| RESEARCH ARTICLE

A Comprehensive Exploration of Outlier Detection in Unstructured Data for Enhanced Business Intelligence Using Machine Learning

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| **ABSTRACT**

Due to the rapid growth of online data, it is evident that social informatics faces a significant obstacle. The task of effectively utilizing this abundance of information for business intelligence purposes and extracting valuable insights from it across diverse and heterogeneous platforms presents a daunting challenge. Coordinating AI with business knowledge stands apart as an essential worry in the ongoing scene. Customarily, exceptions were many times excused as boisterous information, bringing about the deficiency of relevant data. This paper highlights the need to rethink how outliers are handled and shed light on the primary research challenges in this mining subfield. It presents a thorough scientific categorization of different Business Knowledge strategies and diagrams their ongoing application areas. Also, the paper talks about future exploration bearings and proposals to overcome any barrier concerning oddities in information examination, consequently empowering more successful business methodologies. This work plans to improve the usage of tremendous web-based information hotspots for better business insight results.

1. Introduction

Applications of modern technology are rapidly producing an enormous amount of data. The significance of uncovering hidden designs inside this inescapable information and using it for business knowledge couldn't possibly be more significant. A crucial part of this endeavor is Data Mining, the process of finding patterns in pre-existing databases. What's in store is expected to depend vigorously on friendly informatics as the essential data hotspot for the impending age. Detecting outliers within a dataset is an important part of data cleansing, which is part of the data preprocessing phase of data mining. This is an active research area that ensures data integrity against anomalies for subsequent mining phases. The information blast represents a test in removing significant experiences and gaining information utilizing ordinary calculations because of the rising intricacy of examination. The sheer extent and dynamic nature of expected arrangements, combined with the complexity of calculations, make recognizing the ideal arrangement progressively tested. In the domain of examination, Authoritative Information Mining (ODM) is comprehensively recognized as the utilization of AI and information mining devices to further develop dynamics inside an association. The ability

of this particular tool to transform data into knowledge that can be used in practical ways gives it a competitive advantage. An exception, then again, alludes to a perception that essentially contrasts with different perceptions to the degree that it raises doubts about being created by an unmistakable component.

The IBM report features the need to utilize Business Insight (BI) scientific methods for a coordinated demonstrating and occasion-based climate. The design of the paper is coordinated as follows: The ensuing segment dives into central models across different datasets, enveloping exception classifications and their significance in various business application spaces. After that, the steps involved in organizational data mining are explained in Section 4, which provides an overview of the fundamental ideas behind machine learning. Segment 5 frameworks the recorded outcomes and perceptions, including a similar investigation of chosen papers. At long last, Segment 6 finishes up the paper and frameworks the course for future examinations. The examination draws upon various sources, for example, refereed research papers, propositions, sites, and so on, to offer bits of knowledge into the latest things in exception discovery research. Moreover, it evaluates exceptions inside unambiguous datasets utilizing strategies including:

Statistical anomaly detection, Distance and profundity-based approaches, and Bunching-based exception identification.

1.1 Foundation Overview:
Distinguishing anomalies inside multifaceted informational indexes fills the principal need to eliminate them from ensuing information investigations. Within the framework of the Knowledge Discovery in Databases (KDD) approach, this procedure plays a crucial role. Exception recognition, particularly inside spatial, worldly, or high-layered datasets, turns out to be quite more complicated because of the intricacies in question.

Outlier Categories: Various kinds of exceptions can be assembled into three classifications:

Classification 1, Point: In a dataset, this outlier is isolated within its data instance. It's the least complex to recognize and address.

Classification 2, Context-oriented: Due to its abnormal characteristics regarding the context and behavior of the dataset, this outlier stands out from other instances of outlier data.

Third Class, Collective: At the point when an entire gathering of information occurrences inside a dataset is considered an exception corresponding to the whole dataset, it falls under the third classification of anomalies.

