Amity Journal of Computational Sciences
ISSN 2456-6616 (Online)
Volume 5 Issue 1 2021

Disease prediction system using machine learning

Preetika bhardwaj
Dept. of CSE
Amity University
Uttar Pradesh, India
preetikabhardwaj03@gmail.com

Aman Sharma
Dept. of CSE
Amity University
Uttar Pradesh, India
Sharmaaman202202@gmail.com

Sumit Jangid
Dept. of CSE
Amity University
Uttar Pradesh, India
sumitjangid044@gmail.com

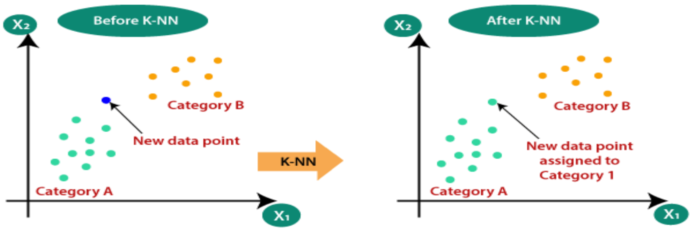
Abstract- ***In contemporary times, the prevalence of diverse diseases has surged due to environmental conditions and lifestyle choices. Consequently, the early prediction of diseases has emerged as a crucial task to enhance healthcare outcomes. However, accurately predicting diseases solely based on symptoms poses significant challenges for medical practitioners. Overcoming this obstacle, data mining has surfaced as a pivotal tool to predict diseases more effectively. The field of medical science witnesses a substantial growth in data volume each year, presenting an opportunity for accurate analysis of medical data, thereby benefiting early patient care. By harnessing disease data, data mining uncovers hidden patterns within vast medical datasets. In this study, we propose a novel approach for general disease prediction, utilizing patient symptoms as predictive indicators. To achieve this, we employ the K-Nearest Neighbor (KNN) and Support Vector Machine (SVM) machine learning algorithms, known for their accuracy in disease prediction. The success of our predictive model hinges on the availability of a comprehensive dataset containing disease symptoms.***

I. INTRODUCTION

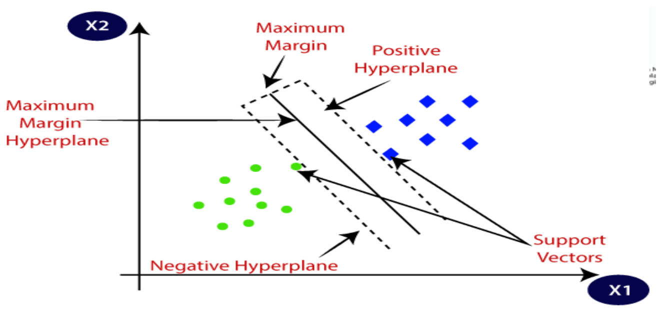
Machine learning has played a pivotal role in enhancing computer intelligence, enabling computers to think and learn autonomously. Various machine learning techniques, including Unsupervised, Semi-Supervised, Supervised, Reinforcement, Evolutionary Learning, and Deep Learning, have proven valuable for classifying vast datasets swiftly. The field of general disease prediction has seen significant advancements, where living habits and checkup information are now considered for more accurate results. In this context, the CNN (Convolutional Neural Network) algorithm has demonstrated a remarkable accuracy of 83.5%, surpassing the KNN algorithm. Additionally, CNN proves to be more efficient in terms of time and memory requirements. Beyond predicting diseases, this system further provides risk assessment, categorizing individuals into lower or higher risk for general diseases. Machine learning classifiers have become indispensable tools for medical data analysis and disease prediction, partitioning datasets into multiple classes based on their distinct characteristics.

II. METHODOLOGY

1. K Nearest Neighbour: The K-Nearest Neighbor (KNN) algorithm is a simple Supervised Learning technique in Machine Learning. It operates on the principle of similarity, where a new data point is classified into a category based on its resemblance to the available data. KNN stores all the existing data and, when presented with new data, assigns it to a suitable category based on similarity. It can be used for both Regression and Classification tasks, but it is primarily employed for Classification problems. As a non-parametric algorithm, KNN makes no assumptions about the underlying data distribution. Additionally, it is known as a lazy learner algorithm since it postpones learning from the training set and performs classification when new data is encountered.

