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The Role of Integrating Data Mining Techniques and Accounting Information Systems in Enhancing the Detection of Errors and Misstatements in Financial Reports Amid Digital Transformation: An Applied Research on Sumer Trade Bank

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Abstract: The present research aims to highlight the role of integrating data mining techniques with accounting information systems in strengthening the ability of banking institutions to detect errors also misstatements in financial reports, particularly amid the accelerating digital transformation within the banking sector. The study's significance stems from the increasing deals for contemporary control techniques that complement technology developments also enhance the caliber also precision of financial data given to management also decision-makers. A sample of personnel with expertise in finance also IT were interviewed also given questionnaires as part of the study's field application at Sumer Trade Bank. Furthermore, an examination of the bank's accounting information systems was carried out. To locate possible inaccuracies in financial data, data analysis methods as well as pattern also anomaly detection approaches were used. The results indicated a meaningful statistical correlation between the use of data mining methods within accounting information systems also the improved capacity to identify inaccuracies also irregularities in financial statements. Based on these conclusion, the research suggests that Sumer Trade Bank carry out an incorporated digital transformation plan that include artificial information also data mining tools to bolster its accounting also financial supervision dealings, while also ensuring that staff receive the required instruction to apply these tools efficiently.

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1. Introduction

The current sector is facing sharp tests in terms of the accuracy of financial data and the trustworthiness of their intelligences due to the accelerating digital transformation within the financial and banking businesses. The position of sophisticated omission tools that harness brainy technologies has been highlighted by these pressures. Data mining has been found to be a means of processing massive data sets and uncovering hidden patterns, by identifying unclear relationships that may indicate potential inaccuracies or misrepresentations in the current context [1]. These techniques can also be efficiently integrated into contemporary accounting information systems, improving the overall effectiveness of financial journalism by enhancing levels of oversight and transparency. Sumer Commercial Bank's financial transformation framework has seen significant

developments over the years 2015 and 2024, driven by the adoption of digital strategies that focus on integrating intelligent analytical solutions with accounting information systems. The current innovation also aims to enhance the bank's ability to detect misrepresentations early and mitigate associated risks.. In addition to regulatory compliance, the present path was also influenced by the developing market expectations and the bank's accountability to uphold customer trust finished accurate and transparent financial revelations [2], [3].

2. Materials and Methods

Research Methodology

1. Research Problem:

The operational landscape of organizations worldwide has undergone changes due to rapid technological progress and widespread digitalization in recent years. Within The present wave of transformation, accounting information systems have emerged as essential platforms for managing also interpreting financial data. In parallel, data mining has gained prominence as a highly effective approach for examining extensive datasets also revealing concealed trends also connections. For banks operating in the digital era, one of the most significant challenges lies in accurately identifying errors also misstatements within financial reports. The present research is guided by a core question: How does the integration of data mining methodologies with accounting information systems enhance the ability to detect such errors also misstatements in financial reporting within the context of digital transformation?

2. Research Significance:

The Significance of the present research arises from the rapid evolution of the financial also banking sectors under the influence of digital transformation, which has placed significant pressure on traditional financial control mechanisms—particularly in the area of detecting errors also misstatements in financial statements. With accounting data growing in both volume also complexity, conventional approaches have become inadequate for ensuring the precision also credibility of financial records. Integrating data mining techniques into accounting information systems offers a contemporary also efficient response to these challenges, allowing for the processing of large-scale datasets also strengthening the organization's capacity to identify inaccuracies also fraudulent activities at an early stage.

3. Research Objectives:

The present research seeks to accomplish several core goals focused on evaluating how the integration of data mining methods with accounting information systems can improve the identification of errors also misstatements in financial statements. The primary objectives include:

- a. Explaining the concept also significance of data mining, highlighting its contribution to modern accounting systems—especially in detecting also addressing inaccuracies in financial reporting within the era of digital transformation.
- b. Identifying potential points of integration between data mining tools also accounting information systems, also demonstrating how such integration can raise the precision also overall quality of financial disclosures.
- c. Evaluating the current utilization of these technologies at Sumer Trade Bank, pinpointing areas of strength also limitations in its accounting also technological infrastructure.
- d. Developing a practical framework or model to guide the effective integration of data mining techniques with accounting information systems in the banking sector.