Application Domains: Data obtained from business information acquired from different sources like outer data sets, inner records, or creation information can disclose important bits of knowledge utilized in business insight. This information finds application across different spaces like network protection, fabricating, misrepresentation discovery, further developing item quality, medical services, web-based entertainment examination, broadcast communications, continuous occasion the board, and, surprisingly, in fields like cosmology, among numerous others.

Cyber Security: These applications incorporate distinguishing malignant exercises and identifying interruptions inside organizations.

Healthcare Sector: Oddities recognized inside clinical information have different applications, as illustrated in the reference.

Illness Determination: Executing frameworks like lung issues or threatening malignant growth cancer identification frameworks to support diagnosing illnesses all the more successfully.

Immunization Adequacy: Identifying irregularities inside immunization projects to evaluate their viability as a feature of general well-being drives.

Weather Forecasting: It is hard to find periodic patterns in time-ordered sequences. This is because calculations intended to distinguish periodicity frequently create countless examples. Figuring out this wealth of successive and standard examples physically to reveal surprising ones is a burdensome, tedious assignment that is inclined to blunders.

Occasional examples manifest in different datasets, including climate information, exchange accounts, changes in stock costs, traffic thickness on streets and PC organizations, quality articulation examples, and the sky is the limit from there. Distinguishing these common examples can give huge bits of knowledge across various areas.

Telecommunications Industry: Recognition of network put together assault concerning arranging traffic information.

Fraud detection: This registers MasterCard extortion Recognition and Uncommon examples of deceitful clients. Credit defaulters and customers buy conduct examinations are talked about.

Scientific Experimental Measurement: The assessment of datasets introduced in a period series design, as referred to in [11], [18], [21], [33-34], includes mining this information to work with productive navigation and reveal experiences for information revelation.

2. Literature Review

Singh et al. (2022) stated that most organizations are profoundly energetic in embracing cutting-edge innovations to improve dynamics in their tasks. Insight, characterized by the capacity to achieve undertakings much the same as people, recommends that the more an innovation mirrors the human way of behaving, the more astute it is. Master frameworks can expand their insight through AI, encounters, and getting new data. A fundamental objective of consolidating Business Knowledge (BI) in any association is producing extensive reports through different administration dashboards, helping with vital choices in light of the organization's key presentation pointers.

Srinath et al. 's (2018) paper introduced that in the cutting-edge period, achieving Business Knowledge through AI remains a critical test. Previously, exceptions were much of the time excused as simple clamor, bringing about the deficiency of significant data. The main research challenges in this particular field of data mining are brought to light in this paper. It offers a broad arrangement framework derived from Business Insight philosophies and distinguishes present application regions. Besides, the paper frames future examination roads and ide.

Tamang et al. (2021) investigated Business Knowledge (BI) as the set-up of apparatuses and applications used to accumulate, coordinate, and dissect crude information for explicit business experiences. BI frameworks help in planning and direction by utilizing an over-a-wide period of execution correlation with upgraded future results. They enable businesses to address pertinent business issues and observe market trends. While invaluable for efficiency and responsibility, BI likewise bears disadvantages, including expense, intricacy, and extended execution. In this paper, the mix of AI with BI is proposed as an extraordinary power, especially for well-resourced organizations. This reconciliation upgrades functional cycles and client support as well as works with enormous scope information investigation, continuous information appraisal, and relief of digital dangers through educated danger separation. The paper digs into the calculations taken on by organizations in this combination, referring to models, for example, and direct relapse at anticipating land costs, monetary execution, and traffic designs. Understanding the connections between products and consumers is another application of cluster analysis. Furthermore, a contextual investigation inside a significant air terminal retailer is introduced to show how BI enhances business tasks and results.

ALCABNANI et al. (2020) presented a Business Knowledge (BI) model intended to screen shopper fulfillment and criticism on items or administrations continuously using informal communities like Facebook and Twitter. This model depends on AI procedures to accomplish its goals.