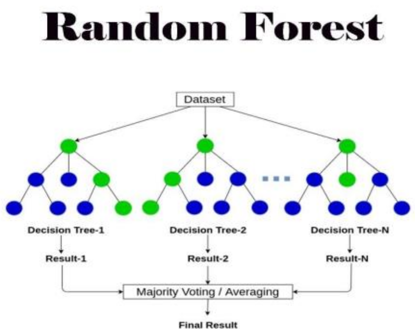


2. *Support Vector Machine:* Support Vector Machine (SVM), a widely used Supervised Learning algorithm for both Classification and Regression tasks. However, its primary application is in Classification problems within Machine Learning. The main objective of SVM is to establish an optimal decision boundary, known as a hyperplane, that effectively separates the n-dimensional space into distinct classes. By identifying the extreme points, also called support vectors, SVM constructs the hyperplane. The paragraph concludes by mentioning a diagram illustrating how SVM can classify two different categories using a decision boundary or hyperplane.



3. *Random Forest:* Random Forest is a versatile machine learning algorithm utilized for both classification and regression tasks. It falls under the category of ensemble learning methods, which combine multiple decision trees to create a more accurate and robust model. The algorithm constructs numerous decision trees, each trained on a

random subset of the data and features at each node, generating a diverse set of trees. The combination of their predictions through ensemble learning results in a more accurate and stable prediction. In classification, the most common prediction among the trees is chosen, while in regression, the average prediction is taken. Random Forest possesses several advantages, including its ability to handle large datasets with high dimensionality, manage missing values, and tolerate noisy data.



III. HARDWARE & SOFTWARE REQUIREMENT

1. Software:
2. Android Studio is the official integrated development environment (IDE) for Android app development. It is built on JetBrains' IntelliJ IDEA and supports Android development across various devices.
3. VS Code is a source-code editor developed by Microsoft, offering features like debugging, code completion, snippets, and Git integration. It is a streamlined editor that provides essential tools for quick code development.
4. Sublime Text is a cross-platform source code editor with support for numerous programming languages. Its functionality can be extended through community-built plugins.
5. Octave is a high-level programming language focused on numerical computing. It offers a versatile interpreter, graphical user interface, and supports matrix-based syntax, making it compatible with MATLAB.

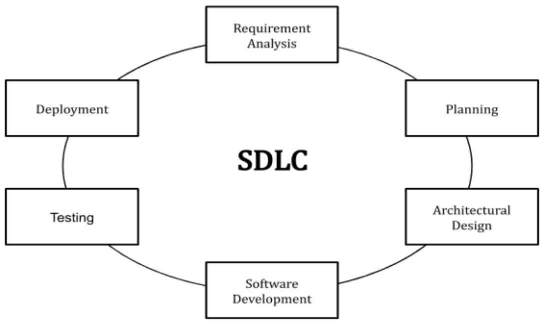
Hardware:

- CPU: Intel Core 2 Quad CPU Q6600 @ 2.40GHz (4 CPUs) / AMD Phenom 9850 Quad- Core Processor (4 CPUs) @ 2.5GHz
- RAM: 4 GB
- OS: Windows 10 64 Bit, Windows 8.1 64 Bit, Windows 8 64 Bit, Windows 7 64 Bit Service Pack 1, Windows Vista 64 Bit Service Pack 2*
- VIDEO CARD: 32 MB Direct3D Video Card
- FREE DISK SPACE: 10GB
- DEDICATED VIDEO RAM: 1 GB

IV. SOFTWARE DEVELOPMENT LIFE CYCLE

The Software Development Life Cycle (SDLC) is a systematic process aimed at producing software of high quality, minimizing costs, and reducing development time. It offers a well-structured flow of phases that enable organizations to efficiently create thoroughly tested and production-ready software. SDLC ensures a methodical approach to software development, resulting in reliable and effective software products.

