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EMPIRICAL EVALUATION IN DATA MINING IN ASSOCIATION WITH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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ABSTRACT

Data analysis and decision-making have undergone a dramatic revolutionize as a consequence of modern improvements in data mining, which are driven by Artificial Intelligence, Machine Learning, and Deep Learning. Artificial Intelligence and Machine Learning approaches are increasingly being used to supplement and improve traditional data mining techniques as the dimensions and involvedness of information persist to increase. With an emphasis on advancements generated by AI and ML, this article examines the most recent research trends in data mining. The usage of Auto-ML to automate machine learning processes, Federated Learning for privacy-preserving data mining, and Explainable AI (XAI) to increase model transparency are important areas of study. More dynamic and scalable solutions are also being made possible by the combination of multimodal data mining, graph-based algorithms, and real-time analytics at the edge. In response to ethical concerns about AI-driven decision-making systems, efforts to reduce bias, maintain justice, and protect privacy have also gained traction. More precise, scalable, and effective solutions are becoming possible in a variety of segments, such as healthiness care, economics, and security, thanks to the convergence of Artificial Intelligence, Machine Learning, along with data mining. Future studies will probably concentrate on resolving issues with explainability, privacy, and processing more complicated, unstructured data as these technologies develop further. This research paper provides an indication of these budding trends and discusses the impending directions for expectations research in the sector of information mining in perspective of AI and ML.

INTRODUCTION

Finding patterns, connections, and valuable information in massive databases via computational methods is known as data mining. It entails taking raw data and turning it into intelligible structures by identifying hidden, previously undiscovered patterns. When combined with ML furthermore AI, information mining becomes an effective technique for drawing insightful conclusions from vast volumes of data. AI and ML improve data mining skills and automate the discovery process.

Key Concepts in Data Mining with AI and ML including:

- ***Data Preprocessing:*** The data must be cleansed, converted, and arranged before any machine learning or artificial intelligence algorithms are applied. In order to improve model performance, this stage may involve addressing missing values, eliminating outliers, normalizing data, and feature selection.
- ***Data Exploration:*** Data scientists investigate the dataset at this point in order to comprehend its distribution, structure, and interrelationships. Data analysis and the selection of suitable modeling strategies are frequently guided by statistical tools and visualizations.
- ***Organized Learning:*** A sort of ML called organized learning utilizes marked as data—that is, data with known results—to train a model. The algorithm uses input-output pairs to learn how to predict or categorize. Typical algorithms for supervised learning include: For the purpose of forecasting continuous values, linear regression Decision trees and random forests are used for both classification and regression jobs, logistic regression is used for binary classification issues, and support vector machines (SVM) are used for both classification and regression activities.
- ***Unorganized Learning:*** In unorganized learning, the representation attempts to identify patterns or groups in unlabeled data. Typical methods include: Association Rule Learning: Identifying correlations or relationships between variables in large datasets (e.g., Apriori algorithm); Clustering: Assembling similar data points together (e.g., K-Means, DBSCAN); and Dimensionality Reduction: Reducing the number of variables in a dataset while preserving its structure (e.g., PCA – Principal Component Analysis).
- ***Reinforcement Learning:*** In this kind of ML, a representative gains decision-making skill set throughout interface with its environment. During incentives or

penalties, the agent gets input and modifies its behavior to optimize the total reward. This method is frequently applied to optimization jobs, robotics, and gaming.

- ***Deep Learning***: The term "deep" refers to a detachment of ML called "deep learning," which models intricate patterns using multi-layered artificial neural networks. The CNNs are utilized for picture appreciation, persistent neural networks, and transformers, are utilized for natural verbal communication dispensation, verbal communication identification, and other applications.
- ***Evaluation and Model Selection:*** Depending on the profession, a model's concert must be reviewed utilizing a variety of measures, such as accurateness, exactitude, recollect, F1-score, or indicate squared blunder. To fine-tune models for best performance, cross-validation and hyper parameter tweaking are frequently employed.

