Report Component: Credit Card Fraud Detection

Aim:

This assignment aims to build a system for spotting credit card fraud using Artificial Intelligence and Machine Learning (AI/ML) techniques. The main goal is to create a model that can accurately flag fraudulent transactions while keeping false alarms to a minimum, ensuring a smooth experience for users. Additionally, the model should be able to adapt to new tricks fraudsters might come up with and maintain high detection rates.

Objectives:

1. **Identify Emerging Fraud Patterns**: We'll review existing literature to identify common fraud patterns and trends, as well as any emerging tactics that might not yet be widely known.

2. **Enhance Model Flexibility**: Through code execution, we'll develop algorithms that can adapt and learn from new data in real time, allowing the system to quickly recognize and respond to new fraud patterns.

3. **Evaluate Effectiveness**: We'll assess the performance of our system both through literature review and code execution, comparing its ability to detect emerging fraud tactics against traditional methods.

Research Gap:

One area where there's room for more research is in improving the adaptability of fraud detection systems to emerging fraud tactics. While current systems are effective to some extent, they may struggle to keep up with new tricks used by fraudsters. Finding ways to make these systems more flexible and responsive to new threats could greatly enhance their effectiveness in preventing fraud.

Literature Review:

Detecting credit card fraud is super important for keeping our money safe. Scientists have been trying different methods to solve this problem, from old-school statistics to fancy machine learning. Recently, they've had success with methods like Logistic Regression, Random Forest, and Neural Networks. These methods look at past transactions to learn what normal and fraudulent ones look like, helping them tell the difference.

Some cool tricks they've used include Isolation Forest and Local Outlier Factor, which can spot weird patterns in transactions that might be fraud. Also, combining different methods into one model has helped catch fraudsters without bothering too many innocent folks.

Even though we've made progress, there are still challenges. Fraudsters are always coming up with new tricks, like stealing someone's identity or taking over their account. We need to keep working on our models to stay ahead of them.

Methodology:

Here's how we'll build our Credit Card Fraud Detection system:

1. **Data Cleanup**: We'll start by cleaning up our data, fixing any missing or weird values, and making sure our features make sense.

2. **Picking Models**: Next, we'll try out different machine learning methods, like Logistic Regression and Random Forest, to see which one works best for catching fraud.

3. **Training and Testing**: We'll train our chosen model using some of our data and then test it on the rest to see how well it does.

4. **Checking Performance**: Finally, we'll look at how well our model did. We'll check things like accuracy and how good it was at finding fraud without wrongly accusing innocent people.

Conclusion:

In the end, building a Credit Card Fraud Detection System using AI/ML is super important for keeping our money safe online. By using fancy algorithms and looking at lots of data, we can catch fraudsters while letting honest folks go about their business. But we need to keep updating our methods to stay one step ahead of the bad guys.

References:

1. Bolton, R. J., & Hand, D. J. (2002). Statistical fraud detection: A review. *Statistical Science, 17*(3), 235-255.
2. Bhattacharyya, S., & Jha, S. (2019). Credit card fraud detection using machine learning: A survey. IEEE Access, 7, 27235-27257.
3. Dal Pozzolo, A., Boracchi, G., Caelen, O., Alippi, C., & Bontempi, G. (2015). Credit card fraud detection: a realistic modeling and a novel learning strategy. IEEE *Transactions on Neural Networks and Learning Systems, 29*(8), 37843797.
4. Ribeiro, G., & Santos, E. (2019). Credit card fraud detection using machine learning: A systematic mapping study. *Expert Systems with Applications, 129*, 266-288.
5. Skrzypczak, M., & Pedrycz, W. (2020). Credit card fraud detection using machine learning techniques: A comparative study. *Information Sciences, 515*, 381-395.
6. Stojanovic, A., Martínez-de-Dios, J. R., Radojevic, V., & Peña, J. M. (2020). Credit card fraud detection with machine learning techniques: A contemporary survey. *Expert Systems with Applications, 164*, 113856.
7. Zhang, Y., Zhu, Y., Wu, S., & Guo, Y. (2020). Credit card fraud detection based on machine learning algorithms. *Journal of Computational Science, 41*, 101080.
8. Zhu, B., & Zhou, X. (2017). Fraud detection for online transactions: A data analytics approach. *Decision Support Systems, 95*, 26-37.
9. APA Style Guide. (2022). American Psychological Association. Retrieved from https://apastyle.apa.org/
10. MLA Handbook. (2021). Modern Language Association. Retrieved from https://style.mla.org/