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CPE 019 - CPE32S3

Assignment 5.1 - Perceptron Applications

Paper 1: Credit Card Fraud Detection Based on Multilayer Perceptron and Extreme Learning Machine Architectures.
Authors: F. Z. El hlouli, J. Riffi, M. A. Mahraz, A. El Yahyaouy and H. Tairi
Conference Date: June 9,2020 - June 11, 2020
Title of Publication: 2020 International Conference on Intelligent Systems and Computer Vision (ISCV)

- *What is the problem being solved in the research?*

Credit cards are used for payments when shopping in physical stores or on online stores. It can also be used when withdrawing money from accounts. With increasing credit card transactions, credit card fraud arises. Their paper aims to detect fraudulent transactions on credit cards.

- *What is the proposed solution of the author/s?*

They would use Multilayer Perceptron and Extreme Learning Machine on credit card fraud datasets. They would first synthesize data on existing papers and then process those data to search for the most important features. They would then present a comparative study between the MLP and ELM.

- *How did the author/s solve the problem/s? Provide a summary of the methodology*

They first gathered a dataset to be used in data processing. The data set used were from European cardholders in 2013 with 28 variables and 284.807 transactions where there were 492 frauds. They then pre processed their data and then proceeded with experimenting.

- *Provide a summary of the results.*

Upon experimenting, all the variables used have a cumulative importance of 99%. Their confusion matrix for their ELM had an accuracy of 95.46% and a precision of 98.83% whereas the MLP model had a 97.84% accuracy and 99.32% precision.

- *What is the conclusion of the author/s and provide your own recommendations on the paper.*

The purpose of their paper is to detect credit card fraud transactions using MLP and ELM algorithms. Their results showed that MLP outperformed ELM. However, ELM can perform faster than MLP in predicting new fraudulent transactions.

F. Z. El hlouli, J. Riffi, M. A. Mahraz, A. El Yahyaouy and H. Tairi, "Credit Card Fraud Detection Based on Multilayer Perceptron and Extreme Learning Machine Architectures," 2020 International Conference on Intelligent Systems and Computer Vision (ISCV), Fez, Morocco, 2020, pp. 1-5, doi: 10.1109/ISCV49265.2020.9204185. keywords: {Credit cards;Classification algorithms;Machine learning;Training;Logistics;Multilayer perceptrons;Credit card fraud;MLP;ELM},

Paper 2: Malware Detection with Structural Entropy Features Using Multilayer Perceptron Neural Network.
Authors: Y. T. Ling, P. Phang, K. L. Chiew and X. Zhang
Conference Date: December 1, 2022 - December 2, 2022
Title of Publication: 2022 International Conference on Digital Transformation and Intelligence (ICDI)

- *What is the problem being solved in the research?*

Malware attacks are common issues in information security. Traditional anti-malware tools base their detection with existing malware which makes it inefficient when faced with newly launched malware.

- *What is the proposed solution of the author/s?*

Their first step would be to preprocess the data by splitting their files into chunks. After the determined number of chunks, they adopt an algorithm to evenly spread the chunks from each file. Lastly, they would evaluate the proposed method.

- *How did the author/s solve the problem/s? Provide a summary of the methodology*

A dataset including 7,852 binary files were collected where in the first dataset were from VirusShare and the second dataset was from Malicia Project. They then constructed a 3-layer and 4-layer MLP model for their study.

- *Provide a summary of the results.*

The AUC scores from the MLP model shows that all the malware, except BHO, can achieve an AUC score of more than 93% using the structural entropy features with 256 chunk size. The 4-layer model achieves a slightly higher AUC score than the 3-layer model.

- *What is the conclusion of the author/s and provide your own recommendations on the paper.*

Their 3-layer model achieved an F1-score of 88.84% - 98.38%, whereas 4-layer ranged 87.04% - 98.85%. The structural feature is suitable for feature representation for malware detection using neuron network. They could use multiple hidden layers with various neurons and epochs for future study.

Y. T. Ling, P. Phang, K. L. Chiew and X. Zhang, "Malware Detection with Structural Entropy Features Using Multilayer Perceptron Neural Network," 2022 International Conference on Digital Transformation and Intelligence (ICDI), Kuching, Sarawak, Malaysia, 2022, pp. 01-07, doi: 10.1109/ICDI57181.2022.10007419. keywords: {Measurement;Digital transformation;Neurons;Information security;Multilayer perceptrons;Feature extraction;Nonhomogeneous media;multilayer perceptron;malware;entropy;static analysis},