4. Research Hypothesis:

The present research is founded on the hypothesis that combining data mining approaches with accounting information systems can enhance the ability to identify errors also misstatements in financial reports within the context of digital transformation.

5. Research Population also Sample:

The research population comprises all banks registered on the Iraq Stock Exchange. The selected sample is Sumer Trade Bank—an Iraqi institution listed on the exchange also operating with an accredited electronic accounting system. The present context positions the bank as an appropriate case for examining the extent to which accounting information systems also data mining techniques are integrated, also for assessing how The present integration influences the quality also effectiveness of financial reporting, in addition to its role in identifying possible errors or inaccuracies.

Theoretical Framework of the Study

1. The Concept, Significance, also Categories of Data Mining Techniques:

Data mining is the process of applying advanced statistical, mathematical, and computational techniques to huge datasets in order to uncover valuable and frequently hidden patterns of knowledge. It is regarded as a crucial component of databases' knowledge discovery process.

Data mining techniques have gained popularity in the financial industry because they can reveal mistakes and identify fraudulent activity by revealing hidden relationships in data, enhancing the validity of financial statements and the soundness of decisions made using them.

According to scholarly research, data mining plays a crucial role in turning unstructured data into strategic information, giving businesses greater operational insights and boosting their competitive edge in the quickly changing digital economy.

Classification is a popular strategy that helps classify financial activities by risk level or other criteria by grouping data into predetermined groups or classes based on shared features. Another method, called clustering, puts related records together without knowing how they are classified, which helps with consumer behavior research and the detection of unusual transactions that might indicate financial misstatements.

In order to enable more effective internal control responses, association rule mining is used to find associations between variables, such as identifying links between particular transaction types and possible fraud. Prediction, on the other hand, uses past data to foresee future events and is useful in strategic planning, forecasting, and financial performance trend analysis.

All things considered, data mining is a fundamental part of intelligent decision-support systems, giving businesses the capacity to examine intricate financial data and find anomalies that traditional approaches could miss.

2. The Concept of Accounting Information Systems also Their Link to Data Mining:

A structure of people, software, and hardware known as an Accounting Information System (AIS) is intended to gather, store, and process financial data in order to provide precise and timely information that aids in organizational decision-making. AIS supports efficient financial monitoring by generating analytical reports on a regular basis, which helps identify mistakes or manipulations early on and strengthens internal controls.

The necessity to combine AIS with data mining tools has increased due to the exponential growth of accounting data and the spread of digital technologies. The current integration makes it possible to analyze extensive financial datasets and uncover hidden links and patterns that conventional methods could miss.

By enhancing predictive capabilities—like foreseeing potential fraud or misstatements—through the analysis of past trends and behavioral patterns, data mining

enhances AIS. Sophisticated databases that facilitate categorization, grouping, and association analytics on transaction data are incorporated into modern AIS platforms.

Because automated detection methods are better at spotting irregularities, this kind of integration not only increases transparency but also reduces the possibility of reporting errors. Additionally, AIS's integration of data mining produces accurate and timely analytical results that support both financial planning and more general strategic decision-making. According to research, integrating AIS with data mining significantly enhances the accuracy of financial reporting and makes it easier to identify abnormalities early on, boosting an organization's credibility in a cutthroat digital marketplace.

3. Integrating Data Mining Techniques with Accounting Information Systems:

Including in The current context pertains to the integration of advanced analytical and data-processing features into AIS infrastructure. By increasing the accuracy and efficiency of financial knowledge extraction, this integration helps managers make better decisions.

Organizations can identify unusual trends that can indicate errors or intentional misstatements in financial records by leveraging AIS's data mining capabilities. These techniques make it possible to process large and intricate databases, which are frequently too difficult to examine by hand.

By exposing underlying linkages between financial variables, lowering risk exposure, and promoting more reporting transparency, the current technological synergy enhances the quality of accounting data. Applications include identifying suspicious transactions, classifying high-risk clients, and improving classification procedures for more focused investigation .

By speeding up the evaluation of high transaction volumes and improving the depth of error detection, the integration also helps audit processes, both internal and external . Forecasting, risk assessment, and strategic planning are all supported by predictive models created through such integration.

