**Report Template for ITP4514 Group Assignment**

Points to note:

* Please delete all unnecessary words in the template.
* Project Cover Page, Table of Contents, References & Appendix pages do not count for words
* You must start a new page for each section.
* Font-family: Times New Roman
* Font Size: 12px for body; 9px for image caption, 10px for reference list
* Spacing: 1.5

ITP4514 Artificial Intelligence and Machine Learning

Group Assignment

**[Stock prediction AI]**

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| --- | --- | --- |
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*(Include your* ***Table of Contents*** *with the following elements* ***with page number*** *on this Page)*

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# Introduction / Background

As students pursuing the IVE Software Engineering Advanced Diploma, we are embarking on an exciting project in the ITP4514 subject that focuses on utilizing artificial intelligence (AI) to analyze stock trends. This project aims to explore the potential of AI techniques in the context of stock market analysis, with a specific focus on integrating LSTM stock prediction, Informer, Pandas, and the ARIMA model.

AI has emerged as a transformative force in various industries, and the finance sector is no exception. Leveraging the power of AI algorithms and models, we aim to revolutionize the way stock market trends are analyzed and predicted. By harnessing the potential of LSTM stock prediction, we seek to train models that can effectively capture and forecast stock price trends.

LSTM (Long Short-Term Memory) has gained significant attention as a powerful deep learning model for time series analysis, making it particularly suitable for stock market prediction. By leveraging its ability to capture long-term dependencies in sequential data, LSTM models can learn intricate patterns and trends, enabling more accurate predictions. In our project, we will apply LSTM stock prediction techniques to train models that can forecast stock prices and identify potential trends.

To further enhance the analysis of stock trends, we will integrate the Informer framework into our project. Informer is a cutting-edge self-attention-based sequence modeling framework that enables effective capture of long-term dependencies and multi-scale feature extraction. By incorporating Informer, we aim to extract deeper insights from time series data, allowing us to uncover hidden patterns and trends in stock market behavior.

Pandas, a widely used data manipulation library in Python, will be employed for data preprocessing and management. Its comprehensive set of tools and functions for handling time series data will facilitate efficient handling of stock market datasets. We will leverage Pandas to address challenges such as missing data, data smoothing, and organizing data into suitable formats for analysis with AI models.

Additionally, we will incorporate the ARIMA (AutoRegressive Integrated Moving Average) model into our project. ARIMA models are widely recognized for their effectiveness in analyzing time series data and identifying underlying patterns and trends. By integrating ARIMA with LSTM stock prediction, we aim to create a robust prediction framework that leverages the strengths of both approaches.

Through the integration of LSTM stock prediction, Informer, Pandas, and the ARIMA model, this project seeks to provide valuable insights into stock market trends. By harnessing the power of AI techniques and comprehensive data analysis tools, we aim to empower investors, traders, and financial analysts with enhanced decision-making capabilities. Our endeavor is to contribute to the realm of AI-driven stock market analysis and potentially improve investment strategies through a deeper understanding of stock trends.

一張含有 文字, 螢幕擷取畫面, 數字, 軟體 的圖片

自動產生的描述

The above pictures are some examples of the data used in our stock prediction AI project. The data is about the Hang Seng Index from October to November.

# Problem Formulation

1. **Data Availability and Comprehensiveness:** One potential challenge is ensuring that we have access to comprehensive and reliable stock market data. The quality and breadth of the data we use can significantly impact the accuracy and effectiveness of our AI models. Ensuring that the data we gather covers a wide range of stocks, includes relevant attributes, and is free from biases or inaccuracies is crucial.
2. **Lack of Domain Knowledge:** Adequate understanding of the stock market domain is essential for designing effective AI models and interpreting the results. It is important for us to have a solid grasp of key concepts such as stock market dynamics, factors influencing stock prices, and technical indicators.
3. **Model Selection and Parameter Tuning:** Choosing the right AI models, such as LSTM, Informer, Pandas, and ARIMA, requires careful consideration. Each model has its strengths and limitations, and selecting the most appropriate one for our specific project goals is crucial. Additionally, tuning the model's hyperparameters, such as learning rate, hidden state size, or attention head count, can significantly impact the model's performance. Experimentation and validation on different parameter settings may be necessary.
4. **Overfitting and Generalization:** Overfitting occurs when a model performs well on the training data but fails to generalize to unseen data. It is important for us to monitor and address overfitting issues to ensure that our AI models can make accurate predictions on new and unseen stock data. Techniques like regularization, cross-validation, and ensemble learning can help mitigate overfitting problems.
5. **Ethical Considerations:** As we analyze stock trends using AI, we must be mindful of the ethical implications. We should avoid using insider information or engaging in manipulative practices. Ensuring compliance with legal and regulatory frameworks governing stock market analysis and trading is essential.

# Methodology

In order to solve the above problems that may be encountered in this project, we have thought of the following 5 methods to solve them.

1. **Data Availability and Comprehensiveness:**

* Explore reputable financial data providers or APIs that offer comprehensive and reliable stock market data.
* Consider utilizing multiple data sources to cross-validate and ensure the accuracy and comprehensiveness of the data.
* Implement data cleaning and preprocessing techniques to handle missing values, outliers, and inconsistencies.

1. **Lack of Domain Knowledge:**

* Engage in extensive research on stock market dynamics, technical indicators, and factors influencing stock prices.
* Seek guidance from finance professionals, professors, or experts in the field to acquire domain-specific knowledge.
* Attend webinars, workshops, or online courses focused on stock market analysis to enhance understanding.

1. **Model Selection and Parameter Tuning:**

* Conduct a thorough literature review and comparative analysis of different AI models (LSTM, Informer, ARIMA, etc.) to understand their strengths and limitations.
* Evaluate the performance of each model on historical data to identify the most suitable one for stock trend analysis.
* Utilize techniques such as grid search or random search to tune hyperparameters and optimize model performance.

1. **Overfitting and Generalization:**

* Split the available data into separate training, validation, and testing sets to assess the model's performance on unseen data.
* Implement regularization techniques like L1/L2 regularization or dropout layers to prevent overfitting.
* Apply cross-validation methods, such as k-fold cross-validation, to evaluate the model's generalization ability and identify potential issues.

1. **Ethical Considerations:**

* Familiarize yourselves with the legal and regulatory frameworks governing stock market analysis and trading.
* Adhere to ethical guidelines and avoid using insider information or engaging in manipulative practices.
* Consult with mentors, advisors, or professionals to ensure compliance with ethical standards and industry best practices.

Findings & Results

**ITP4514 Group Assignment Submission Checklist**

**Before the submission of my work, I (the signed party) admit that:**

*(Please tick the corresponding box.)*

Yes No

1. I do not ***DIRECTLY COPY*** from any internet resources. ⬜ ⬜
2. I do not copy from **other students’** work. ⬜ ⬜
3. I have **summarized/paraphrased** my work from different ⬜ ⬜

kinds of materials.

1. I have fulfilled the word limitations (i.e. exceeded the ⬜ ⬜

***minimum required words***).

1. My work contains ***more than one paragraphs***. ⬜ ⬜
2. With all my works that I have referred from different ⬜ ⬜

sources, I have performed ***sufficient referencing.***

1. **If any violations on the above rules are found,** ⬜ ⬜

**I acknowledge that my marks might / would be**

**deducted in certain proportion.**

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**(Date) (Signature)**