AI and Machine Learning in Banking: A Systematic Literature Review

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AI and Machine Learning in Banking: A Systematic Literature Review

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ABSTRACT

Machine learning techniques are using in many sectors for the better performance. Most of the time these are used for the prediction purpose so that the organization can take the necessary steps. In this paper, the different advantages and benefits of Artificial intelligence and machine learning techniques are discussed. The work of different researchers is discussed in this literature review to prove the importance of Artificial intelligence for the banking sector. It is also discussed how machine learning techniques can be helpful in the banking sector to deal with the risks especially the credit scoring process.

Key Words: Artificial Intelligence, Machine learning techniques, bank performance, Credit Scoring

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INTRODUCTION

Artificial intelligence is the most important branch of computer science. The main purpose of artificial intelligence is to reduce the human efforts in performing different tasks. These can be the tasks in different fields. The work a human has to be performed is increasing day by day that is why we need the artificial intelligence. Artificial intelligence uses the machine learning to train the machines or systems in a way that they can think like a human and perform the action accordingly (Beetz, Buss, & Wollherr, 2007). There is a big role of the banks in the economy of a country. So the performance of the bank matters for various stakeholders that include investors, customers, and the general public etc.

The load of work is increasing with the passage of time. Getting the all work done by the human being is a difficult and time consuming task. A human cannot perform the task in a fast way as a machine can do that task. Also there is a chance of the mistake if a human performs that task. Therefore, there is a need for expert systems with artificial intelligence. The expert system is the system that can perform the tasks better than a human being (Horvitz, Breese, & Henrion, 1988). These systems can be used in banks for problem solving or to automate the tasks. Banks failed because they don't have the systems to decrease the

work burden. There is another factor of the loss in banking is that they don't use any prediction techniques.

A number of papers are studied for this literature review and it is found that the use of AI and Machine Learning is necessary to increase the performance of banks. Banks should use this technology to keep themselves updated with the latest advancement in the field of IT (Jakšič & Marinč, 2019). The authors in (Moro, Cortez, & Rita, 2015) recommended intelligence systems for the banks to help the managers in taking the decisions.

In this paper, it will be discussed how AI and machine learning can be used in the field of banking to solve different problems. This literature review will explain the importance of AI in the banking field to solve the different problems.

The methodology is presented in the section 2, research question are created in the section 3, section 4 shows the search process, results and discussion is given in section 5, and the conclusion is given in the section 6.

METHODOLOGY

The methodology that is used to analyze the different research paper is the systematic literature review. According to the search string twenty papers were found.

Inclusion and Exclusion

The papers were further analyzed to be added in this literature review. Only the journal papers that were written in the English Language are included in this literature review. Ten journal papers were relevant to our concern so these ten papers are included in this literature review.

Quality Assessment

This literature review is based on ten papers because the research work they present is according to the topic of this literature review. These journal papers show the importance of Artificial Intelligence and Machine Learning for the banks.

RESEARCH QUESTION

Research Questions are the important part of a literature review. This literature review will answer the two research questions to understand the work done. These research questions are given below.

RQ1: What are the different uses of AI in the banking sector?

RQ2: What is Credit Scoring and how machine learning techniques can be used for this purpose?

SEARCH PROCESS

A number of paper is collected from some famous databases that include the Elsevier, IEEE Xplore etc. The relevant papers are then finalized to be discussed in this literature review.

In the first phase, the papers were excluded on the basis of their titles and abstracts. Then in the second phase, papers were excluded by reading the text and the conclusion they have.

RESULT AND DISCUSSION

A number of papers has been published for proving the importance of artificial intelligence and machine learning for the banking sector. In (Casabianca, Catalano, Forni, Giarda, & Passeri, 2019) authors proposed an early warning system that will predict the upcoming crisis. This early warning system is based on the machine learning algorithms because the researcher found that machine learning algorithms are best for the prediction purpose. The machine learning algorithms are first trained through a training dataset and then they perform different actions according to the learning.

RQ 1: What are the different uses of AI in banking sector?

Artificial intelligence can be used in the banking sector for different purposes. This has made the banking easy and efficient. Some of the major uses of AI in banking are as follows.

Artificial intelligence has made the banking secure from the fraud. With the increasing use of online payments the number of cyber criminals also increased to do online fraud. AI algorithms monitor the transactions and the transaction is blocked if the algorithm sees risks (Kaya, Schildbach, AG, & Schneider, 2019). AI algorithm identifies the fraudulent activity by comparing a transaction with the previous transaction amount and location.

AI is very helpful to the bank for handling the customers through the chatbots. Chatbots are a kind of digital assistants that interact with the customer which can be in the form of a text or voice. This interaction is performed without the involvement of a bank employee. Chatbots learn from the behavior of a customer and provide suggestions or take actions accordingly (Agarwal, Agarwal, & Talib, 2019). Chatbots are helpful for providing a quick response to the customers.

Through the use of artificial intelligence, it is easy to keep the records updated and error free. There is no chance of human errors or the insertion of incorrect data.

With the help of machine learning algorithms, artificial intelligence system can be used to detect the security threats (Alzaidi & Security, 2018). These can also perform any action according to the security threat.

Face recognition system with advanced AI techniques can be used at the ATM for the detection and prevention of the fraud (Sindhu & Namratha, 2019).