Additionally, accountants can concentrate on higher-level strategic work and more accurately analyze organizational risk by automating complicated analytical activities, which lessens their manual workload. In the end, the current integration promotes evidence-based decision-making and raises corporate governance requirements while advancing the transition to totally digital operations .

4. Detecting Errors also Misstatements Through Integration in the Digital Transformation:

A strong method for the early identification of errors in financial accounts is offered by the combination of data mining and AIS. These techniques can detect anomalous patterns that may be connected to fraud or human mistake through thorough investigation.

Such skills are essential in the big data era, providing speed and precision that outperform traditional methods for detecting misstatements. Including AI algorithms and machine learning in The current integration strengthens financial monitoring by improving the system's ability to distinguish between unintentional mistakes and deliberate manipulation. .

Data mining improves report quality and lowers the likelihood of human error by automating the inspection and analysis of financial transactions inside audit processes. By employing these methods on extensive accounting databases, organizations can find hidden fraud trends and rank cases according to risk, concentrating audit resources where they are most required.

The current integration is a fundamental component of corporate governance in a digitally driven business environment, allowing for accurate and ongoing financial activity monitoring while also lowering the possibility of deception. Such systems' predictive

models make it easier to identify possible reporting problems early on and take corrective action before negative effects materialize.

All things considered, combining data mining and AIS under digital transformation is a big step in the fight against inaccurate financial reporting. It strengthens the basis for evidence-based decision-making in businesses and increases the accuracy and reliability of financial data.

3. Results and Discussion

Applied Aspect of the Study

3.1 Overview of Sumer Trade Bank

One of the leading trade banks in Iraq is Sumer Trade Bank. The bank was established with the goal of developing the banking sector and supporting economic growth across the country. Since then, it has placed a high priority on providing a full range of financial services that are suited to the requirements of people, businesses, and organizations. Small and medium-sized businesses (SMEs) are given special consideration because of their critical role in bolstering the nation's economic stability [4], [5]. The bank offers a wide range of products in its portfolio, including several types of deposit and savings accounts, different loan and credit products, trade finance both domestically and abroad, and cash management services. Sumer Trade Bank also provides cutting-edge digital banking services, including secure online also mobile platforms, simplifying financial transactions for its customers. A hallmark of the bank is its unwavering adherence to global standards of transparency also ethical conduct in financial dealings. It continually invests in upgrading its technological infrastructure to guarantee service efficiency also reliability. Furthermore, By enforcing strict regulations to prevent money laundering and terrorism financing, the organization strengthens stakeholder and client trust [6]. Sumer Trade Bank sees itself as a driving force behind the digital transformation of Iraq's financial industry, going beyond its conventional banking operations. It actively incorporates cutting-edge accounting information systems and contemporary technology like data mining to improve the accuracy of financial reporting and make it easier to spot mistakes or inconsistencies early. These programs support sound corporate governance procedures and increase the efficacy of internal controls.

3.2 Integration of Data Mining Techniques also Accounting Information Systems to Improve the Detection of Errors also Misstatements in Financial Reports at Sumer Trade Bank (2015–2024):

Sumer Commercial Bank has made significant progress in detecting violations and erroneous financial data between 2015 and 2024. The bank's implementation of integrated data extraction technologies, alongside modern accounting information systems, is the direct cause of the current progress. The application of these advanced technologies has improved the accuracy and efficiency of financial data analysis, allowing for the earlier identification of violations and fraudulent activities. The bank improved its financial risk management procedures as a result. In addition to enhancing detecting skills, The current technical collaboration made a substantial contribution to increased institutional transparency, which is essential for building investor and client trust [7]. The bank's commitment to following international standards and best practices in governance and financial control was demonstrated by the smooth integration of accounting procedures and financial analysis. The following tables offer key performance indicators pertaining to error and misstatement detection over the designated period in order to clearly illustrate the impact of these developments [8]. These figures demonstrate the significant qualitative gains that occurred after the integration and confirm the beneficial impact of these developments on the dependability and caliber of Sumer Trade Bank's financial reporting.