Among the uses of AI and ML in data mining are: Customer Segmentation: To enable more focused marketing tactics, companies employ data mining to divide their clientele into discrete categories. Fraud Detection: To find odd transaction patterns and spot fraudulent behavior, banks and other financial organizations employ data mining. Recommendation Systems: To make product or content recommendations, e-commerce websites and streaming services like Netflix and Amazon utilize recommendation systems that analyze user behavior and preferences. Healthcare: By identifying patterns in medical data, data mining techniques are used in the healthcare industry to forecast patient outcomes, identify possible disease outbreaks, and aid in diagnosis. Predictive analytics is a tool used by organizations to estimate future trends by analyzing previous data. This is widespread in fields such as economics, trade, and industrialized things.

How we handle, examine, and draw conclusions from massive information has been completely transformed by the incorporation of Artificial Intelligence, ML, and information mining. Businesses along with organizations may better comprehend their data, make more informed decisions, and increase efficiency by utilizing strong algorithms and cutting-edge computational methodologies. The importance of AI and ML in data mining for fostering innovation and gaining a competitive edge across sectors will only increase as data volume and complexity continue to rise.

An introduction to data mining using AI and ML, including its salient characteristics and several application-related ideas, is given in the first portion of this research paper. A list of the several active studies that combine data mining with AI is provided in the second part. Debates and suggestions on current research concepts in several fields are covered in the third section. The fourth section, the conclusion, discusses data mining with AI and ML terms of potential furthermore expectations.

Review of Related Literature

Goel.et.al. The necessity for precise and effective illness diagnosis, treatment planning, and patient care has made classification techniques in the healthcare industry more and more significant. Decision trees, logistic deterioration, and SVM are illustrations of supervised knowledge algorithms that are used for illness diagnosis, patient outcome prediction, and risk factor identification. Radiology and pathology are two fields that employ classification algorithms for picture recognition and analysis. Using a collection of characteristics, classification is a supervised learning approach that predicts an instance's class or category. The application of classification algorithms in data mining for healthcare applications is investigated in this paper. Applying categorization algorithms like Naive Bayes, Random Forest, in addition to Logistic Regression to healthcare datasets and assessing their effectiveness is the aim of this research. Unwearied information likely demographics, medicinal narration, along with diagnosis are among the datasets used in this study. According to the results, categorization methods may be useful in data mining for medical applications, allowing medical practitioners to use patient data to make better judgments.

Saberi.et.al. To ascertain the associations flanked by variables from a sizable illustration of information, data mining entails applying the mathematical sciences, statistics, AI along with ML. Information mining has been demonstrated to increase the accuracy of category 2 diabetes mellitus diagnosis and prediction. The minority researches have used ML to improve the evaluation of cardiovascular disease risk and evaluate biomarkers linked to metabolic syndrome and hypertension. In order to forecast the onset of chronic kidney disease, the course of the illness, and the survival of renal grafts, ML techniques have also been used to evaluate novel biomarkers and continued existence conclusions in patients with renal disorders. In the latter, the most effective strategies for predicting chronic renal disease were random forest techniques. Using decision tree models, several researches have looked at the prediction of sensitive liver malfunction and nonalcoholic fatty liver disease as well as the prediction of curative reaction in patients with viral illnesses. Alzheimer's disease has been diagnosed using machine learning methods like the Sparse High-Order communication representation with denunciation preference. In order to identify and forecast the superiority of existence of patients suffering from severe mental illnesses like dementia and depression, information mining methods have also been used to determine the threat causes for these conditions. Studies on child health have identified the most effective algorithms for forecasting malnutrition and obesity. The key threat causes for low confinement weight and premature birth have been identified using machine learning. There aren't many published studies of cancer patients with bacterial illnesses, which may need to be covered in greater detail in further research. Here, we describe the probable uses of information mining techniques in experimental identification by offering a thorough assessment of studies where biochemical biomarker information was processed using ML techniques to evaluate the menace of a number of prevalent illnesses. Clinical diagnostics has recently seen a rise in the use of data mining techniques, which might help this area.