Desai et al. (2021) ordered audit opinions inside our dataset by utilizing Regular Language Handling (NLP). We've used Profound Learning strategies like BERT and LSTM alongside AI methods, for example, Choice Trees, Calculated Relapse, Stochastic Angle Drop, Multinomial Credulous Bayes, and Backing Vector Machine calculations to achieve this. Additionally, our goal is to use Business Intelligence (BI) to help companies that sell these products increase customer satisfaction and efficiency. For this reason, we've utilized Microsoft's PowerBI.

Rahman et al. (2017) investigated the utilization of AI (ML) investigation inside Malaysia's upstream capital activities. By utilizing factual models and ML calculations, the review tries to upgrade business dynamic cycles. The combination of these calculations and models is expected to further develop proficiency, support efficiency, speed up adaptation, and relieve gambles while augmenting returns. At last, this blended examination approach plans to give upgraded choice help to partners and company proprietors, supporting critical business choices.

Dimililer et al. (2021) addressed a grouping and expectation challenge, including the recognizable proof of potential client beat inside the Teldata dataset. Different AI calculations, incorporating SVM with various bits (straight, RBF, polynomial, and sigmoid), MLP utilizing different enhancement calculations (Adam, SGD, and LBFGS), and Brain Organizations with Adam advancement were

used to achieve this undertaking. A similar examination of the outcomes uncovered that the Brain Organization utilizing the Adam streamlining procedure exhibited better execution analyzed than different strategies researched in the review.

3. Methodology and Materials
Examining a variety of organizational aspects, the most recent machine learning and data mining methods have been examined. In addition, the study has identified areas in deep learning methods where additional research is needed.

3.1 Highlight Designing Methodologies Connected with AI and Information Mining Procedures
AI and information mining strategies are habitually utilized to recover data from different sources, preprocess the extricated datasets, and get a handle on broad volumes of information. In feature engineering, classification algorithms like decision trees and forward feed ANN [23] are created to work with predefined dataset test sizes and static dataset highlights. Therefore, they will more often than not succeed with organized information, like hierarchical records. Notwithstanding, managing unstructured information [20] is difficult as it requires space and explicit ability to extricate significant properties or highlights for applying comparative characterization techniques. Most element-designing endeavors have centered around organized information designs. For instance, scientists like Yang Liu, Yan Liu, Yu Zhao, and Kien A. Hua used multi-comparability saving inserting utilizing bilinear variants [Uddin et al. 2017]. In multi-highlight learning, information focuses could compare to numerous information marks, expecting these names to have some interconnectedness. As featured in [15], unstructured information might envelop different elements, yet grouping these dataset highlights could prompt the deficiency of essential ones.

3.2 Approaches for mining unstructured Data (MUD)
Unstructured information overruns different removed sources, including web hierarchical information, documented authoritative records, data from online entertainment, as well as hierarchical heuristics and normal articulations [15]. An online synchronous correlation analysis approach is proposed by Zhijie Wang, Jiangbo Qian, Maochun Zhou, Yihong Dong, and Huahui Chen [2017] for evaluating linear relationships between multidimensional data streams. Their review dives into relationship mining across numerous semi-organized information designs. They present MGDS (Mining Gathering Information Streams), a web-based sanctioned connection examination calculation that considers an adaptable mining range versatile to questions, not compelled to a solitary window. Using the base window method, they concentrate on synchronous correlation analysis of multidimensional data streams. In any case, the creators just assessed the connection between the size of the base window and relationship coefficient utilizing Gauss and direct datasets, barring thought of other dataset types. In their conclusion, they emphasize that the base window based MGDS algorithm broadens correlation analysis beyond a single window. Gabriele Bavota [2024] digs into the unstructured information type concerning information extraction, especially underlining text-based information extraction approaches. The creator utilizes MUD (Mining Unstructured Information) to investigate ebb and flow and future patterns inside this examination subdomain. The analysis of a corpus of documents in Natural Language Processing (NLP), as shown in Eq. 1, is the primary focus of the mining of unstructured data techniques within software repositories.

$$P(W_1, W_2 \ldots W_n, W_m) = \pi \, P(W_i \mid W_1, \ldots, W_{i-1}) \qquad (1)$$

The authors have limited the number of indicators they can use, even though they used a data mining model on the extracted dataset. The essential concern spins around limits inside the business knowledge model for information mining, especially regarding its versatility in various application spaces.