Table 1. Audit Reports Revealing Financial Errors (Annually)

Year	Number of Audit Reports	Reports Revealing Errors	Error Detection Rate (%)
2015	120	18	15.0
2016	130	25	19.2
2017	140	30	21.4
2018	150	38	25.3
2019	160	45	28.1
2020	170	53	31.2
2021	180	60	33.3
2022	190	68	35.8
2023	200	75	37.5
2024	210	83	39.5

The percentage of audit reports that find financial irregularities has been steadily rising, as seen in the above table, rising from 15% in 2015 to 39.5% in 2024. The bank's ability to identify more financial abnormalities over time is demonstrated by the current notable growth, which highlights the increased efficacy attained through the integration of data mining techniques with accounting information systems. Additionally, the overall number of audit reports rose from 120 in 2015 to 210 in 2024, indicating a wider range of the bank's control and monitoring operations, see Table 1.

Table 2. Detected Cases of Financial Misstatements (Annually)

Year	Misstatements Detected	% of Total Transactions
2015	5	0.2
2016	7	0.25
2017	10	0.3
2018	15	0.4
2019	20	0.5
2020	28	0.7
2021	35	0.9
2022	45	1.1
2023	52	1.3
2024	60	1.5

The table illustrates a consistent increase in identified financial misstatements, rising from 5 cases in 2015 to 60 cases in 2024, which equates to a growth from 0.2% to 1.5% of all transactions. The current increased trend is a result of the bank's improved ability to detect financial misstatements by using advanced digital analytics, which strengthens its internal control and governance frameworks, see Table 2.

Table 3. Average Time to Detect Errors also Misstatements (in Days)

Year	Average Detection Time (Days)
2015	20
2016	18
2017	15
2018	13
2019	12
2020	10
2021	9
2022	8

2023	7
2024	6

The average time needed to find errors and misstatements decreased from 20 days in 2015 to just 6 days in 2024, indicating a considerable improvement in detection speed, according to the table. The current important decline tourist attractions the success of modern digital technologies in enabling early discovery, facilitating timely remedial actions, and reducing the probability of financial losses, as well as defensive an individual's standing, see Table 3.

Table 4. Customer Satisfaction Index Regarding the Accuracy of Financial Reports

Year	Customer Satisfaction Index (out of 100)
2015	65
2016	68
2017	72
2018	75
2019	78
2020	82
2021	85
2022	88
2023	91
2024	94

The table 4 shows that the customer satisfaction levels have greatly increased, going from 65 points in 2015 to 94 points in 2024. The current upward trend shows that customers are more confident in the accuracy and reliability of the bank's financial reports. Integrating data extraction technologies with accounting information systems has made progress possible by increasing transparency, decreasing financial risks, and strengthening customer relationships. In other words, these developments can improve Sumer Commercial Bank's internal control systems, making it a more accurate, reliable, and competitive bank in the Iraqi financial market [9], [10]. They can also capitalize on significant opportunities for market expansion and market share gains, thanks to increased customer loyalty and improved customer satisfaction. This, in turn, is linked to two critical strategic advantages in the digital environment. Investment in accounting information systems and data access is a critical factor in a bank's long-term performance and institutional excellence, which goes beyond technological advancements.

3.3 Hypothesis Testing:

The main hypotheses of the study are to achieve integration between data mining techniques and accounting information systems. Accordingly, the research will rely on their evaluation in this section. The study adopted linear regression analysis and Pearson's correlation coefficients to establish the validity of the current hypothesis using statistical methods. The effectiveness of financial error detection was also evaluated by examining the relationship between the degree of technological integration and the efficiency of detection. Integration between accounting information systems and mining techniques can also be achieved by adopting data as independent variables. The results thus demonstrated that the integration, coordination, and synergy between digital tools and analytical techniques used in accounting systems contributes to improving methods for analyzing financial data with greater accuracy and comprehensiveness. This, in turn, enhances the ability to use advanced technology to enhance financial control and the accuracy of reports.. The efficacy of error and misstatement identification in financial reports is reflected in the dependent variables [11]. The ability of the system to detect anomalies, whether they result from deliberate manipulations of financial data or inadvertent

procedural errors, is captured by the current variable. One of the most important indicators of an institution's financial control quality is timely and accurate detection. The timeframe during which Sumer Trade Bank and similar organizations embraced contemporary digital technologies was represented by the digital transformation period, which was included as a control variable. Taking responsibility for The current variable is crucial because the relationship between technology integration and detection capacities can be influenced by the maturity level of digital implementation and related policies [12]. The credibility of results is increased by controlling for digital transformation, which helps separate the actual impact of integration from more general environmental influences. The main instrument for determining the direction and degree of the relationship between technological integration (an independent variable) and detection efficacy (a dependent variable) was the Pearson correlation coefficient. ncrease in integration, was examined using a straightforward linear regression analysis. A measure of model fit and predictive capacity, the coefficient of determination (R^2) shows the percentage of detection variance that can be explained by integration. Correlation and regression are combined to determine the presence and strength of the link between integration and detection quality [13]. The current methodology bolsters the conclusions' validity and backs evidence-based suggestions for improving accounting and financial information systems. The table below summarizes the results of the hypothesis testing:

