (2024). Securing the Gatekeeper: Addressing Vulnerabilities in OAuth Implementations for Enhanced Web Security. *International Journal of Global Innovations and Solutions (IJGIS)*. <https://doi.org/10.21428/e90189c8.af381673>
- [18] Venkata Sathya Kumar Koppiseti, 2024. "The Future of Remote Collaboration: Leveraging AR and VR for Teamwork" *ESP International Journal of Advancements in Computational Technology (ESP-IJACT)* Volume 2, Issue 1: 56-65. [Link]
- [19] Sumanth Tatineni, Anirudh Mustyala, 2024. "Enhancing Financial Security: Data Science's Role in Risk Management and Fraud Detection" *ESP International Journal of Advancements in Computational Technology (ESP-IJACT)* Volume 2, Issue 2: 94-105.
- [20] Kuraku, Sivaraju and Kalla, Dinesh and Smith, Nathan and Samaah, Fnu, Safeguarding FinTech: Elevating Employee Cybersecurity Awareness In Financial Sector (December 29, 2023). *International Journal of Applied Information Systems (IJAIS)*, Volume 12- No.42, December 2023, Available at SSRN: <https://ssrn.com/abstract=4678581>

- [21] Arnab Dey, 2021. "Implementing Latest Technologies from Scratch: A Strategic Approach for Application Longevity" European Journal of Advances in Engineering and Technology, 2021, 8 (8): 22-26. | PDF
- [22] Dhamotharan Seenivasan, Muthukumaran Vaithianathan, 2023. "Real-Time Adaptation: Change Data Capture in Modern Computer Architecture" ESP International Journal of Advancements in Computational Technology (ESP-IJACT) Volume 1, Issue 2: 49-61
- [23] Chanthati, S. R. (2024). Product Colour Variation Management with Artificial Intelligence. Sasibhushan Rao Chanthati. American Journal of Education and Technology, 3(3), 46-52. <https://doi.org/10.54536/ajet.v3i3.3213>
- [24] Shreyaskumar Patel "Enhancing Image Quality in Wireless Transmission through Compression and De-noising Filters" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-3, April 2021, pp.1318-1323, URL: <https://www.ijtsrd.com/papers/ijtsrd41130.pdf>
- [25] Vijay Panwar, "AI-Powered Data Cleansing: Innovative Approaches for Ensuring Database Integrity and Accuracy," *International Journal of Computer Trends and Technology*, vol. 72, no. 4, pp. 116-122, 2024. Crossref, <https://doi.org/10.14445/22312803/IJCTT-V72I4P115>
- [26] Dixit, A.S., Patwardhan, A.V. and Pandit, A.B., 2021. PARAMETER OPTIMIZATION OF PRODIGIOSIN BASEDDYE-SENSITIZED SOLAR CELL. *International Journal of Pharmaceutical, Chemical & Biological Sciences*, 11(1), pp.19-29.
- [27] Amit Mangal, 2021. "Evaluating Planning Strategies for Prioritizing the most viable Projects to Maximize Investment Returns" *ESP Journal of Engineering & Technology Advancements* 1(2): 69-77. [Link]
- [28] Chanthati, Sasibhushan Rao. (2021). Second Version on A Centralized Approach to Reducing Burnouts in the IT industry Using Work Pattern Monitoring Using Artificial Intelligence using MongoDB Atlas and Python. 10.13140/RG.2.2.12232.74249.
- [29] Nilesh Charankar, Dileep Kumar Pandiya, 2024, Title: Enhancing Efficiency and Scalability in Microservices Via Event Sourcing, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 13, Issue 04 (April 2024).
- [30] Komperla, R. C., Pokkuluri, K. S., Nomula, V. K., Gowri, G. U., Rajest, S. S., & Rahila, J. (2024). Revolutionizing Biometrics With AI-Enhanced X-Ray and MRI Analysis. In P. Paramasivan, S. Rajest, K. Chinnusamy, R. Regin, & F. John Joseph (Eds.), *Advancements in Clinical Medicine* (pp. 1-16). IGI Global. <https://doi.org/10.4018/979-8-3693-5946-4.ch001>
- [31] Chanthati, Sasibhushan Rao. (2021). How the Power of Machine - Machine Learning, Data Science and NLP Can Be Used to Prevent Spoofing and Reduce Financial Risks. 10.13140/RG.2.2.18761.76640.