Cai.et.al. Engineering education throughout the world has enormous challenges in terms of career development and education in the contemporary digital era. Cloud services technology has changed the educational landscape by allowing administrators and teachers to go to the actions. In order to promote future growth and start skill-set improvement courses through e-learning, this research proposes a multiple medium aided MSLS. This suggested method assesses learners' academic/skill data to categorize their profession potential at an early stage of commencement. The rise of database industry advances in data processing research, and commercial needs for techniques that can extract valuable information from large data stores are all factors contributing to the speedy progress of advanced research obedience of ML and information mining. Furthermore, a useful technique is proposed for skill set evaluation in order to identify various student groups that are deficient in the relevant skill set. E-learning can give the expected student groups the chance to improve the necessary skill set. The results indicate that by putting the new engineering education system into practice, more important decisions can improve overall educational progress and job prospects.

Xiaoling.et.al. The need for innovative analytical techniques beyond the conventional statistical procedures to extract new knowledge from the data mine gave rise to the multidisciplinary fields of knowledge discovery and data mining. This emergent method is a dialectic, inductive, and deductive research procedure. In order to address causal heterogeneity and enhance prediction, the data mining technique automatically or semi-automatically takes into account a greater number of joint, interacting, and independent predictors. It enhances model goodness of fit, uncovers legitimate and significant hidden patterns in data, detects nonlinear and non-additive effects, offers insights into data developments, methods, and theory, and advances scientific discovery—all without undermining the traditional model-building approach. In situations when the explicit model structure is unknown and it is challenging to develop algorithms with excellent performance, machine learning creates models and algorithms by learning and improving from data. The latest advancement is combining this new predictive modeling paradigm with the traditional

parameter estimate regression technique to create better models that integrate prediction and explanation.

Xinlei.et.al. Numerous researches have looked into the utilization of information mining and ML algorithms to improve BEM as a result of recent developments in the IoT and information science methodologies. Different DM and ML algorithm classes, however, have unique functions and performances in BEM due to their varied methods and capacities. To encourage their widespread use and offer direction for new subject areas, it is crucial that various DM and ML algorithm categories be appropriately integrated into BEM. The employment of DM and ML algorithms in important BEM domains, such as demand flexibility optimization, energy use prediction, and building performance evaluation, is reviewed in this work. Organized DM, unorganized DM, and strengthening learning are the three primary categories into which the review divides DM and ML approaches. While supervised approaches are largely utilized for energy use prediction and building performance benchmarking, unsupervised techniques are mostly used for evaluating the energy performance of buildings. In order to increase interior thermal comfort, demand flexibility, and efficiency, RL has been used for effective construction manage. Along with some recommendations for further study in this area, the advantages, disadvantages, and incorporation of various approaches in stipulations of their appliance in BEM are examined.

Rajeswari.et.al. The area of data mining is very new and expanding quickly. Among the fields that provide concepts and resources are statistics, database research, machine learning, high-performance computing, and commerce. This explains why the field of data mining is so dynamic, varied, and rapidly changing. Data mining techniques are used to find patterns, structure, regularities, and singularities in large and growing data sets. Data mining, to put it simply, is the process of identifying hidden patterns in data from different viewpoints in order to classify it into useful information that is gathered and compiled in particular areas like data warehouses, effective analysis, data mining algorithms, supporting decision making, and other data requirements, which eventually leads to cost reduction and revenue generation. The technique of automatically searching through vast volumes of data for patterns and trends that transcend basic analysis is known as data mining. Data mining uses sophisticated mathematical methods for data segments to estimate the likelihood of future events. Data knowledge discovery (KDD) is another name for information mining. All of the employment might be finished faster and cheaper by outsourcing data mining. Additionally, specialized companies can use modern expertise to obtain information that would be hard to find physically otherwise. Despite the abundance of content on many platforms, there remains a lack of specialized knowledge.