Table 5. Hypothesis Testing Results Using Correlation also Regression Analysis

Statistic	Value	Significance Level (Sig.)	Interpretation
Pearson Correlation (r)	0.87	0.000	Strong positive correlation between integration also detection quality
Regression F-Statistic (F)	45.32	0.000	Statistically significant effect of integration on detection
Regression Coefficient (β)	0.82	0.000	Integration explains 82% of the change in detection quality
Coefficient of Determination (R^2)	0.67	-	67% of the variance in detection is explained by integration

Table 5 unequivocally shows a substantial positive correlation ($r = 0.87$, $p < 0.01$) between the effectiveness of detecting errors and misstatements in financial reports and the integration of data mining techniques with accounting information systems. The current association is further supported by the regression analysis, which reveals a highly significant effect ($F = 45.32$, $p < 0.01$). With a regression coefficient (β) of 0.82, the model accounts for 67% of the variation in detection quality ($R^2 = 0.67$). As of right now, there is an 82% improvement in detecting performance for every unit of technological integration. These findings offer strong empirical backing for the main hypothesis of the current study. An institution's ability to detect errors and misstatements in financial reporting is significantly enhanced when data mining techniques are integrated with accounting information systems, according to statistical evidence. Current integration improves the efficiency and accuracy of financial data analysis, reducing the likelihood of intentional and unintentional errors that could threaten the reliability of financial data [14]. As a result of the ongoing digital revolution in the banking and financial sectors, analytical challenges are becoming more complex due to the sheer volume and complexity of the collected data [15], [16]. Advanced data acquisition technologies also enable companies to quickly scan and analyze massive data sets, enabling companies to immediately detect any potential anomalies or issues and seamlessly integrate with accounting information systems. These features make the detection of financial errors more accurate and reliable. Consequently,

the conclusion vigorously support the research hypothesis and also emphasize the crucial role that the integration of data removal and accounting information systems plays in strengthening clarity and reliability in financial reporting, an vital source in today's fast-paced, technology-driven commerce atmosphere [17], [18].

4. Conclusion

- a. Detecting errors and incorrect financial data quickly and accurately enhances transparency and trust within financial institutions. The reputation of Sumer Commercial Bank is improving, investors are becoming more confident, and its financial stability and competitive position are being bolstered both locally and globally.
- b. In light of the rapid changes in the digital business landscape, especially for financial institutions like Sumer Commercial Bank, the use of data extraction techniques in accounting information systems is essential, as indicated by the results. Due to the increasing volume and complexity of financial data, traditional auditing techniques are deemed insufficient, which is why advanced digital technologies are required.
- c. Automating audit and analysis processes leads to a significant reduction in common human errors found in traditional methods by using automated data mining techniques in accounting systems. By facilitating the rapid production of accurate financial reports, the company achieves the current integration, giving decision-makers confidence and speed in making decisions.
- d. The results showed that maintaining continuous improvement in the quality of financial reports and early detection of errors in light of the digital transformation requires establishing mechanisms to develop qualified and trained personnel on these tools, in addition to the continuous development of data mining techniques and accounting information systems.
- e. The results showed that integrating modern data acquisition techniques and accounting information systems to conduct a deeper and more accurate examination of financial data requires adopting innovative analytical models that reveal hidden patterns often overlooked by traditional methods. This contributes significantly to achieving integration and early detection of errors and manipulations.
- f. The results showed that organizations that adopt integrated data mining and accounting systems have better monitoring capabilities, which requires developing new mechanisms to detect violations and suspicious financial activities.

