Algorithmic Trading System Project Plans

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### Overview of Project

This project is to design an algorithmic trading system in a dynamically evolving way of tracking the asset class and market. Besides the traditional pre-trading design and prediction based on Real-time/Historic data, the Post-Trade analysis will include Data Optimisation and Model Optimization components which are the distinguishing features from the traditional trading system. The system will do the Post-Trade Analysis based on the machine learning algorithms implemented. We will design the algorithmic trading system; select and analysis algorithms to implement; choose historical data to simulate a algorithm trading process and write a report based on the performance and practicability.

Github repository: <https://github.com/tz1003/UCL_SDIC2022_Algorithm_Trading>

### Work Package Description

Use a table to describe each work package and subsidiary tasks, people responsible, duration and deliverables. A possible structure is given below:

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| **WP1:** **Pre-trading Design** | | | | | | | | |
| **Participant** | J.G., S.W, T.Z., X. Z | | **Duration** | 19/5/2022 – 08-06-2022 | | | **Deliverable** |  |
| *The Pre-Trading Design is the first part of the system we need to finish. Including the* Asset Optimization, Trading Environment. *Determine the asset will be used in our trading system and download data.*  At the same time, we need to write the Literature Review for our project | | | | | | | | |
| **T1.1 Literature Review** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Reading papers and Writing Literature Review.* | | | | | | | | |
| **T1.2 Trading Environment** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Infra-structure; Regulation constraints; Compliance considerations.* | | | | | | | | |
| **T1.3 Data access** | | | | | | | | |
| **Participant** | |  | **Duration** | |  | **Deliverable** | |  |
| *Determine and Download data. Construct a database for data storing if time allows.* | | | | | | | | |

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| **WP2: Real-time/Historic Data** | | | | | | | | |
| **Participant** |  | | **Duration** | | 09/06/2022 – 15/06/2022 | **Deliverable** | |  |
| *In this part, We will be doing the price prediction based on the acquired price data and considered environment impacts or social concerns, etc.* | | | | | | | | |
| **T2.1 Data Cleansing** | | | | | | | | |
| **Participant** |  | | **Duration** | |  | **Deliverable** | |  |
| *Cleaning data that will drive our algorithmic trading.* | | | | | | | | |
| **T2.1 Price prediction** | | | | | | | | |
| **Participant** | |  | | **Duration** |  | **Deliverable** |  | |
| *Considering the important informations we need for the data in order to have a better price prediction.* | | | | | | | | |  |  |  |  |  |

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| **WP3: Data Optimization** | | | | | | | | |
| **Participant** | S.W, X. Z | | **Duration** | 16/06/2022 –10/08/2022 | | | **Deliverable** |  |
| *The Data Optimisation is the firt part of the Post-Trade Analysis. Features and algorithms will be selected and implemented for the algorithmic trading system.* | | | | | | | | |
| **T3.1 Feature selection** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Choose and use features like Covariance Threshold, Shrinkage methods, etc. Gives detailed mathematical explanation of each method used and their implementation.* | | | | | | | | |
| **T3.2 Feature mapping** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Using methods like Nystrom, Isomap to optimize our data for better fitting and performance in the model optimization part.* | | | | | | | | |
| **T3.3** | | | | | | | | |
| **Participant** | |  | **Duration** | |  | **Deliverable** | |  |
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| **WP4: Model Optimization** | | | | | | | | |
| **Participant** | J.G., T.Z. | | **Duration** | 16/6/2022 – 10/08/2022 | | | **Deliverable** |  |
| *In this part, We will be selecting and training 5 models based on optimazed data.* | | | | | | | | |
| **T4.1 Model selection** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Reading papers and Writing Literature Review. Mainly search literatures related to application of machine learning on financial data.* | | | | | | | | |
| **T4.2 Model training** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Firstly develop a backtesting system to check the performance of models on historical data.* | | | | | | | | |
| **T4.3 Hyper-parameter tuning** | | | | | | | | |
| **Participant** | |  | **Duration** | |  | **Deliverable** | |  |
| *Find the best combination for the hyper-parameter given the best score, evaluated by several metrics(i.e. sharp ratio).* | | | | | | | | |

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| **WP5: Trading Execution** | | | | | | | | |
| **Participant** | J.G., T.Z., S.W, X. Z | | **Duration** | 11/8/2022 – 31/8/2022 | | | **Deliverable** |  |
| *Executing orders for the selected asset* | | | | | | | | |
| **T5.1 Portfolio Optimization** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Using machine Learning algorithms to find the best portfolio* | | | | | | | | |
| **T5.2 Trading Model** | | | | | | | | |
| **Participant** |  | | **Duration** |  | | | **Deliverable** |  |
| *Infra-structure; Regulation constraints; Compliance considerations* | | | | | | | | |
| **T5.3 Accumulation** | | | | | | | | |
| **Participant** | |  | **Duration** | |  | **Deliverable** | |  |
| *Wrapping up the trading system. Finishing the dissertation.* | | | | | | | | |

### Gantt Chart

Also useful is a timetable – such as a Gantt chart – showing the estimated duration of each work package and task. Depending on the duration of the project,

|  |  | **Weeks/Months 1-12** | | | | | | | | | | | | | | |
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|  |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** |
| **WP1: Pre-trading Design** | | | | | | | | | | | | | |  |  |  |
| T1.1 | Literature Riview |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1.2 | Trading Environment |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1.3 | Data access |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **WP2: Real time/Historical Data** | | | | | | | | | | | | | |  |  |  |
| T2.1 | Data Cleansing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.2 | Price predication |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **WP3: Data Optimization** | | | | | | | | | | | | | |  |  |  |
| T3.1 | Feature selection |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T3.2 | Feature Mapping |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **WP4: Model Optimization** | | | | | | | | | | | | | | | | |
| T4.1 | Model selection |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T4.2 | Model training |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T4.2 | Hyper-parameter tuning |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **WP5: Trading Execution** | | | | | | | | | | | | | | | | |
| T5.1 | Portfolio Optimization |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T5.2 | Trading Model |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T5.3 | Accumulation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Week 1: 16th May to 22nd May

Week 5: 13th June to 19th June

Week 10: 18th July to 24th July

Week 15: 22nd August to 28th August