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Project Plan

Project Topic Development of an Automated GBP/USD Forex Trading Bot Using ML Algorithms

Research Question: How can machine learning algorithms (GRU, XGBoost, and Random Forest) be compared to develop the most profitable automated trading bot for the GBP/USD Forex market?

Project objectives:

- Collect, preprocess historical Forex data for GBP/USD and perform EDA to understand & identify patterns.
- Develop and evaluate the performance of three machine learning models (GRU, XGBOOST, and Random Forest models) in predicting Forex price movements
- Implement a simple trading strategy for each model and simulate trades using a back testing approach.
- Analyze the trading results for each model to determine profitability, considering factors like total returns, Sharpe ratio, and drawdown.
- Compare the models based on evaluation metrics and profitability analysis to identify the best model for the trading bot.

Summary of Project and Background

Forex price movements are affected by numerous outside factors, making them hard to forecast. Therefore, modelling these movements could lead to highly profitable investment strategies (Santuci et al., 2022). The foreign exchange (Forex) market is the largest financial market in the world, with a daily trading volume of $6.6 trillion. The GBP/USD currency pair is one of the most frequently traded pairs. Forex trading offers many opportunities but also comes with risks due to market changes. According to Mesleh and Mahmoud (2021), many experts believe that 60% of Forex trading volume is handled by automated algorithms, especially in developing countries.

This project is inspired by research such as that of Loh et al. (2021), which explores the use of ensembles of machine learning models for Forex trading. It will focus on three specific models: Gated Recurrent Unit (GRU), Extreme Gradient Boosting (XGBoost), and Random Forest. These models are known for their effectiveness in time series forecasting, making them suitable for predicting future currency price movements.

The aim of this project is to create an automated trading bot for the GBP/USD Forex market using machine learning algorithms. By analyzing historical Forex data, the project will employ GRU, XGBoost, and Random Forest to predict future price movements. These predictions will help the trading bot make automatic trades. The goal is to develop a system that can trade profitably by using advanced algorithms to understand market trends and make quick decisions. The performance of the trading bot will be evaluated based on various metrics and profitability analysis to identify the best model for trading.

The historical data, sourced from Yahoo Finance, covers over 20 years and will be used to train, test, and validate the models. The performance of the trading bot will be evaluated by testing it on this data to determine if it can be profitable and manage risks effectively.