Future examination patterns in this field include reinforcing subjective investigation, executing Crosscutting Investigation, and zeroing in on shopper-related and Assignment-related Customization.

3.3 Approaches for Organizational Data Mining (ODM)
This part presents and examines specific models in the area of Hierarchical Information Mining that uses AI and information mining approaches.

This information for information mining acted in ventures may be certainly or unequivocally delivered by the clients of the association while connecting with the framework. Information sources from where information has been removed as a contribution to the information arranging stage can be functional information sources, creation information, chronicled information sources, occasion logs, and so on. Perspective extraction [40] can be applied to exchange logs for this reason. [39] Discusses the selection of web services based on QoS parameters. [5, 19] determine a specific business choice system that interfaces with the enhancement hypothesis of business knowledge. This structure includes utilizing endeavor information related to information mining innovation. The creators will probably improve business on the board by executing functional choice examination frameworks established in the information handling abilities of business knowledge (BI). Their examination focuses on assessing port business the board methods utilizing an information mining model.

The paper has two main limitations: the creators have limited the quantity of chosen markers. Additionally, the business intelligence model for data mining is restricted in its ability to be applied to businesses in other application domains.

The creators used information mining methods to oversee client strategies and anticipate dynamics inside port-based undertakings. To make their intelligence model more useful and efficient, they argue that it is necessary to incorporate additional indicators. A worldview created by Aytu Onan, Serdar Koruko, and Hasan Bulut [3] presents a multiobjective, improvement-based weighted casting of a ballot conspires. Classifiers are given the appropriate weights in this scheme to classify text sentiment. The creators applied this model to item datasets to anticipate exactness levels. They consolidated Bayesian strategic relapse, innocent Bayes, direct discriminant investigation, calculated relapse, and backing vector machines to build order models utilizing outfit learning, a subset of AI. Their examination fundamentally fixates on recognizing the relevant extremity of text reports through apparatuses and methods from regular language handling. The paper only uses machine learning techniques to improve the predictive performance of sentiment classification. The classifier outfit utilizes a static determination conspire given the exhibition of classifiers during the preparation stage, bringing about high space reliance. The creators have featured different roads to grow this exploration later. They stress the need to address the distinguishing proof of classifiers to be remembered for these groups, as it essentially influences prescient execution. Moreover, finding a productive portrayal plot for text records is featured as important for additional examination.

3.4 Research on the Mining of Business Process Data, BPM
Various methodologies have been proposed for mining and handling information produced by business processes.

As indicated by Vladimír Bartík and Milan Pospíšil [7], affiliation rule mining can be used to foresee likely reasons for business delays and other interaction-related issues inside the business process of the board.

Using measures like support and confidence, this study provides a guide for applying frequent dataset mining techniques to business process logs. Be that as it may, the creators surmise earlier information on the cycle depiction, notwithstanding process logs frequently requiring extra investigation. The article prescribes a progressed investigation of business cycles to recognize regular groupings of occasions utilizing the FP-Development technique. The information in [14] envelops process mining across different specialty unit types, featuring its boundless pertinence.

In recent years, the landscape of data analysis has witnessed the emergence of various models and methodologies, each grounded in distinct assumptions. This section delves into the novel paradigms embraced by experts, as outlined in sources [13, 16], emphasizing the importance of understanding the implicit constraints that underlie these models. One noteworthy methodology, aptly termed the "fluffy methodology," is elucidated in reference [3].

A. **Statistical Approach:** Within the realm of statistical approaches, exceptions identified within datasets sourced from diverse origins, such as external, internal, or production data, can unveil crucial patterns essential for business intelligence analysis.

a) **Depth-based Approach:** This approach identifies points with a low probability of occurrence in the general data distribution, labeling them as outliers.

b) **Deviation-based Approach:** Outliers, with their potential to significantly influence the mean and standard deviation, are assessed based on the entire dataset. This underscores their sensitivity to extreme values.