The SDLC involves six phases:



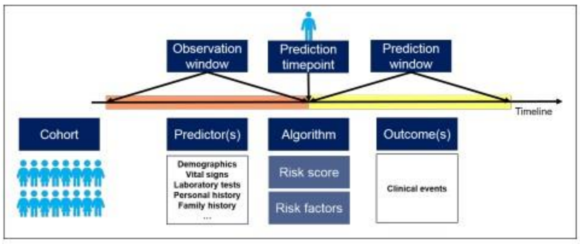
The various software development life cycle (SDLC) models are including the Waterfall model, Rapid Application Development (RAD) process, Spiral model, V-Model, Incremental model, Agile methodology, and Big Bang model.The Waterfall model divides the software development process into sequential phases. RAD is a time-sensitive adoption of the Waterfall model, focusing on quicker development through focus groups to gather requirements. The Spiral model combines rapid prototyping and concurrency, addressing objectives and risks in cycles.V-Model emphasizes parallel planning and testing phases. The Incremental model breaks requirements into groups and iteratively adds functionality. Agile methodology promotes continuous interaction between development and testing in incremental builds.

The SDLC model which we used is Prototype Model.

Prototype Model, a software development approach that starts with requirements gathering and involves creating a quick design followed by the development of a prototype. The loop continues with feedback from users leading to better versions of the prototype until the customer is satisfied. Once approved, the prototype is converted into the final system with considerations for quality and security.The second part of the paragraph discusses the effectiveness of the Prototype Model in the context of disease prediction. It mentions using a disease dataset from the UCI machine learning website and performing preprocessing to clean the data. Feature extraction and selection are carried out, followed by classification using techniques like KNN and SVM for accurate disease prediction.

V. RISK ASSESSMENT

A risk prediction model is a set of equations that estimates the likelihood of developing a specific clinical outcome based on personal profiles. The key elements of such a model include the cohort, which represents the group of individuals likely to develop the outcome. Predictors are personal characteristics used in risk prediction, such as demographics, vital signs, laboratory results, and family disease history. For instance, predictors for type 2 diabetes may include age, family history of diabetes, body mass index, and waist circumference. Similarly, predictors for cardiovascular disease may include factors like smoking, diabetes, hyperlipidemia, and hypertension, among others. While including more predictors can improve prediction performance, it may also increase data collection burden. Hence, using easily accessible and less invasive predictors may encourage wider adoption of the model.

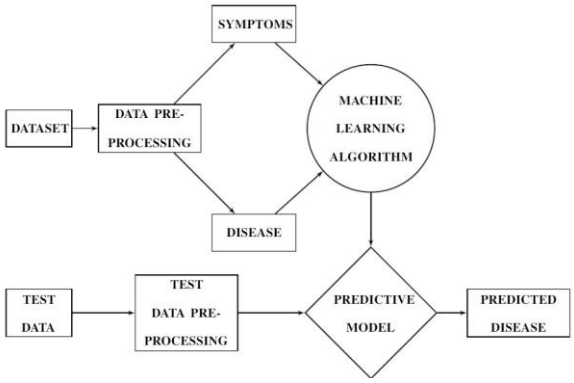


Evaluation metrics, feature engineering, pre-processing, feature construction, feature selection, and the risk equation are crucial components in developing effective risk prediction models.

Classification is a common type of risk prediction problem, particularly in binary classification, where the model predicts between two outcomes. Model performance can be assessed using various metrics, including discrimination (the model's ability to differentiate between positive and negative cases), calibration (how close the predicted risk aligns with the actual probability), and interpretability (how easily the model can be understood by humans). Classification models are evaluated based on discrimination, calibration, and interpretability, each providing valuable insights into the model's performance and understandability.

VI. SYSTEM DESIGN / WIREFRAME

1. Machine Learning Model



2. User Interface

The project involves the development of a UI using React and React Native, integrated with an ML model created through data mining techniques and ML algorithms. Several essential modules are included in the project:

1. Creation of a Linux machine Elastic Compute Cloud (EC2) instance on AWS.
2. Establishment of a postgres RDS instance for the database on AWS.
3. Downloading the project on the EC2 instance and setting up a suitable Python3 environment with Django installed.
4. Installation of pgadmin and accessing the remote RDS database on the local machine.
5. Creation of migrations and launching the project.
6. Accessing the project on a web browser using the public IP of the EC2 instance.
7. Implementation of user account creation and disease prediction functionality.

Each module plays a vital role in ensuring the proper functioning and seamless execution of the project. Missing any of these modules could lead to issues, as they collectively enable access to the UI and utilize the ML model for disease prediction.