The science of creating intelligent robots is known as artificial intelligence. Because of their capacity for human-like thinking and decision-making, these computers are known as intelligent. The study of creating intelligent machines that can carry out human-like activities is known as artificial intelligence. It has specifically built control mechanisms rather of relying on learning or feedback. AI systems solve problems on their own by doing calculations. Data mining is a technique used by AI systems to generate solutions from mined data. Data mining is the cornerstone of artificial intelligence. A subset of computer codes known as data mining contains the information desirable by AI machines. One essential component of artificial intelligence is machine learning. This designates that ML algorithms provide the establishment of AI's intellectual performance. If a computer performs as predicted and the error decreases over time, it is said to have learned from the work.

Martin.et.al. New requirements for inspecting and controlling the learned models arose from the increasing number of ML and information mining applications in a variety of fields, including business, teaching, industrial production, medical, and agriculture. (XAI) is a relatively young sector of study that focuses heavily on post-hoc techniques for black box models. An alternate approach that has been contemplated is the utilization of interpretable machine learning techniques, in which white-box models are developed. White-box models are explicit representations of information that usually come from rule-learning techniques, whereas black-box models are classified as embodying implicit knowledge that usually results from arithmetical and neural advances of ML. The authors of this preamble to the extraordinary subject on "Explainable and Interpretable Machine Learning and Data Mining" suggest combining the two viewpoints by highlighting their similarities and going over potential integration strategies. Explainability in AI systems is a long-standing problem that has already been studied in relation to expert systems. Here, research has largely focused on verbal and rule-based explanations. Deep learning has led to an ever-expanding array of XAI techniques, ranging from contrastive explanations to feature relevance. Numerous taxonomies have been developed to categorize the various techniques since they are so diverse.

Iqbal .et.al. In the current Fourth Industrial Revolution (4IR or Industry 4.0), data from the Internet of Things (IoT), cyber security, mobile, business, social media, and health are all widely available in the digital world. To analyze these data effectively and develop the corresponding intelligent and automated applications, one must have a solid understanding of artificial intelligence (AI), specifically machine learning (ML). The area of machine learning encompasses a wide variety of algorithms, such as reinforcement learning, supervised, unsupervised, and semi-supervised. Furthermore, deep learning, which is a subset of a broader family of machine learning algorithms, can analyze enormous amounts of data intelligently. The author of this research study paper offers a methodical analysis of various ML techniques that may be utilized to progress an application's intelligence and capabilities. Explaining the rudiments of multiple ML advances and their suitability for use in a range of real-world appliance areas, together with cyber security machines, stylish cities, health care, e-commerce, cultivation, and etc., is therefore this study's primary contribution. On the basis of our investigation, we also point out the difficulties and possible lines of inquiry. The generally objective of this editorial is to be a resource for experts in academia and industry, as well as for decision-makers in a multiplicity of real-world circumstances and relevance sectors, especially from a technical standpoint.

For a machine learning model to succeed, both the data and the efficiency of the learning algorithms are required. The collected real-world data and application-specific knowledge must be used to teach the advanced learning algorithms before the system can assist intelligent decision-making. We also discussed several well-known application areas to illustrate how machine learning methods might be used to solve various real-world issues. We have wrapped up by reviewing and discussing the challenges faced as well as potential directions for further research and advancement in the area. As a result, the aforementioned problems provide important research questions that need to be addressed in a number of application domains.

Andre.et.al. With the emergence of artificial intelligence (AI) technology and their wide range of applications in higher education, teaching, learning, and administrative procedures are currently undergoing significant change. As a result, there was an increase in both general and focused scientific interest in the subject. However, there isn't a systematic review of AI in higher education that enables the identification of key research issues and trends, the concretization of oddities, and the development of suggestions for more action. This research aims to close this gap by organizing the current scholarly discussion on artificial intelligence in higher education administration and instruction. This analysis found disparities in cross-national research activity, a lack of interdisciplinary research, an imbalance in disciplines, ignored research subjects and routes, and an imbalance in research on AI in educational and administrative contexts. This contributes to research by comparing the use of AI in teaching and learning processes and administration, organizing the current status of the field, identifying research gaps, and suggesting future directions for AI in higher education.