- [32] Naga Ramesh Palakurti, Bridging the Gap: Frameworks and Methods for Collaborative Business Rules Management Solutions , *International Scientific Journal for Research: Vol. 6 No. 6 (2024): ISJR*
- [33] Kalla, Dinesh and Smith, Nathan and Samaah, Fnu and Polimetla, Kiran, Facial Emotion and Sentiment Detection Using Convolutional Neural Network (January 2021). *Indian Journal of Artificial Intelligence Research (INDJAIR)*, Volume 1, Issue 1, January-December 2021, pp. 1-13, Article ID: INDJAIR\_01\_01\_001, Available at SSRN: <https://ssrn.com/abstract=4690960>
- [34] Pratiksha Agarwal, Arun Gupta, "Harnessing the Power of Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) Systems for Sustainable Business Practices," *International Journal of Computer Trends and Technology*, vol. 72, no. 4, pp. 102-110, 2024. Crossref, <https://doi.org/10.14445/22312803/IJCTT-V72I4P113>
- [35] Shreyaskumar Patel "Performance Analysis of Acoustic Echo Cancellation using Adaptive Filter Algorithms with Rician Fading Channel" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-2, February 2022, pp.1541-1547, URL: <https://www.ijtsrd.com/papers/ijtsrd49144.pdf>
- [36] Kalla, Dinesh, Nathan Smith, Fnu Samaah, and Kiran Polimetla. "Enhancing Early Diagnosis: Machine Learning Applications in Diabetes Prediction." *Journal of Artificial Intelligence & Cloud Computing*. SRC/JAICC-205. DOI: [doi.org/10.47363/JAICC/2022\(1\)191\(2022\):2-7](https://doi.org/10.47363/JAICC/2022(1)191(2022):2-7).
- [37] Borra, Praveen; Exploring Microsoft Azure's Cloud Computing: A Comprehensive Assessment *International Journal of Advanced Research in Science, Communication and Technology* 2 8, 897-906, 2022 IJARST.
- [38] Palakurti, N. R. (2024). Intelligent Security Solutions for Business Rules Management Systems: An Agent-Based Perspective. *International Scientific Journal for Research*, 6(6), 1-20.
- [39] "Secure and Ethical Innovations: Patenting Ai Models for Precision Medicine, Personalized Treatment, and Drug Discovery in Healthcare". (2023). *International Journal of Business Management and Visuals*, ISSN: 3006-2705, 6(2), 1-8. <https://ijbmv.com/index.php/home/article/view/60>
- [40] S. E. Vadakkethil Somanathan Pillai and K. Polimetla, "Mitigating DDoS Attacks using SDN-based Network Security Measures," 2024 International Conference on Integrated Circuits and Communication Systems (ICICACS), Raichur, India, 2024, pp. 1-7, doi: 10.1109/ICICACS60521.2024.10498932.
- [41] Sachan, V., Malik, S., Gautam, R., & Kumar, P. (Eds.). (2024). *Advances in AI for Biomedical Instrumentation, Electronics and Computing: Proceedings of the 5th International Conference on Advances in AI for Biomedical Instrumentation, Electronics and Computing (ICABEC - 2023)*, 22-23 December 2023, India (1st ed.). CRC Press. <https://doi.org/10.1201/9781032644752>

- [42] S. E. V. S. Pillai and K. Polimetla, "Enhancing Network Privacy through Secure Multi-Party Computation in Cloud Environments," 2024 International Conference on Integrated Circuits and Communication Systems (ICICACS), Raichur, India, 2024, pp. 1-6, doi: 10.1109/ICICACS60521.2024.10498662.
