SCHOOL OF COMPUTING
Faculty of Engineering

Project Proposal Form MCST1043
Sem: 2 Session: 2024/25

SECTION A: Project Information.

Program Name:	**Masters of Science (Data Science)**
Subject Name:	**Project 1 (MCST1043)**
Student Name:	Mira Edora Binti Yunos
Metric Number:	MCS241057
Student Email & Phone:	miraedora@graduate.utm.my
Project Title:	Forecasting AirAsia's Profitability Based on Fuel Price Trends Using ARIMA and XGBoost
Supervisor 1:	
Supervisor 2 / Industry Advisor(if any):	

SECTION B: Project Proposal

Introduction:

> AirAsia, one of Asia's leading low-cost airlines, faces major challenges due to its high sensitivity to fuel prices. Fuel makes up about 30% of airline costs, and even small increases can significantly hurt profits—especially for budget carriers with thin margins. Despite AirAsia's use of digital tools like AI and predictive analytics, the company still struggles with external economic risks, particularly in fuel markets. Accurate fuel price forecasting is therefore crucial for managing financial risks and making long-term decisions.
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> In Malaysia, fuel prices like RON97 are closely tied to global oil prices and affected by factors such as exchange rates and taxes. While traditional methods like ARIMA have been used to predict these prices, newer machine learning models like XGBoost offer better performance by capturing complex, non-linear patterns and multiple variables.This project aims to forecast AirAsia's profitability by focusing on historical fuel price trends as the main cost driver. It combines ARIMA and XGBoost into a hybrid model to improve prediction accuracy. Unlike previous studies that used only statistical or ML methods, this approach uses the strengths of both to give more reliable insights. The goal is to help AirAsia build stronger financial planning and operational strategies in an unpredictable fuel market.

Problem Background:

> AirAsia, a leading low-cost airline, operates in a highly competitive and cost-sensitive industry where fuel costs can make up to 50% of total expenses. Rising volatility in global oil prices—driven by supply shocks, currency fluctuations, and changes in government policies—has made it difficult for AirAsia to maintain stable profits. While the airline has embraced digital tools like AI and predictive analytics to improve efficiency, it still faces major financial risks due to unpredictable fuel prices.
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> Traditional forecasting methods like ARIMA are good at predicting linear trends but struggle with complex fuel price patterns. Hybrid models that combine ARIMA with machine learning techniques such as XGBoost have shown better results in other industries, yet their use in aviation profitability forecasting—especially in Malaysia—is limited. In Malaysia, fuel prices change weekly based on international markets and local policies, but lack of access to key data makes accurate predictions challenging. This project aims to address this gap by developing a hybrid forecasting model using historical fuel price data to help AirAsia better anticipate profitability and support more informed, data-driven decisions.

Problem Statement:

> Currently, there is no specialized forecasting model that effectively measures how fuel price changes impact the profitability of low-cost airlines like AirAsia. Traditional methods like ARIMA are useful for tracking trends over time but struggle with the complex, nonlinear factors that influence fuel prices and airline costs—such as global oil markets, exchange rates, and economic shifts. This is a major issue in an industry where fuel makes up a large portion of expenses and profit margins are slim. To address this, this project develops a hybrid model combining ARIMA for trend analysis and XGBoost for advanced pattern recognition. By analyzing historical data, the model will predict fuel price trends and their effect on AirAsia's profits, offering a more accurate and flexible tool for financial planning. The goal is to provide insights that help AirAsia make smarter decisions, manage risks better, and build stronger strategies to stay financially stable in a volatile market.

Aim of the Project:

To develop a hybrid forecasting model that combines ARIMA and XGBoost to accurately predict AirAsia's profitability based on historical fuel price trends, enabling better financial planning, risk management, and strategic decision-making in the context of fuel price volatility.

Objectives of the Project:
1.   To develop and apply an ARIMA model to forecast fuel price trends over time.

2. To utilize XGBoost to model the nonlinear relationships between fuel prices and AirAsia's profitability.
3. To integrate both models into a hybrid framework to improve the accuracy of financial forecasting.

Scopes of the Project:
1. The project focuses on forecasting the profitability of AirAsia in relation to fuel price trends in Malaysia.
2. Historical data on fuel prices and AirAsia's financial performance will be utilized, primarily from open data platforms or official reports.
3. The study applies ARIMA for time series analysis and XGBoost for structured data modeling, combining them into a hybrid forecasting model.

Expected Contribution of the Project:

1. Develop a robust hybrid forecasting model integrating ARIMA and XGBoost.
2. Accurately predict AirAsia's profitability based on historical fuel price trends.
3. Provide insights into the impact of fuel price volatility on airline financial performance.
4. Support strategic planning and risk mitigation for airline operations.

Project Requirements:

Software:	• Python • Google Colab • Microsoft • CSV file reader
Hardware:	Personal Laptop with minimum 8 GB RAM.
Technology/Technique/ Methodology/Algorithm:	• Time Sries Forecasting using ARIMA • XGBoost • Feature Engineering • Model Evaluation using MAE and RMSE

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Type of Project (Focusing on Data Science):

[ ] ..Data Preparation and Modeling...

[ ] ..Data Analysis and Visualization..

[ ] ..Business Intelligence and Analytics..

[X] ..Machine Learning and Prediction..

[ ] .....Data Science Application in Business Domain...........................

Status of Project:

[X] ..New........

[ ] ..Continued

If continued, what is
the previous title?   ....

SECTION C: Declaration

I declare that this project is proposed by:

[X] ..Myself...

[ ] .....Supervisor/Industry Advisor (   )

Student Name: ....

....
Signature   **Date**

SECTION D: Supervisor Acknowledgement

The Supervisor(s) shall complete this section.

I/We agree to become the supervisor(s) for this student under aforesaid proposed title.

Name of Supervisor 1:   ....

....
Signature   **Date**

Name of Supervisor 2 (if any):   ....

....
Signature   **Date**

SECTION E: Evaluation Panel Approval

The Evaluator(s) shall complete this section.

Result:
[ ] FULL APPROVAL   [ ] CONDITIONAL APPROVAL (Major)*
[ ] CONDITIONAL APPROVAL (Minor)   [ ] FAIL*
* Student has to submit new proposal form considering the evaluators' comments.

Comments:

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Project1 Proposal Form MSc (Data Science)

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Name of Evaluator 1:

Signature   **Date**

Name of Evaluator 2:

Signature   **Date**