VII. TESTING, TRAINING AND EVALUATION

Unit testing : Unit tests focus on verifying that correct changes occur in the program's state when a transaction is processed. Business logic in transaction processor functions is thoroughly tested to achieve high code coverage and detect typos or logic errors. Each algorithm is individually tested, and pre-processing is adjusted accordingly to enhance accuracy.
System testing: System Testing involves evaluating the complete and integrated software to assess its compliance with specified requirements. This level of testing encompasses various types, including Usability Testing to check user-friendliness, Load Testing to assess performance under real-life loads, Regression Testing to ensure no new bugs were introduced during development, Recovery Testing

to demonstrate reliability, and Migration Testing to assess smooth transitions between system infrastructures.
Functional test: Functional Testing, also known as functional completeness testing, involves identifying any possible missing functions in the program. It evaluates use-case scenarios and related business processes, ensuring the correct behavior of components like chatbots and smart contracts.

VIII. FUTURE SCOPE OF PROJECT

The future of disease prediction systems using machine learning is promising, driven by the increasing availability of healthcare data, improved algorithms, and better computing power. These systems hold immense potential for healthcare professionals and patients alike.
The primary advantage of disease prediction systems is their capability to detect diseases at an early stage. Early identification is crucial for successful treatment, and machine learning algorithms excel at identifying hidden patterns and risk factors that may elude human clinicians. With the integration of wearable technology and IoT devices, continuous monitoring becomes possible, facilitating early detection and timely interventions. Machine learning algorithms also play a key role in identifying risk factors and predicting disease outcomes for individual patients. By analyzing vast amounts of data from various sources, these systems can offer personalized recommendations for prevention and treatment, leading to improved patient outcomes and reduced healthcare costs.
As the technology continues to evolve, disease prediction systems using machine learning may integrate with emerging technologies like blockchain and decentralized databases. These advancements can enhance the security and privacy of patient data while facilitating seamless data sharing between healthcare providers and researchers.

IX .CONCLUSION

Disease prediction systems using machine learning hold immense potential to revolutionize healthcare by analyzing extensive data, identifying risk factors, and providing personalized recommendations. They enable early disease detection, leading to better treatment outcomes, and aid in developing effective public health interventions. However, careful implementation is essential, addressing ethical, privacy, and reliability concerns through rigorous testing. The future is promising, with advancements expected in accuracy and personalized treatments. Integrating technologies like blockchain can enhance data security and sharing. Overall, disease prediction systems using machine learning can transform healthcare and contribute to a healthier and equitable future.

ACKNOWLEDGMENT

This work is partially supported by Prof. Suman Avdhesh Yadav [Department of computer science and engineering] Amity University Uttar Pradesh.

REFERENCES

[1] M. Chen, Y. Hao, K. Hwang, L. Wang, and L. Wang,"Disease prediction by machine learning over big data from healthcare communities", ," IEEE Access, vol. 5, no. 1,
pp. 8869–8879, 2017.
[2] B. Qian, X. Wang, N. Cao, H. Li, and Y.-G. Jiang, "A relative similarity based method for interactive patient risk prediction," Springer Data Mining Knowl. Discovery, vol. 29, no. 4, pp. 1070–1093, 2015.
[3] IM. Chen, Y. Ma, Y. Li, D. Wu, Y. Zhang, and C. Youn, " Wearable 2.0: Enable human-cloud integration in next generation healthcare system," IEEE Commun. , vol. 55, no. 1,
pp. 54–61, Jan. 2017.
[4] Y. Zhang, M. Qiu, C.-W. Tsai, M. M. Hassan, and A. Alamri, "HealthCPS: Healthcare cyberphysical system assisted by cloud and big data," IEEE Syst. J., vol. 11, no. 1,
pp. 88–95, Mar. 2017.
[5] L. Qiu, K. Gai, and M. Qiu, "Optimal big data sharing approach for telehealth in cloud computing," in Proc. IEEE Int. Conf. Smart Cloud (Smart Cloud), Nov. 2016, pp. 184– 189.
[6] Disease and symptoms Dataset –www.github.com.
[7] Heart disease Dataset-WWW.UCI Repository. com
[8] Ajinkya Kunjir, Harshal Sawant, Nuzhat F.Shaikh, "Data Mining and Visualization for prediction of Multiple Diseases in Healthcare," in IEEE big data analytics and computational intelligence, Oct 2017 pp.2325.
[9] Shanthi Mendis, Pekka Puska, Bo Norrving, World Health Organization (2011), Global Atlas on Cardiovascular Disease Prevention and Control, PP. 3–18. ISBN 978-92-4-156437-3.
[10] Amin, S.U.; Agarwal, K.; Beg, R., "Genetic neural network based data mining in prediction of heart disease using risk factors", IEEE Conference on Information & Communication Technologies (ICT), vol., no.,pp.1227-31,11- 12 April 2013.
[11] Palaniappan S, Awang R, "Intelligent heart disease prediction System using data mining techniques," IEEE/ACS International Conference on Computer Systems and Applications, AICCSA 2008., vol., no., pp.108115, March 31 2008-April 4 2008.
[12] Ghosh, S., Rana, A., & Kansal, V. (2020). A benchmarking framework using nonlinear manifold detection techniques for software defect prediction. International Journal of Computational Science and Engineering, 21(4), 593-614.
[13] Raghavendra, M. S., Chawla, P., & Rana, A. (2020, June). A survey of optimization algorithms for fog computing service placement. In 2020 8th international conference on reliability, infocom technologies and optimization (trends and future directions)(ICRITO) (pp. 259-262). IEEE.
[14] Gupta, S., Rana, A., & Kansal, V. (2020). Optimization in wireless sensor network using soft computing. In Proceedings of the Third International Conference on Computational