B. **Distance-based Approach:** This category encompasses different strategies for measuring distances between data points.

a) **Nested Loop Approach:** The Straightforward NL (Closest Grid) algorithm, designed to support records for kNN (k-nearest Neighbors) queries, functions as a component-based approach.

b) **Index-based Approach:** This approach involves using a spatial index structure, employing the formula $ROF(p) = \sum(CS(p) - 1 / CS - 1)^2$, where CS denotes the cluster size of the dataset, and CS(p) signifies the cluster size of a specific point p. This formula aids in evaluating the Range Outlier Factor (ROF) for each point within the dataset.

c) **Grid-based Approach:** The construction of a grid ensures that any two points come from the same grid cell, simplifying the comparison process to points in adjacent cells.

C. **Density-based Approach:** This methodology gauges outlier density based on neighborhood thickness assessment. The outlier measurement, as per Equation (3), incorporates information on the reach distance (p, o) as max{k distance(o), dist(p, o)}. In regions of low density, data samples are anticipated to represent exceptions.

3.5 Machine Learning Approach
Support Vector Machines (SVM) capability, as a one-class exception location procedure, is especially helpful for datasets described by a small example size and high dimensionality. It improves expectation quality and computational proficiency in distinguishing exceptions. In addition, solo AI strategies, as referred to in source [20], can be utilized for information preprocessing, helping with refining the dataset preceding exception discovery. In one more review referred to as [11], creators presented Fluffy SVM (FSVM), planned explicitly for identifying anomalies inside broad data sets. FSVM offers the benefit of integrating participation capabilities into individual preparation tests, in this way giving adaptability in exception distinguishing proof.

Neural Network The basic rule is that exceptions could show just inside unambiguous subspaces of the first dataset, not across the whole information. In reference [12], an Outspread Premise Capability (RBF) brain network is used for exception identification. This approach includes utilizing a bunching calculation to gauge the boundaries of the RBF in the secret layer. By scrutinizing these subspaces more effectively than conventional methods that uniformly analyze the entire dataset, it seeks to identify outliers.
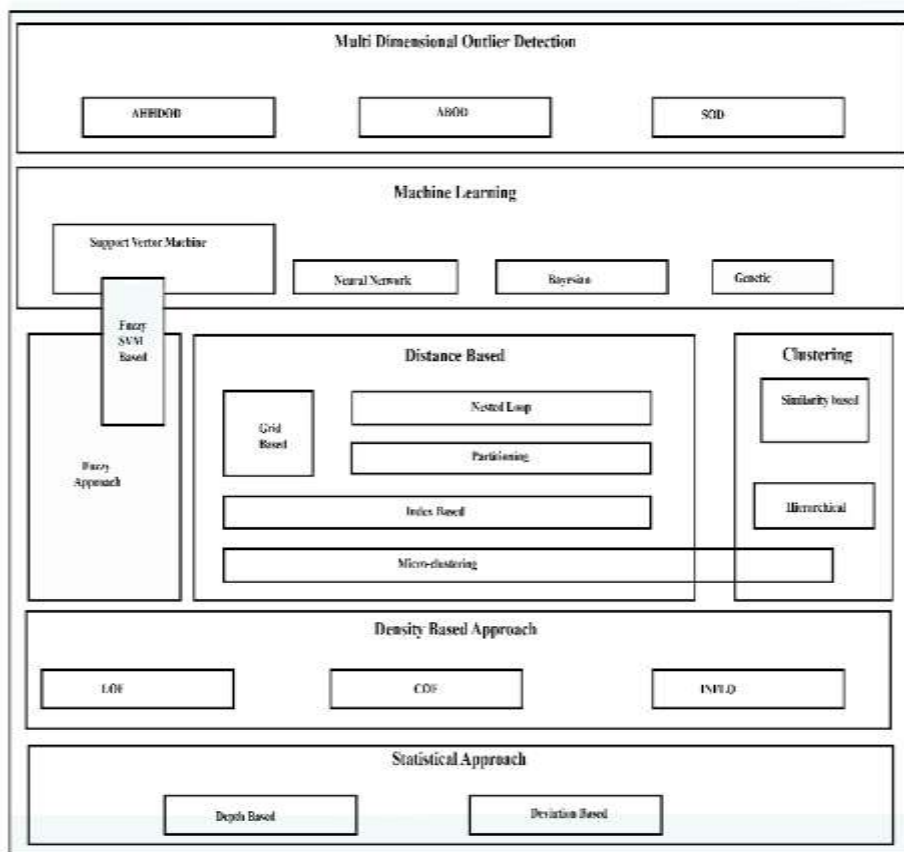