RQ 2: What is Credit Scoring and how machine learning techniques can be used for this purpose?

Credit scoring is the process of checking the probability of a customer whether he will be able to pay or not. There is a big problem in the banking is that they give the money to the customers who are not able to return back. Machine learning techniques can help to predict whether the client will be able to pay the money back or not. On the basis of this prediction the customer can be able to get the credit (Boughaci, Alkhawaldeh, & Analysis, 2020). Different variables can be used for this purpose such as guarantees, historical payments etc. In (Steenackers, Goovaerts, & Economics, 1989) researchers said that the traditional way of making the decision for giving the loan is very time consuming and there is also a chance of error. In the traditional way a specialized person decides this whether to give the loan to a person or not. But the machine learning techniques have made this decision making process easy. Different machine learning techniques can be used for this process.

Table 1: Machine learning techniques for Credit Scoring

Random Forest	Logistic classifier
k-Nearest Neighbor classifier	Support Vector Machine
Naive Bayes classifier	Bagging
Bayes Network classifier	AdaBoost
OneR	Logit Boost

In (Boughaci et al., 2020) authors said that the machine learning methods can help the bank to find out the good applicants. Basically they have used the different machine learning methods that have different results on different data sets. In (Van Gestel, Baesens, Garcia, & Van Dijcke, 2003) researchers found that the SVM provides better results for the credit scoring. Authors of (Auria & Moro, 2008; Donepudi, 2016) also found the SVM as the best technique for credit scoring process. Authors in (Baesens et al., 2003) used different machine learning techniques on eight credit scoring data sets. They found that the Neural network classifier and LS-SVM have good performance. The performance is assessed on the basis of accuracy.

CONCLUSION

It is proved that Artificial intelligence and machine learning techniques are very helpful for the banking sector. This can be in the form automating the increasing tasks or providing a quick response to the customers. Data can also be made secured and error free through the use of Artificial Intelligence. Use of Artificial intelligence is very necessary for the banking sector to survive in the modern time. The prediction of machine learning techniques can help the manager in the decision making process. Banks can also use these techniques for the credit scoring process. These machine learning techniques can give the prediction after the learning process. Different machine learning techniques can be used for this purpose but the survey shows that the support vector machine can provide the good performance.

In this literature review, the advantages or benefits of Artificial intelligence and machine learning techniques is discussed. Future work can be the discussion on the disadvantages of AI and machine learning techniques.

REFERENCES

Agarwal, B., Agarwal, H., & Talib, P. J. I. J. A. R. (2019). Application of artificial intelligence for successful strategy implementation in indias banking sector. *7*, 157-166.

Alzaidi, A. A. J. I. J. o. C. S., & Security, N. (2018). Impact of Artificial Intelligence on Performance of Banking Industry in Middle East ocr. *18*(10), 140-148.

Auria, L., & Moro, R. A. (2008). Support vector machines (SVM) as a technique for solvency analysis.

Baesens, B., Van Gestel, T., Viaene, S., Stepanova, M., Suykens, J., & Vanthienen, J. J. J. o. t. o. r. s. (2003). Benchmarking state-of-the-art classification algorithms for credit scoring. *54*(6), 627-635.

Beetz, M., Buss, M., & Wollherr, D. (2007). *Cognitive technical systems—what is the role of artificial intelligence?* Paper presented at the Annual Conference on Artificial Intelligence.

Boughaci, D., Alkhawaldeh, A. A. J. R., & Analysis, D. (2020). Appropriate machine learning techniques for credit scoring and bankruptcy prediction in banking and finance: A comparative study. (Preprint), 1-10.

Casabianca, E. J., Catalano, M., Forni, L., Giarda, E., & Passeri, S. (2019). An Early Warning System for banking crises: From regression-based analysis to machine learning techniques. In *Marco Fanno Working Papers 235*.

Donepudi, P. (2016). Influence of Cloud Computing in Business: Are They Robust?. *Asian Journal Of Applied Science And Engineering*, *5*(3), 193-196.

Horvitz, E. J., Breese, J. S., & Henrion, M. J. I. j. o. a. r. (1988). Decision theory in expert systems and artificial intelligence. *2*(3), 247-302.

Jakšič, M., & Marinč, M. J. R. M. (2019). Relationship banking and information technology: The role of artificial intelligence and FinTech. *21*(1), 1-18.

Kaya, O., Schildbach, J., AG, D. B., & Schneider, S. J. A. i. (2019). Artificial intelligence in banking.

Moro, S., Cortez, P., & Rita, P. J. E. S. w. A. (2015). Business intelligence in banking: A literature analysis from 2002 to 2013 using text mining and latent Dirichlet allocation. *42*(3), 1314-1324.

Sindhu, J., & Namratha, R. J. A. J. o. M. (2019). Impact of Artificial Intelligence in chosen Indian Commercial Bank-A Cost Benefit Analysis. *10*(4), 377-384.

Steenackers, A., Goovaerts, M. J. I. M., & Economics. (1989). A credit scoring model for personal loans. *8*(1), 31-34.

Van Gestel, I. T., Baesens, B., Garcia, I. J., & Van Dijcke, P. (2003). *A support vector machine approach to credit scoring*. Paper presented at the FORUM FINANCIER-REVUE BANCAIRE ET FINANCIAIRE BANK EN FINANCIEWEZEN-.

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