To guarantee a representative coverage of the current research disciplines, a broad search query was created. The search query

incorporates keywords from the domains of higher education, teaching, and administration, as well as other terms from the fields of AI and ML. The Web of Science Core Collection database, which includes numerous papers from several academic topics as well as a range of highly regarded journals and conferences pertinent to the domains of AI and processes in HEI, was utilized for the query. When we were inquiring, we focused on the fields of mathematics, business, education, engineering, social science, and psychology. The literature on AI in HEI teaching and administrative procedures was bibliometrically analyzed. Future research directions were developed based on this. This analysis found disparities in cross-national research activity, neglected research subjects and routes, an imbalance in fields and a lack of interdisciplinary research, and an imbalance in research on AI in educational and administrative contexts. In particular, it reveals that the teaching component is the focus of AI research in the EdTech environment at HEI. Less than a tenth of the outputs of AI in instructional procedures are found in administrative operations. This could be a good representation of the HEI's personnel and spending ratio in these areas. However, considering AI's promise in areas like learner profiling, tracking trends in student performance, and course staffing, the two fields must also be viewed entirely independently. There are several restrictions on this study. First, the results are limited since WoS is the only database used for data extraction. It is standard practice to choose a restricted emphasis, which is in line with contemporary research.

Lai.et.al. The demand for data information processing has been growing daily in recent years owing to the explosive growth of dissimilar category of information. As a result, ML and information mining technologies have become increasingly popular in all spheres of life. The utilize of information mining technologies in ML intelligent systems is the primary focus of this research. By concealing a connection between neurons, the new learning framework we provide in this study for short and long temporal memory networks (LSTM) seems to be a link between various doctor types. In order to provide individualized care, the model additionally integrates hidden states with static variables like age and gender via the entire connection layer. The suggested approach outperforms competing algorithms in tests conducted on real-world datasets.

Dan.et.al. This paper's main goal is to do a thorough examination of an enterprise business big data mining system that is based on ML. First, the context, importance, and goals of the study are presented in the introductory section. Second, we give a summary of the core ideas of ML and information mining, including ML algorithms along with information mining techniques. In particular, we go over ML procedures like the Naive Bayes procedure and the K-nearest neighbors approach, as well as data mining techniques like the Apriori algorithm, clustering algorithm, and decision tree. We also present the fundamentals and uses of Hadoop, a platform for massive data processing. The enterprise big data mining system's design and deployment are then covered. Lastly, we test the big data mining solution for enterprises. The introduction of experimental data, the experimental environment, parameter settings, and particular experimental processes and procedures are all covered in detail in this presentation of the experimental process. We also do analysis and assessment and present the experimental outcomes. This paper's study attempts to give businesses useful advice and real-world experience in the area of business big data mining, encouraging intelligent and accurate decision-making and boosting the competitive edge and healthy growth of companies.

DISCUSSION

Recent developments in data mining research, especially as they relate to AI, ML, and DL, show how sophisticated methods are increasingly being integrated into a diverse range of fields. Enhancing data analysis quality, forecast accuracy, efficiency, and application variety are the main goals of these developments. Some of the main areas where these technologies are developing and merging are listed below:

Explainable AI (XAI) in Data Mining: As machine learning and deep learning models become more complex, there is an increasing emphasis on explainability and interpretability. The trend of Explainable AI aims to make AI models more transparent by providing clear reasoning behind their predictions and decisions. In critical areas such as healthcare, finance, and law enforcement, ensuring that AI-driven data mining results can be easily understood by humans is crucial for trust and accountability. ***Research section***: Development of methods for interpreting black-box models (such as decision trees, rule-based systems, and attention mechanisms in neural networks) has gained attention.

