



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
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Engineering, Built Environment and IT
Department of Computer Science

COS314

Artificial Intelligence

Assignment Three

Due: 24 May 2025

Instructions

- A zipped folder containing the data for this assignment is attached.
- Only Java or C++ may be used to complete this assignment.
- The programs must be executable (JAR) and be able to run without linking to libraries via the IDE (in the case of C++). Please note the programs will not be run in IDEs but as a piece of commercial software (marks may be lost if this is not complied with).
- Read-me instructions are to be included.
- NB: Both the Report and Code need to be submitted. One will not be marked without the other.
- Submission is through Clickup; no email submissions will be allowed.
- For evaluation and replication all code must be seeded and run by initially requesting the seed value and necessary filepath and parameters.
- This is a group project (team of 4 (1-GP, 2-MLP, 3-DT, 4-Report)). The report must contain the names of all the group members. All members of the group are to submit the assignment package individually.
- Marking may be through Demo, this will be confirmed.

Background

Machine learning (ML) has emerged as a powerful tool for financial forecasting, enabling more accurate predictions and insights into complex financial systems. By leveraging historical data, ML models can identify patterns, trends, and relationships that traditional statistical methods may miss.

1. Question 30 Marks (Structure and quality of the report is 10 Marks)

To implement 3 Machine Learning models that can predict (classification) whether a financial stock should be purchased based on historical data. The following specifications of the models are stipulated.

1. Genetic Programming classification algorithm. (10 marks)
2. Multi-Layer Perceptron. (Python library may be used) (5 marks)
3. Decision tree. (J48 from the Weka Package) (5 marks)

Model	Seed value	Training		Testing	
		Acc	F1	Acc	F1
Genetic Programming					
MLP					
Decision Tree					

Figure 1: Results Table

A folder containing a training and test set is made available. The report must detail the design specification of the GP, MLP and J48 and the results table. Additionally, statistical tests (Wilcoxon signed-rank test) should be carried out between GP and MLP and detailed in the report to evaluate the significance of the differences in performance.

Acc - accuracy, F1 - F1 score.

The official Weka website is available at <https://www.cs.waikato.ac.nz/ml/weka/>.

References

- 1 Koza, J.R., 1994. Genetic programming as a means for programming computers by natural selection. Statistics and computing, 4, pp.87-112.
- 2 Popescu, M.C., Balas, V.E., Perescu-Popescu, L. and Mastorakis, N., 2009. Multilayer perceptron and neural networks. WSEAS Transactions on Circuits and Systems, 8(7), pp.579-588.
- 3 Singhal, S. and Jena, M., 2013. A study on WEKA tool for data preprocessing, classification and clustering. International Journal of Innovative technology and exploring engineering (IJITEE), 2(6), pp.250-253.