Intelligence and Informatics: ICCII 2018 (pp. 801-810). Springer Singapore.
[15] Kunwar, V., Agarwal, N., Rana, A., & Pandey, J. P. (2018). Load balancing in cloud—a systematic review. Big Data Analytics: Proceedings of CSI 2015, 583-593.
[16] Chawla, P., Chana, I., & Rana, A. (2015). A novel strategy for automatic test data generation using soft computing technique. Frontiers of Computer Science, 9, 346-363.
[17] Walia, H., Rana, A., & Kansal, V. (2017, September). A Naïve Bayes Approach for working on Gurmukhi Word Sense Disambiguation. In 2017 6th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO) (pp. 432-435). IEEE.
[18] Dash, Y., Dubey, S. K., & Rana, A. (2012). Maintainability prediction of object oriented software system by using artificial neural network approach. International Journal of Soft Computing and Engineering (IJSCE), 2(2), 420-423.
[19] Dubey, S. K., & Rana, A. (2010). A comprehensive assessment of object-oriented software systems using metrics approach. International Journal on Computer Science and Engineering, 2(8), 2726-2730.
[20] S. Gupta, A. Rana and V. Kansal, "Comparison of Heuristic techniques:A case of TSP," 2020 10th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2020, pp. 172-177, doi: 10.1109/Confluence47617.2020.9058211.
[21] Ghosh, S., Rana, A., & Kansal, V. (2018). A nonlinear manifold detection based model for software defect prediction. Procedia computer science, 132, 581-594.
[22] Chawla, P., Chana, I., & Rana, A. (2016). Cloud-based automatic test data generation framework. Journal of Computer and System Sciences, 82(5), 712-738.
[23] Bhardwaj, M., & Rana, A. (2016). Key Software Metrics and its Impact on each other for Software Development Projects. International Journal of Electrical & Computer Engineering (2088-8708), 6(1).
[24] Rana, A., & Sharma, S. (2016). Mechanism of sphingosine-1-phosphate induced cardioprotection against I/R injury in diabetic rat heart: Possible involvement of glycogen synthase kinase 3β and mitochondrial permeability transition pore. Clinical and Experimental Pharmacology and Physiology, 43(2), 166-173.
[25] G. Dubey, A. Rana and N. K. Shukla, "User reviews data analysis using opinion mining on web," 2015 International Conference on Futuristic Trends on Computational Analysis and Knowledge Management (ABLAZE), Greater Noida, India, 2015, pp. 603-612, doi: 10.1109/ABLAZE.2015.7154934.
[26] Ghosh, S., Rana, A., Kansal, V. (2017). Predicting Defect of Software System. In: Satapathy, S., Bhateja, V., Udgata, S., Pattnaik, P. (eds) Proceedings of the 5th International Conference on Frontiers in Intelligent Computing: Theory and Applications . Advances in Intelligent Systems and Computing, vol 516. Springer, Singapore. https://doi.org/10.1007/978-981-10-3156-4_6
[27] Sanjay Kumar Dubey, Ajay Rana, and Yajnaseni Dash. 2012. Maintainability prediction of object-oriented software system by multilayer perceptron model. SIGSOFT Softw. Eng. Notes 37, 5 (September 2012), 1–4. https://doi.org/10.1145/2347696.2347703
[28] S. Chawla, G. Dubey and A. Rana, "Product opinion mining using sentiment analysis on smartphone reviews," 2017 6th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), Noida, India, 2017, pp. 377-383, doi: 10.1109/ICRITO.2017.8342455.
[29] Dubey, S. K., Rana, A., & Sharma, A. (2012). Usability evaluation of object oriented software system using fuzzy logic approach. International Journal of Computer Applications, 43(19), 1-6.