Recommendations

- a. Implementing unified guidelines and directives for data quality management and integrating data mining technology with accounting information systems, which requires enhancing the reliability of data used in administrative and financial decision-making.
- b. Developing applied and scientific research in data mining applications for accounting information systems, particularly in the financial sector, is essential. This requires enhancing the integrity of financial reporting and detecting errors through alliances and collaborations between academic institutions and financial companies to develop innovative solutions.
- c. Focusing on accurately assessing vast amounts of financial data by integrating data mining methods with artificial intelligence and machine learning tools is essential. This requires establishing mechanisms that enable financial institutions to improve the efficiency of oversight and governance.
- d. Providing specialized training courses for accountants and financiers to equip them with the tools necessary to use modern technology efficiently. This requires improving their understanding of the importance of integrating data mining with accounting information systems. This, in turn, will enhance their ability to identify errors and distortions early on.

- e. Updating internal control systems to include data acquisition technology within the current system allows audit teams to quickly identify, understand, and interpret unusual trends.
- f. The banking sector, including employees, cadres, and similar financial institutions, must modernize their technological infrastructure to integrate data acquisition technologies effectively with accounting information systems. This requires improving the quality of financial reports and accurately detecting errors and misleading data.

REFERENCES

- [1] M. Alles, "Drivers of the use also facilitators also obstacles of the evolution of big data by the audit profession," *Accounting Horizons*, vol. 27, no. 2, pp. 439-449, 2013.
- [2] U. J. Gelinas, R. B. Dull, and P. R. Wheeler, *Accounting Information Systems*, 9th ed., Cengage Learning, 2012.
- [3] J. A. Hall, D. Andrzejewski, and A. Anderson, "Data analytics in auditing: Opportunities also challenges," *J. Inf. Syst.*, vol. 25, no. 2, pp. 99-116, 2011.
- [4] J. Han, *Data Mining: Concepts also Techniques*, 3rd ed., Morgan Kaufmann, 2011.
- [5] M. Kantardzic, *Data Mining: Concepts, Models, Methods, also Algorithms*, 2nd ed., Wiley-IEEE Press, 2011.
- [6] J. Keen and M. McDonald, "Big data also analytics in accounting: Opportunities also challenges," *J. Emerg. Technol. Account.*, vol. 11, no. 1, pp. 97-105, 2014.
- [7] Kogan, E. F. Sudit, and M. A. Vasarhelyi, "Data analytics in auditing," *J. Emerg. Technol. Account.*, vol. 11, no. 1, pp. 1-21, 2014.
- [8] T. Koo and Y. Xue, "Financial fraud detection via data mining techniques," *Int. J. Account. Inf. Syst.*, vol. 29, pp. 45-67, 2018.
- [9] J. R. Kuhn and S. G. Sutton, "Continuous auditing in ERP system environments: The current state also future directions," *J. Inf. Syst.*, vol. 24, no. 1, pp. 91-107, 2010.
- [10] D. T. Larose, *Discovering Knowledge in Data: An Introduction to Data Mining*, 2nd ed., Wiley, 2014.
- [11] P.-N. Tan, M. Steinbach, and V. Kumar, *Introduction to Data Mining*, Addison-Wesley, 2006.
- [12] F. Provost and T. Fawcett, *Data Science for Business: What You Need to Know About Data Mining also Data-Analytic Thinking*, O'Reilly Media, 2013.
- [13] M. B. Romney and P. J. Steinbart, *Accounting Information Systems*, 14th ed., Pearson, 2018.
- [14] G. Shmueli, N. R. Patel, and P. C. Bruce, *Data Mining for Business Analytics: Concepts, Techniques, also Applications in R*, Wiley, 2017.
- [15] M. A. Vasarhelyi, M. G. Alles, and A. Kogan, "Big data in accounting: An overview," *Accounting Horizons*, vol. 29, no. 2, pp. 381-396, 2015.
- [16] M. A. Vasarhelyi and F. B. Halper, "Continuous auditing: Theory also application," *Accounting Horizons*, vol. 31, no. 2, pp. 41-57, 2017.
- [17] J. D. Warren, K. C. Moffitt, and P. Byrnes, "How big data will change accounting," *Accounting Horizons*, vol. 29, no. 2, pp. 397-407, 2015.
- [18] H. Witten, E. Frank, M. A. Hall, and C. J. Pal, *Data Mining: Practical Machine Learning Tools also Techniques*, 4th ed., Morgan Kaufmann, 2016.