- [43] Kumar Shukla, Shashikant Tank, 2024. "CYBERSECURITY MEASURES FOR SAFEGUARDING INFRASTRUCTURE FROM RANSOMWARE AND EMERGING THREATS", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN: 2349-5162, Vol.11, Issue 5, page no.i229-i235, May-2024, Available: <http://www.jetir.org/papers/JETIR2405830.pdf>
- [44] Sukhdev S. Kapur, Ashok Ganesan, Jacopo Pianigiani, Michal Styszynski, Atul S Moghe, Joseph Williams, Sahana Sekhar Palagrahara Chandrashekar, Tong Jiang, Rishabh Ramakant Tulsian, Manish Krishnan, Soumil Ramesh Kulkarni, Vinod NairJeba Paulaiyan, 2021. *Automation of Maintenance Mode Operations for Network Devices*, US10938660B1. [Link]
- [45] Kumar Shukla, Nimeshkumar Patel, Hirenkumar Mistry, 2024. "Transforming Incident Responses, Automating Security Measures, and Revolutionizing Defence Strategies through AI-Powered Cyber security", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN: 2349-5162, Vol.11, Issue 3, page no.h38-h45, March-2024, Available: <http://www.jetir.org/papers/JETIR2403708.pdf>
- [46] Chandrakanth Lekkala 2023. "Implementing Efficient Data Versioning and Lineage Tracking in Data Lakes", Journal of Scientific and Engineering Research, Volume 10, Issue 8, pp. 117-123. [Link]
- [47] Patel, N. (2024, March). SECURE ACCESS SERVICE EDGE(SASE): "EVALUATING THE IMPACT OF CONVERGED NETWORK SECURITYARCHITECTURES IN CLOUD COMPUTING." Journal of Emerging Technologies and Innovative Research. <https://www.jetir.org/papers/JETIR2403481.pdf>
- [48] Ayyalasomayajula, Madan Mohan Tito, Sathishkumar Chintala, and Sandeep Reddy Narani. "Optimizing Textile Manufacturing With Neural Network Decision Support: An Ornstein-Uhlenbeck Reinforcement Learning Approach." Journal of Namibian Studies: History Politics Culture 35 (2023): 335-358.
- [49] Vishwanath Gojanur , Aparna Bhat, "Wireless Personal Health Monitoring System", IJETCAS:International Journal of Emerging Technologies in Computational and Applied Sciences,eISSN: 2279-0055,pISSN: 2279-0047, 2014. [Link]
- [50] Ayyalasomayajula, Madan Mohan Tito, et al. "Proactive Scaling Strategies for Cost-Efficient Hyperparameter Optimization in Cloud-Based Machine Learning Models: A Comprehensive Review." ESP Journal of Engineering & Technology Advancements (ESP JETA) 1.2 (2021): 42-56.
- [51] Mistry, H., Shukla, K., & Patel, N. (2024). Transforming Incident Responses, Automating Security Measures, and Revolutionizing Defence Strategies throughAI-Powered Cybersecurity. Journal of Emerging Technologies and Innovative Research, 11(3), 25. <https://www.jetir.org/>
- [52] Ayyalasomayajula, M., & Chintala, S. (2020). Fast Parallelizable Cassava Plant Disease Detection using Ensemble Learning with Fine Tuned AmoebaNet and ResNeXt-101. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 11(3), 3013-3023.
- [53] Aparna Bhat, "Comparison of Clustering Algorithms and Clustering Protocols in Heterogeneous Wireless Sensor Networks: A Survey," 2014 INTERNATIONAL JOURNAL OF SCIENTIFIC PROGRESS AND RESEARCH (IJSR)-ISSN : 2349-4689 Volume 04- NO.1, 2014. [Link]
- [54] Ayyalasomayajula, Madan Mohan Tito, et al. "Implementing Convolutional Neural Networks for Automated Disease Diagnosis in Telemedicine." 2024 Third International Conference on Distributed Computing and Electrical Circuits and Electronics (ICDCECE). IEEE, 2024.
- [55] Shashikant Tank Kumar Mahendrabhai Shukla, Nimeshkumar Patel, Veeral Patel, 2024." AI BASED CYBER SECURITY DATA ANALYTIC DEVICE", 414425-001, [Link]
- [56] Ayyalasomayajula, Madan Mohan Tito, Akshay Agarwal, and Shah Nawaz Khan. "Reddit social media text analysis for depression prediction: using logistic regression with enhanced term frequency-inverse document frequency features." International Journal of Electrical and Computer Engineering (IJECE) 14.5 (2024): 5998-6005.
- [57] Aparna Bhat, Rajeshwari Hegde, "Comprehensive Study of Renewable Energy Resources and Present Scenario in India," 2015 IEEE International Conference on Engineering and Technology (ICETECH), Coimbatore, TN, India, 2015. [Link]
- [58] Ayyalasomayajula, Madan Mohan Tito. "Innovative Water Quality Prediction For Efficient Management Using Ensemble Learning." Educational Administration: Theory and Practice 29.4 (2023): 2374-2381.
- [59] Sarangkumar Radadia Kumar Mahendrabhai Shukla ,Nimeshkumar Patel ,Hirenkumar Mistry,Keyur Dodiya 2024." CYBER SECURITY DETECTING AND ALERTING DEVICE", 412409-001, [Link]
- [60] Ayyalasomayajula, Madan Mohan Tito, Srikrishna Ayyalasomayajula, and Sailaja Ayyalasomayajula. "Efficient Dental X-Ray Bone Loss Classification: Ensemble Learning With Fine-Tuned ViT-G/14 And Coatnet-7 For Detecting Localized Vs. Generalized Depleted Alveolar Bone." Educational Administration: Theory and Practice 28.02 (2022).
