Thu, 20th March, 2025

Intelligent Algorithmic Trading Assignment (ARI5123, Assignment 2)

Method

Individual Assignment. Under no circumstances are you allowed to share the design and/or code of your task implementations (unless otherwise explicitly stated by the task specification). The Department of Artificial Intelligence takes a strict and serious view on plagiarism. For more details refer to plagiarism guidelines of the University of Malta[1].

Weighting

This is the main assignment for the module carrying 80% weight of the overall assessment (5 ECTS in total).

Expected effort

Assuming that you went through the exercises and examples provided in class, you are expected to allocate approximately 60 hours to complete the assignment.

Submission

The deadline of the assignment is end-of-day Sunday 8th June, 2025. Submission of the assignment should be done online via the submissions section on module VLE portal. Note that all the deliverables have to be submitted by specified deadline. If you fail to follow these instructions, your assignment will not be graded. Late submissions will not be accepted.

Task

The goal of this project is to develop an intelligent autonomous system for algorithmic trading. The idea is to apply **ONE** artificial intelligence / machine learning (ML) algorithm of your choice to investigate how it can be utilized effectively for algorithmic trading purposes.

Deliverables

You are expected to provide your assignment in the form of a paper using Latex. The format should follow the ACM Paper latex format available here: ACM SIGPLAN Proceedings Template. It is expected that the paper is 10-12 pages in length, including references. In addition to the paper, you are expected to submit a separate Jupyter notebook that includes the code (documented, inline, as

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[1] https://www.um.edu.mt/__data/assets/pdf_file/0007/436651/UniversityGuidelinesonPlagiarism.

required). You must also submit a scanned, signed copy of the plagiarism form as part of your documentation.

Paper Structure

As an indication, your paper is expected to follow the following points and structure (you can create further sub-sections if you deem that the outcome will make the paper more readable and structured):

1. Title – indicative of your approach/technique **(2 marks)**

2. Abstract

   - Not more than 100 words description of your work

(8 marks)

3. Introduction

   - Brief description of algorithmic trading and the problem being addressed.

   - Briefly discuss and refer to findings from recent literature on the application of AI/ML in this domain.

   - Explain briefly your proposed approach.

   - Clearly define aim and objectives. Explain what you are trying to optimise (profit? Risk? Both?).

   - Briefly highlight the main conclusions or contributions of your work.

(15 marks)

4. Background and Literature Review

   - From recent literature, provide an overview of how AI/ML techniques are applied in the algorithmic trading domain.

   - Provide technical background on the AI/ML technique you are proposing.

   - Give reasons why you selected your proposed approach.

   - In your references and descriptions, provide a critical analysis of existing work, indicating, possibly, any gaps or "weaknesses" that will be addressed in your approach.

(20 marks)

5. Methodology

   - Overview of your approach. Describe the experiment/s you intend doing and how they are addressing the objectives defined in the introduction.

   - Model Description - Detailed explanation of your selected model features and your reasoning behind their selection. Your description should also explain any data pre-processing methods applied and the rationale behind choosing the specific methods.

   - Configurations and parameters that will be tested, including the rationale why these were selected and how they will be optimised in-sample prior to out-of-sample evaluation.

   - Model evaluation – how you intend to evaluate the chosen AI/ML model performance. Also, include a description of the data that you will be using for your experiment, including the underlying distributions. Your description should also include your rationale in choosing the

specific data/instruments. To maximize the strength of your arguments/contributions, it is suggested that in terms of dataset, you select a dataset (instrument/s and period) that was utilized in a published paper of your choice – This can be utilized to compare against and aid your results discussion. Replicating a benchmark paper is NOT in the scope of the assignment, however you should indicate the steps taken to compare your model as fairly as possible.

- In addition, as part of your methodology you should compare against standard benchmark model/s (e.g., buy and hold, random model or other models/results from existing literature).

- Description of your trading algorithm, applied trading strategy, constraints and parameters (e.g. transaction costs).

(25 marks)

6. Results and discussion

- Present and discuss results from the proposed AI/ML model.

- Present and discuss results in view of selected benchmark models and benchmark paper.

- Discuss variations in results between your proposed model and selected benchmark/s, attributing any benefits (or not) of your proposed AI/ML model.

- Discuss the results in view of the objectives identified in the introduction.

(25 marks)

7. References and overall paper quality

We expect your work to be of adequate postgraduate-study level all-around (including formatting). Figures and tables should i) have captions and be numbered, ii) have axes labels (and units), and iii) should be linked to the text and discussion. Mathematical formulas should be labelled and explained. Ample references should be presented in a correct (i.e. consistent) format. Sectioning should be logical (as per tasks described in this document) and clearly labelled. Furthermore, we expect you to proof-read your report carefully.

(5 marks)

Grading Criteria

The following criteria will be taken into consideration when grading your assignment:

- The scientific/experiment methodology, method/s applied and the motivation behind your selection.

- Results robustness and solid conclusive outcomes.

- Creativity and originality in your proposed solutions.

- Academic writing skills.