Auto-ML (Automated Machine Learning) for Data Mining: Auto-ML spotlight on mechanize the procedure of applying ML to real-world issues. It is revolutionizing data mining by simplifying the workflow of model selection, hyper parameter tuning, and feature engineering. It enables non-experts to leverage ML and deep knowledge models for information mining tasks. ***Research section***: Efforts are being made to progress the effectiveness, scalability, and accuracy of Auto-ML systems. Techniques such as neural architecture search (NAS) are helping in automating the design of neural networks.

Graph-Based Data Mining: With the rise of complex data types such as social networks, biological networks, and recommendation systems, graph-based data mining has become crucial. Graph algorithms are used to mine patterns in data that exhibit interrelationships, such as nodes and edges in a graph. Examples include fraud detection, social network analysis, and drug discovery. ***Research section***: The focus is on developing scalable algorithms for graph analysis and integrating graph-based data mining with AI/ML models, especially using deep learning techniques like graph neural networks (GNNs).

Federated Learning in Data Mining: Federated learning allows data mining methods to be educated transversely multiple decentralized servers, exclusive of requires sharing raw information. This addresses solitude concerns whilst still benefiting from large-scale data for training. It is increasingly applied in areas like healthcare (predicting patient outcomes from medical data), finance (fraud detection), and mobile applications (personalized recommendations). ***Research section***: Improvements in federated learning focus on dealing with challenges such as data heterogeneity, communication efficiency, and ensuring fairness across participants.

Transfer Learning and Meta-Learning for Data Mining: Transfer learning and meta-learning aim to progress the presentation of methods when there is incomplete labeled information available. These methods allow a model trained on one task to be adapted for a different, but related task. In situations, where obtaining huge quantity of labeled information is costly or protracted such as in medicinal imaging otherwise remote sensing, these techniques are highly beneficial. ***Research section***: Researchers are exploring ways to make transfer learning more effective across domains and minimizing the need for large datasets.

Edge Computing and Real-Time Information Mining: The combination of edge computing in addition to AI/ML is enabling real-time data mining in gadgets such as elegant phones, IoT gadgets, and autonomous vehicles. Edging computing tolerates for practical analytics in appliance such as predictive maintenance, ecological scrutinize, and elegant cities. ***Research section***: Techniques that optimize models for limited computational resources at the edge, such as model compression and efficient neural networks, are gaining prominence.

Anomaly Detection in Big Data: Anomaly detection is crucial for identifying rare patterns in large datasets. With the growth of big data and the increasing complexity of systems, anomaly detection using AI/ML has become more sophisticated. Used for fraud detection, network security, and identifying outliers in healthcare or industrial systems. ***Research section***: Hybrid models that combine traditional statistical techniques with machine learning, such as semi-supervised or unsupervised anomaly detection, are being developed to improve detection in dynamic environments.

Data Mining for Privacy-Safeguard ML: The need to guarantee data solitude and compliance with regulations like GDPR is

driving research into privacy-preserving techniques for data mining. Procedures like discrepancy isolation, homomorphic based encrypt concept, and protected multi-party working out are being practical to ensure that models can be trained without violating user privacy. ***Research section***: Developing scalable privacy-preserving algorithms that balance model performance and privacy is a critical area of research.

Multimodal Data Mining with Deep Learning: Multimodal data mining combines different categories of information, including wording, pictures, with sensor data, toward provide a more holistic view of information. This is used in areas like healthcare (combining patient records with medical images), autonomous driving (sensor fusion), and e-commerce (combining product reviews with images). ***Research section***: Multi-task learning and deep fusion models that can jointly process heterogeneous data are being actively explored.

Bias Mitigation in Data Mining: With increasing awareness of algorithmic bias, there is significant research focused on identifying and mitigating bias in AI/ML models, especially in sensitive applications like criminal justice, hiring, and loan approvals. Ensuring fairness in data mining systems is crucial for avoiding discrimination and improving equity in decision-making processes. ***Research section***: New techniques are being developed to reduce bias in data collection, feature selection, and model development. Fairness-aware learning algorithms are gaining traction.