- [61] Aparna K Bhat, Rajeshwari Hegde, 2014. "Comprehensive Analysis Of Acoustic Echo Cancellation Algorithms On DSP Processor", International Journal of Advance Computational Engineering and Networking (IJACEN), volume 2, Issue 9, pp.6-11. [Link]

- [62] Ayyalasomayajula, M. M. T., Chintala, S., & Sailaja, A. (2019). A Cost-Effective Analysis of Machine Learning Workloads in Public Clouds: Is AutoML Always Worth Using? *International Journal of Computer Science Trends and Technology (IJCST)*, 7(5), 107-115.
- [63] Nimeshkumar Patel, 2022." QUANTUM CRYPTOGRAPHY IN HEALTHCARE INFORMATION SYSTEMS: ENHANCING SECURITY IN MEDICAL DATA STORAGE AND COMMUNICATION", *Journal of Emerging Technologies and Innovative Research*, volume 9, issue 8, pp.g193-g202. [Link]
- [64] Bhat, A., & Gojanur, V. (2015). Evolution Of 4g: A Study. *International Journal of Innovative Research in Computer Science & Engineering (IJIRCSE)*. Booth, K. (2020, December 4). How 5G is breaking new ground in the construction industry. *BDC Magazine*.<https://bdcmagazine.com/2020/12/how-5g-is-breaking-new-ground-in-the-constructionindustry/>. [Link]
- [65] Nimeshkumar Patel, 2021." SUSTAINABLE SMART CITIES: LEVERAGING IOT AND DATA ANALYTICS FOR ENERGY EFFICIENCY AND URBAN DEVELOPMENT", *Journal of Emerging Technologies and Innovative Research*, volume 8, Issue 3, pp.313-319. [Link]
- [66] Bhat, A., Gojanur, V., & Hegde, R. (2014). 5G evolution and need: A study. In *International conference on electrical, electronics, signals, communication and optimization (EESCO) – 2015*. [Link]
- [67] Chintala, S. ., & Ayyalasomayajula, M. M. T. . (2019). OPTIMIZING PREDICTIVE ACCURACY WITH GRADIENT BOOSTED TREES IN FINANCIAL FORECASTING. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 10(3), 1710-1721. <https://doi.org/10.61841/turcomat.v10i3.14707>
- [68] A. Bhat, V. Gojanur, and R. Hegde. 2015. 4G protocol and architecture for BYOD over Cloud Computing. In *Communications and Signal Processing (ICCSPP)*, 2015 International Conference on. 0308-0313. Google Scholar. [Link]
- [69] Ankitkumar Tejani, Jyoti Yadav, Vinay Toshniwal, Rashi Kandelwal, 2021. "Detailed Cost-Benefit Analysis of Geothermal HVAC Systems for Residential Applications: Assessing Economic and Performance Factors", *ESP Journal of Engineering & Technology Advancements*, 1(2): 101-115. [Link]
- [70] Ankitkumar Tejani, Jyoti Yadav, Vinay Toshniwal, Harsha Gajjar, 2022. "Achieving Net-Zero Energy Buildings: The Strategic Role of HVAC Systems in Design and Implementation", *ESP Journal of Engineering & Technology Advancements*, 2(1): 39-55. [Link]
- [71] Vedamurthy Gejjegondanahalli Yogeshappa, 2024. "AI - Driven Innovations in Patient Safety: A Comprehensive Review of Quality Care", *International Journal of Science and Research (IJSR)*, Volume 13 Issue 9, September 2024, pp. 815-826, [Link]
- [72] Vikramraj Kumar Thiyagarajan, 2024. "Predictive Modeling for Revenue Forecasting in Oracle EPBCS: A Machine Learning Perspective", *International Journal of Innovative Research of science, Engineering and technology (IJIRSET)*, Volume 13, Issue 4, [Link]
- [73] Ali, A., Ahmad, M., Nawaz, S., Raza, T., & Sunil Kumar Suvvari (2022). An effective structure for data management in the cloud-based tools and techniques. *Journal of Engineering Science*, 15(4), 215-228. <https://journal.esrgroups.org/jes/article/view/5519/3943>
- [74] Roman, B., & Sunil Kumar Suvvari (2021). *Social Media Control Version 1.2*. Roman Publications. <https://romanpub.com/resources/smc-v1-2-2021-7.pdf>