[30] Saini, Rimmi, Sanjay Kumar Dubey, and Ajay Rana. "Analytical study of maintainability models for quality evaluation." Indian Journal of Computer Science and Engineering 2.3 (2011): 449-454.
[31] Ghosh, Soumi, Ajay Rana, and Vineet Kansal. "A statistical comparison for evaluating the effectiveness of linear and nonlinear manifold detection techniques for software defect prediction." International Journal of Advanced Intelligence Paradigms 12.3-4 (2019): 370-391.
[32] A. Singh, M. Chaudhary, A. Rana and G. Dubey, "Online Mining of data to generate association rule mining in large databases," 2011 International Conference on Recent Trends in Information Systems, Kolkata, India, 2011, pp. 126-131, doi: 10.1109/ReTIS.2011.6146853.
[33] N. Tyagi, A. Rana and V. Kansal, "Creating Elasticity with Enhanced Weighted Optimization Load Balancing Algorithm in Cloud Computing," 2019 Amity International Conference on Artificial Intelligence (AICAI), Dubai, United Arab Emirates, 2019, pp. 600-604, doi: 10.1109/AICAI.2019.8701375.
[34] Dubey, Sanjay Kumar, and Ajay Rana. "A fuzzy approach for evaluation of maintainability of object oriented software system." International Journal of Computer Applications 49.21 (2012).
[35] Bhavya Makkar, Ayush Kaushik, Bhanu P. Lohani, Vimal Bibhu, Pradeep K. Kushwaha, “Map Reduce concept-based Sentiment Analysis Approach,” International Journal of Computer Sciences and Engineering, Vol.7, Issue.4, pp.924-927, 2019.
[36] Srivastava, A.V., Lohani, B.P., Kushwaha, P.K., Tyagi, S. (2021). Dual-Layer Security and Access System to Prevent the Spread of COVID-19. In: Prateek, M., Singh, T.P., Choudhury, T., Pandey, H.M., Gia Nhu, N. (eds) Proceedings of International Conference on Machine Intelligence and Data Science Applications. Algorithms for Intelligent Systems. Springer, Singapore. https://doi.org/10.1007/978-981-33-4087-9_28.
[37] A. Bhatia, V. Bibhu, B. P. Lohani and P. K. Kushwaha, "An Application Framework for Quantum Computing using Artificial intelligence Techniques," 2020 Research, Innovation, Knowledge Management and Technology Application for Business Sustainability (INBUSH), Greater Noida, India, 2020, pp. 264-269, doi: 10.1109/INBUSH46973.2020.9392164.
[38] G. Gulati, B. P. Lohani and P. K. Kushwaha, "A Novel Application Of IoT In Empowering Women Safety Using GPS Tracking Module," 2020 Research, Innovation, Knowledge Management and Technology Application for Business Sustainability (INBUSH), Greater Noida, India, 2020, pp. 131-137, doi: 10.1109/INBUSH46973.2020.9392193.
[39] S. Suman, P. Kaushik, S. S. N. Challapalli, B. P. Lohani, P. Kushwaha and A. D. Gupta, "Commodity Price Prediction for making informed Decisions while trading using Long Short-Term Memory (LSTM) Algorithm," 2022 5th International Conference on Contemporary Computing and Informatics (IC3I), Uttar Pradesh, India, 2022, pp. 406-411, doi: 10.1109/IC3I56241.2022.10072626.
[40] M. Chandra, P. K. Kushwaha and S. Saxena, "Modified Fractal Carpets," 2011 International Conference on Computational Intelligence and Communication Networks, Gwalior, India, 2011, pp. 537-540, doi: 10.1109/CICN.2011.115.
[41] Bibhu, P. K. Kushwaha, R. Kohli and D. Singh, "Secret key watermarking in WAV audio file in perceptual domain," 2015 International Conference on Futuristic Trends on Computational Analysis and Knowledge Management (ABLAZE), Greater