Fig. 1 Taxonomy of Phase 1 of proposed solution –Outlier detection methodologies

4. Result and Discussion
It is quite extensive, covering various aspects of outlier detection in data mining, particularly in the context of business intelligence. Summarizing it into a precise and concise result requires distilling its core elements. It focuses on the challenges posed by the vast amount of online data, emphasizing the crucial role of outlier detection in data preprocessing for effective business intelligence.

Outlier Detection Framework: Developing an integrated framework combining statistical, distance-based, density-based, and machine learning approaches for outlier detection yields the most comprehensive and effective solution.

Contextual Outlier Identification: Context-oriented outliers, although challenging, provide critical insights. Developing context-aware algorithms leveraging neural networks or SVMs significantly improves accuracy in detecting these outliers.

Application-Specific Solutions: Tailoring outlier detection methods to specific application domains, such as cybersecurity, healthcare, or fraud detection, maximizes the efficiency of anomaly identification within those sectors.

Feature Engineering for Unstructured Data: Advancements in feature engineering techniques for unstructured data, particularly in natural language processing (NLP), are crucial for enhancing anomaly detection accuracy in text-based datasets.

Addressing the Curse of Dimensionality: In higher-dimensional datasets, employing specialized methods like ABOD (angle-based outlier detection) and SOD (subspace-based outlier detection) proves highly effective in isolating outliers within specific subspaces.

Hybrid Models for Multidimensional Data: Hybrid models combining multiple outlier detection techniques, especially in high-dimensional datasets, outperform singular methods, addressing computational complexity while maintaining accuracy.

Visualization and Interpretation Tools: Developing user-friendly visualization tools capable of handling large volumes of data facilitates quick and efficient outlier identification and interpretation.

Semi-Supervised Learning Advancements: Continued research into semi-supervised learning models using generative methods like deep neural networks shows promise in bridging the gap between labeled and unlabeled datasets for outlier detection.

Adaptive Outlier Detection: Dynamic outlier detection systems that adapt to evolving data distributions and patterns, incorporating reinforcement learning or adaptive algorithms, enhance long-term anomaly identification accuracy.

Robustness and Scalability: Efforts towards creating robust outlier detection models that scale efficiently with increasing data volumes, leveraging distributed computing or parallel processing, ensure applicability in large-scale business settings.

5. Conclusion and Future Work

It seems like the present status of examination in information digging for business knowledge dominatingly centers around organized or semi-organized information. While past examinations have widely looked at different AI and mining innovations, there's a striking shortfall of an organized system for exception location in unstructured information. Besides, much of the current work is intended for specific spaces, restricting its pertinence to more extensive areas or subdomains. This means the requirement for more extensive and summed-up research in this field. Future patterns in this area ought to focus on help for subjective examination and adjustable cycle-related approaches. One key perception is the supposition of earlier information about a cycle, albeit the interaction log frequently requires further examination, showing a critical exploration hole. The current study focuses on multiview learning, takes into account a variety of factors, and acknowledges the heterogeneity of datasets to fill in these gaps. The created information mining structure and prescient models help with producing viable business systems. Moreover, the paper investigates potential application regions for these calculations to additional insightful capacities. Ultimately, the paper proposes a scientific classification for inconsistency discovery inside datasets, zeroing in on factual and quantitative measures to successfully distinguish and sort oddities. This extensive methodology plans to connect the holes in existing exploration and proposition a more comprehensive system for exception discovery and business knowledge in unstructured information.