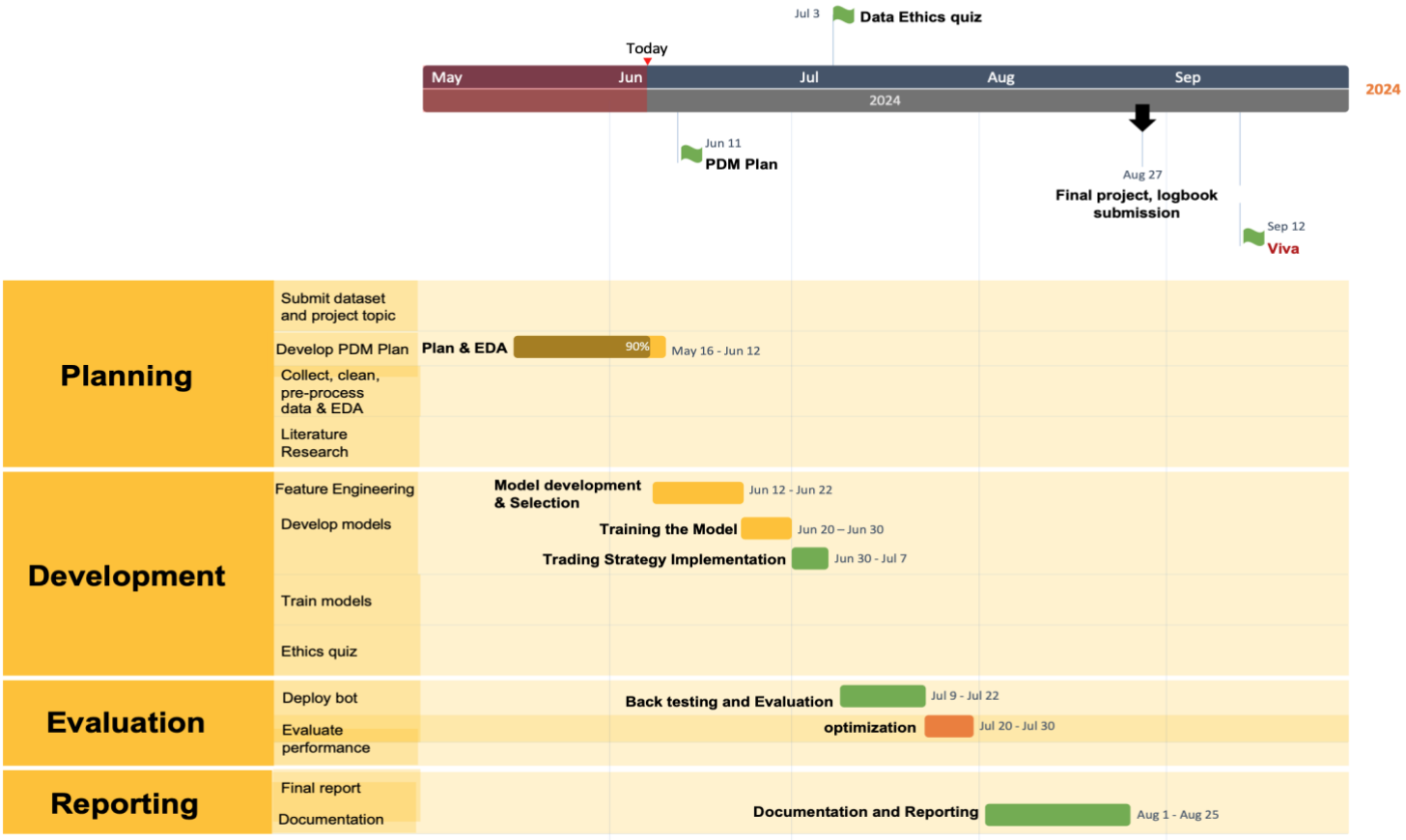
Reference List

Leonard Kin Yung Loh , Hee Kheng Kueh, Nirav Janak Parikh, Harry Chan, Nicholas Jun Hui Ho and Matthew Chin Heng Chua (2022) An Ensembling Architecture Incorporating Machine Learning Models and Genetic Algorithm Optimization for Forex Trading. Available at: https://go.exlibris.link/Xmd96n40

Mesleh, Mahmoud; Kiranyaz, Mustafa (2021) Short-Term Financial Data Prediction by Long-Term Regression. *2021 IEEE 23rd Int Conf on High Performance Computing & Communications*. pp. 1304-1309Available at: https://go.exlibris.link/mqxqT57m

Santuci, A., Sbruzzi, E., Araújo-Filho, L. and Leles, M. (2022) 'Evaluation of FOREX trading Strategies based in Random Forest and Support Vector Machines', IEEE Latin America Transactions, vol. 20, no. 9, pp. 2146-2152. Available at: https://ieeexplore.ieee.org/document/9878170

Project Timeline: Gantt Chart



Task List:

Task	Description	Start date	End date
PDM Plan	Develop PDM plan, submit and present the PDM Plan	22/05/2024	11/06/2024
Data Collection	Collect and preprocess historical GBP/USD data from Yahoo Finance	22/05/2024	12/06/2024
Literature Review	Conduct a comprehensive review of existing literature on forex market prediction	22/05/2024	12/06/2024
Data Preprocessing and EDA	Clean and preprocess data, perform exploratory data analysis	30/05/2024	12/06/2024
Feature Engineering	Add technical indicators like EMAs, RSI, and MACD	11/06/2024	17/06/2024
Model Development	Develop and train GRU, XGBoost, and Random Forest	15/06/2024	19/06/2024
Trading Strategy	Define and implement trading strategy on the models	19/06/2024	27/06/2024
Trading Stimulation	Simulate trades using a back testing approach.	25/06/2024	30/06/2024
Data Ethics Quiz	Prepare and take the quiz	26/06/204	03/07/2024
Profitability Analysis	Analyze the trading results for each model to determine profitability, considering factors like total returns, Sharpe ratio, and drawdown	01/07/2024	12/07/2024
Comparison and Conclusion	Compare the models based on evaluation metrics and profitability analysis to identify the best model for the trading bot.	01/08/2024	25/08/2024

Data Management Plan

Data Collection:

- **Source:** Yahoo Finance
- **Dataset URL:** Yahoo Finance GBP/USD Historical Data
- **Date Range:** December 01, 2003 - May 29, 2024

Overview of Dataset:

Background: The data is collected from Yahoo Finance, a reputable financial data provider. It includes daily historical price data for the GBP/USD currency pair.

Data Details: The dataset contains records for open, high, low, close, adj close prices, and trading volume for each day within the specified date range.

Summary of Data:

Format: CSV

Number of Records: The dataset is 5,348 (daily data for over 20 years)

Size: 301 KB for the dataset and the expected code file will be Megabyte (MB)

Ethical Requirement:

GDPR Compliance: The data is publicly available and does not include personal information

Ethical Policy Compliance: Use of data is in accordance with Yahoo Finance's terms of service and UH ethical guidelines.

Code File: I will be using Google Colab and Python for the implementation

Document Control:

File Name: GBPUSD_HistoricalData.csv

Version Control: I will use GitHub for tracking code versions and changes.

GitHub Repository: Cynthia's GitHub link

Metadata:

User Documents: A README file that entails full documentation on dataset, preprocessing steps, and usage instructions.

Security & Storage:

Backups: I will back up the code weekly on Github, OneDrive and Google drive

Data Sharing: I will share with the project supervisor via GitHub link.