Noida, India, 2015, pp. 629-634, doi: 10.1109/ABLAZE.2015.7154940.

[42] V. Bibhu, A. Kumar, B. P. Lohani and P. K. Kushwaha, "Black Hole Attack in Mobile Ad Hoc Network and its Avoidance," 2021 International Conference on Innovative Practices in Technology and Management (ICIPTM), Noida, India, 2021, pp. 103-107, doi: 10.1109/ICIPTM52218.2021.9388366.

[43] S. Singh, D. Chaudhary, A. D. Gupta, B. Prakash Lohani, P. K. Kushwaha and V. Bibhu, "Artificial Intelligence, Cognitive Robotics and Nature of Consciousness," 2022 3rd International Conference on Intelligent Engineering and Management (ICIEM), London, United Kingdom, 2022, pp. 447-454, doi: 10.1109/ICIEM54221.2022.9853081.

[44] A. Khurana, B. P. Lohani, V. Bibhu and P. K. Kushwaha, "An AI Integrated Face Detection System for Biometric Attendance Management," 2021 2nd International Conference on Intelligent Engineering and Management (ICIEM), London, United Kingdom, 2021, pp. 29-33, doi: 10.1109/ICIEM51511.2021.9445295.

[45] Ranjan, A.A., Rai, A., Haque, S., Lohani, B.P. and Kushwaha, P.K., “An approach for Netflix recommendation system using singular value decomposition,” Journal of Computer and Mathematical Sciences, 2019, 10(4), pp.774-779.

[46] V. Bibhu, A. Kumar, B. P. Lohani and P. K. Kushwaha, "Robust Secured Framework for Online Business Transactions over Public Network," 2021 2nd International Conference on Intelligent Engineering and Management (ICIEM), London, United Kingdom, 2021, pp. 555-560, doi: 10.1109/ICIEM51511.2021.9445380.

[47] D. Pareta, I. N. Verma, B. P. Lohani, P. K. Kushwaha and V. Bibhu, "IoT Enabled Smart and Efficient Musical Water Fountain," 2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM), Gautam Buddha Nagar, India, 2022, pp. 369-373, doi: 10.1109/ICIPTM54933.2022.9754129.

[48] V. Bibhu, P. K. Kushwaha and B. P. Lohani, "A review of security of the cloud computing over business with implementation," 2016 International Conference on Innovation and Challenges in Cyber Security (ICICCS-INBUSH), Greater Noida, India, 2016, pp. 192-198, doi: 10.1109/ICICCS.2016.7542342.

[49] B. P. Lohani, M. Trivedi, R. J. Singh, V. Bibhu, S. Ranjan and P. K. Kushwaha, "Machine Learning Based Model for Prediction of Loan Approval," 2022 3rd International Conference on Intelligent Engineering and Management (ICIEM), London, United Kingdom, 2022, pp. 465-470, doi: 10.1109/ICIEM54221.2022.9853160.

[50] B. P. Lohani, M. Trivedi, R. J. Singh, V. Bibhu, S. Ranjan and P. K. Kushwaha, "Machine Learning Based Model for Prediction of Loan Approval," 2022 3rd International Conference on Intelligent Engineering and Management (ICIEM), London, United Kingdom, 2022, pp. 465-470, doi: 10.1109/ICIEM54221.2022.9853160.

[51] V. Bibhu, S. Salagrama, B. P. Lohani and P. K. Kushwaha, "An Analytical Survey of User Privacy on Social Media Platform," 2021 International Conference on Technological Advancements and Innovations (ICTAI), Tashkent, Uzbekistan, 2021, pp. 173-176, doi: 10.1109/ICTAI53825.2021.9673402.

[52] P. K. Kushwaha and M. Kumaresan, "Machine learning algorithm in healthcare system: A Review," 2021 International Conference on Technological Advancements and Innovations (ICTAI), Tashkent, Uzbekistan, 2021, pp. 478-481, doi: 10.1109/ICTAI53825.2021.9673220.