Quantum Machine Learning and Data Mining: Quantum computing is making inroads into machine learning and data mining, with the potential to solve problems that are computationally expensive for classical computers. Quantum machine learning techniques are being explored for optimizing large-scale data mining tasks, especially in drug discovery, cryptography, and complex pattern recognition. ***Research section***: Quantum procedural activities, such as quantum SVM and quantum clustering, are being studied for their potential to speed up data mining tasks.

The integration of AI, ML, and DL into data mining is driving significant advancements in how data is processed, analyzed, and applied. The key trends are focused on improving model transparency, scalability, efficiency, and ensuring that these models are ethical and accessible. As these fields continue to evolve, new methodologies and applications are expected to emerge, further transforming industries and societies.

CONCLUSION

The field of data analytics is experience the significant renovation due to the union of data mining, AI, ML, and DL. When these expertises are combined, data mining procedures become more precise, scalable, and effective, allowing for the mining of significant imminent from outsized and intricate information sets. The developments discussed in the preceding section show that AI and ML are not only making data mining jobs faster and more accurate, but they are also making it possible to explore new data sources and applications that were previously unfeasible or difficult to manage.

Important viewpoints consist of: Enhanced Efficiency: By automating intricate processes like feature selection, model construction, and data pretreatment, AI and ML algorithms raise the in general efficiency of data mining. Improved DM: Organizations in a assortment of segments, together with manufacturing, health related care takers, furthermore finance, may make more informed decisions by utilizing sophisticated predictive modeling and anomaly detection. Resolving Issues: In order for AI-driven data mining systems to be ethically implemented, current research is concentrated on resolving the issues of model explainability, privacy, fairness, and bias. Multimodal and Real-Time Data: Data mining is developing to enable real-time analytics and manage multimodal data, such as text, pictures, and sensor data, allowing for more dynamic and adaptable systems.

Research on AI-driven data mining for unstructured data, explainable AI (XAI) in data mining, bias detection and fairness in data mining, federated learning and privacy-preserving data mining, quantum computing for data mining, deep learning for complex data mining tasks, real-time data mining and edge computing, integrating multimodal data for holistic insights, and data mining for sustainability and climate change are some of the topics covered in the future.

With ongoing innovation positioned to address present issues and go into new fields, the future of data mining in conjunction with AI, ML, and DL appears incredibly bright. The goal of the current study will be to develop more ethical, scalable, and effective systems that may be used to tackle more challenging real-world issues. Data mining will continue to develop as artificial intelligence (AI) permeates every aspect of society, offering deeper insights and promoting more intelligent decision-making in industries like healthcare, banking, transportation, and more.