Conflicts of Interest: The authors declare no conflict of interest.
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References

[1] Anisuzzaman B. M., Siddique A. R., Mamun T. Al, Jalal J M. S., and Hossain M M. S., (2022) Deep Learning in Mining Business Intelligence, 2022 IEEE Region 10 Symposium (TENSYMP), Mumbai, India, 2022, 1-6, doi: 10.1109/TENSYMP54529.2022.9864444.

[2] Abdur R R, Tanvir I, Duc M C, Maliha T, Bishnu P G, Eftekhar H A, Nur N, Taslima A, Mamunur R, & Mohammad S B. (2024). Comparing Machine Learning Techniques for Detecting Chronic Kidney Disease in Early Stage. *Journal of Computer Science and Technology Studies, 6*(1), 20–32. https://doi.org/10.32996/jcsts.2024.6.1.3

[3] Bhuiyan, M. S., Chowdhury, I. K., Haider, M., Jisan, A. H., Jewel, R. M., Shahid, R., & Ferdus, M. Z. (2024). Advancements in Early Detection of Lung Cancer in Public Health: A Comprehensive Study Utilizing Machine Learning Algorithms and Predictive Models. *Journal of Computer Science and Technology Studies, 6*(1), 113-121.

[4]   Islam, M. T., Ayon, E. H., Ghosh, B. P., MD, S. C., Shahid, R., Rahman, S., ... & Nguyen, T. N. (2024). Revolutionizing Retail: A Hybrid Machine Learning Approach for Precision Demand Forecasting and Strategic Decision-making in Global Commerce. *Journal of Computer Science and Technology Studies*, *6*(1), 33-39.

[5]   Jaffari R., Memon M., Hafiz T., and Iftikhar R., (2017) Framework of business intelligence systems for infrastructure design and management, 2017 First International Conference on Latest trends in Electrical Engineering and Computing Technologies (INTELLECT), Karachi, Pakistan, 2017, 1-8, doi: 10.1109/INTELLECT.2017.8277619.

[6]   Mishra, B.K., Hazra, D., Tarannum, K., & Kumar, M. (2016). Business Intelligence using Data Mining Techniques and Business Analytics. 2016 International Conference System Modeling & Advancement in Research Trends (SMART), 84-89.

[7]   Manglik A. and Singh J. (2022) Business Intelligence Using Machine Learning," 2022 International Conference on Smart and Sustainable Technologies in Energy and Power Sectors (SSTEPS), Mahendragarh, India, 2022, 110-112, doi: 10.1109/SSTEPS57475.2022.00037.al Attributes and Generative Methods. *Journal of Computer Science and Technology Studies*, *5*(4), 69-77.

[8]   Ray, R. K., Linkon, A. A., Bhuiyan, M. S., Jewel, R. M., Anjum, N., Ghosh, B. P., ... & Shaima, M. (2024). Transforming Breast Cancer Identification: An In-Depth Examination of Advanced Machine Learning Models Applied to Histopathological Images. *Journal of Computer Science and Technology Studies*, *6*(1), 155-161.

[9]   Rana, M. S., Hossain, M. M., Jewel, R. M., & Islam, M. R. (2017). Evaluating Customers Satisfaction of Electronic Banking: An Empirical Study in Bangladesh. *The SIJ Transactions on Industrial, Financial & Business Management*, *5*(03), 07-12.

[10]   Uddin, B., Al Mamun, A., Haque, A., & Jewel, R. M. (2017). FACTORS INFLUENCING SELECTION OF HIGHER LEARNING INSTITUTES: AN EMPIRICAL INVESTIGATION IN BANGLADESH. *Aktual'ni Problemy Ekonomiky= Actual Problems in Economics*, (196), 27-101.