REFERENCES

- Mr. J. Sivakumar Swamy, Mrs. M. Usha Sandhya, Dr. Kamma Ramanjaneylu, “Emerging Trends in Artificial Intelligence (AI) and Machine Learning (Ml)”, International Journal for Multidisciplinary Research, Vol. 06, No. 04, July-August 2024, pp. 01 – 09.
- Shangran Li, “Research on Data Mining Technology Based on Machine Learning Algorithm”, IOP Conference Series: Journal of Physics: Conference Series Vol.1168, 032132, 2019, pp. 01 - 08.
- Teng Xiuyi, Gong Yuxia, “Research on Application of Machine Learning in Data Mining”, IOP Conference. Series: Materials Science and Engineering Vol. 392, 062202, 2018, pp. 01 - 04.
- R. Hegde, A. G. V, S. Madival, S. H. S and S. U, "A Review on Data Mining and Machine Learning Methods for Student Scholarship Prediction," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2021, pp. 923-927.
- Y. Li, "Practice of Machine Learning Algorithm in Data Mining Field," 2020 International Conference on Advance in Ambient Computing and Intelligence (ICAACI), Ottawa, ON, Canada, 2020, pp. 56-59.
- D. Yang, "Data Mining Algorithm Data Model Data Analysis Based on Artificial Intelligence Technology," 2022 IEEE 2nd International Conference on Mobile Networks and Wireless Communications (ICMNWC), Tumkur, Karnataka, India, 2022, pp. 1-4.
- H. Goel and D. Kumar, "Data Mining in Healthcare using Machine Learning Techniques," 2023 International Conference on Sustainable Computing and Smart Systems (ICSCSS), Coimbatore, India, 2023, pp. 25-29.
- Saberi-Karimian, M., Khorasanchi, Z., Ghazizadeh, H., Tayefi, M., Saffar, S., Ferns, G. A., & Ghayour-Mobarhan, M. (2021). Potential value and impact of data mining and machine learning in clinical diagnostics. Critical Reviews in Clinical Laboratory Sciences, 58(4), 275–296.
- Cai Yinying, Juan Li, Bo Wang, “Data Mining Techniques and Machine Learning Algorithms in the Multimedia System to Enhance Engineering Education”, ACM Transactions on Asian and Low-Resource Language Information Processing, Volume 21, Issue 6, 112, 2022, Pages 1 - 21.
- Kumar, E. Boopathi, and M. Sundaresan. "Edge detection using trapezoidal membership function based on fuzzy's mamdani inference system." 2014 International Conference on Computing for Sustainable Global Development (INDIACom). IEEE, 2014.
- Xiaoling Shu, Yiwan Ye, “Knowledge Discovery: Methods from data mining and machine learning”, Elsevier Social Science Research, Vol.110, 102817, 2023, pp. 01 - 16.
- Xinlei Zhou a , Han Du a , Shan Xue b , Zhenjun Ma, “Recent advances in data mining and machine learning for enhanced building energy management”, Elsevier Energy, Vol.307, 132636, 2024, pp. 01 - 18.
- Rajeswari J, Sasikala B, “Research on Application of Artificial Intelligence in Data Mining”, International Journal of Current Advanced Research, Volume 11; Issue 04 (A); April 2022, pp. 588-591.
- Prakash, G., P. Logapriya, and A. Sowmiya. "Smart Parking System Using Arduino and Sensors." *NATURALISTA CAMPANO* 28 (2024): 2903-2911.

- Martin Atzmueller, Johannes Fürnkranz, TomasKliegr, Ute Schmid, “Explainable and interpretable machine learning and data mining”, Data Mining and Knowledge Discovery, Vol.3, 2024, pp.2571–2595.
- Renukadevi, R. et al. “An Improved Collaborative User Product Recommendation System Using Computational Intelligence with Association Rules.” Communications on Applied Nonlinear Analysis (2024): n. pag. https://doi.org/10.52783/cana.v31.1243
- Iqbal H. Sarker, “Machine Learning: Algorithms, Real-World Applications and Research Directions”, SN Computer Science, Vol.02, No.160, 2021, pp. 01 - 21.
- Andre Ullrich, Gergana Vladova, Felix Eigelshoven, Andre Renz, “Data mining of scientifc research on artifcial intelligence in teaching and administration in higher education institutions: a bibliometrics analysis and recommendation for future research”, Discover Artificial Intelligence, Vol.02, No.16, 2022, pp. 01 - 18.
- Ashfauk Ahamed A.K.,Manogar E.,Jeevitha S.,Sujithra L. R., Boopathi Kumar E, (2024) Prediction Of The Growing Stock In Stock Market On Analysis Of The Opinions Using Sentiment Lexicon Extraction And Deep Learning Architectures. Frontiers in Health Informatics, 13 (3), 1382-1392.
- Y. Lai, "Application of Data Mining Technology in Intelligent System of Machine Learning," 2022 Second International Conference on Advanced Technologies in Intelligent Control, Environment, Computing & Communication Engineering (ICATIECE), Bangalore, India, 2022, pp. 1-4.
- L. Dan, "Analysis of Machine Learning Based Big Data Mining System for Enterprise Businesses," 2023 5th International Conference on Machine Learning, Big Data and Business Intelligence (MLBDBI), Hangzhou, China, 2023, pp. 164-168.