



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

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: Nur Aina Farraain Binti Zahanizam

Metric Number: MCS241053

Student Email & Phone: nurainafarraain@graduate.utm.my | 01131984323

Project Title: Machine Learning for Sustainable Energy Management in Southeast Asian Oil and Gas Industries

Supervisor 1:

Supervisor 2 / Industry Advisor(if any):

SECTION B: Project Proposal

Introduction:

The oil and gas industry in Southeast Asia (SEA) is a major contributor to the global energy production. However, the region shifts towards a more sustainable energy model resulting to both challenge and opportunities in integrating renewable energy sources into the oil and gas operations. Here, we present the system that optimize the oil and gas energy management in SEA by utilizing the machine learning. The system will be used to forecast the energy demand and renewable energy supply to reduce the dependency on fossil fuel and minimize the environmental effect.

Problem Background:

Southeast Asia's oil and gas industry faces increasing pressure to integrate renewable energy into its operation, reducing the emission and improving sustainability. However, it becomes a challenge to ensure a reliable energy supply for oil and gas production due to the intermittent nature of the renewable sources. In addition, the existing system are incapable in handling the complexity of balancing renewable energy with traditional consumption in real time despite the considerable potential of advanced techniques such as machine learning to optimize energy usage and renewable energy integration. This project aims to fill this gap by proposing machine learning based optimization system tailored for SEAs oil and gas sector.

Problem Statement:

Although the investment for renewable energy in Southeast Asia oil and gas sector is growing, the industry still lacking of machine learning based solution that effectively optimize the integration of renewable energy with conventional energy sources. The increasing of operational cost and higher emissions are the result from the lack of real time optimization and energy demand prediction system. To optimize the energy usage in oil and gas operation while supporting the sustainability effort in southeast asia, the objective of this project is to develop a machine learning system that will predict renewable energy supply and energy demand in real time,

Aim of the Project:

This project aims to develop a machine learning-based system that optimize the integration of renewable energy into oil and gas operations in Southeast Asia. In this system, it will predict the energy demand and renewable energy availability to balance both energy source efficiently by using real time machine learning models. The system will aim to help reducing the reliance on fossil fuels, minimize emission and improve operational efficiency.

Objectives of the Project:

1. To perform pre-processing and analysis on datasets related to energy consumption and renewable energy production from Southeast Asian countries to gain insight for model training.
2. To develop machine learning models that can predict energy demand and renewable energy availability in the region. To perform pre-processing and analysis on a given set of datasets to gain insights on the
3. To design and implement an optimization algorithm that balances renewable and non-renewable energy usage.

Scopes of the Project:

1. The project will focus on Southeast Asia countries that are major in oil and gas produces and adopting renewable energy sources.
2. The project will using open-source datasets from the International Energy Agency (IEA), World Bank, Kaggle and OpenEI focusing on energy consumption and oil and gas production.
3. This project involves learning machine learning skills.

Expected Contribution of the Project:

1. Machine learning based approach that optimizes renewable energy integration into oil and gas operation.
2. The system will predict the energy demand and renewable energy availability to ensure the efficient use of resource.
3. I hope in the future; this project will provide valuable insight for the region energy transition.

Project Requirements:

Software:	● Programming Language: Python
	● Libraries/Frameworks: TensorFlow, Keras, Scikit-learn, Pandas, NumPy, Matplotlib
Hardware:	● Dev Environment: Jupyter Notebook, Anaconda
	● CPU: Intel i5 or equivalent (16 GB recommended for large datasets)
Technology/Technique/ Methodology/Algorithm:	● RAM: Minimum of 8 GB
	● Storage: At least 50 GB of free space
	● GPU: Preferred for training complex models
	● Machine Learning Techniques: Time-Series Forecasting, Regression Models, Neural Networks
	● Data Handling: Data Preprocessing, Exploratory Data Analysis (EDA)
	● Optimization: Google OR-Tools, Reinforcement Learning

Type of Project (Focusing on Data Science):

- [✓] Data Preparation and Modeling
- [✓] Data Analysis and Visualization
- [✓] Business Intelligence and Analytics
- [✓] Machine Learning and Prediction
- [✓] Data Science Application in Business Domain

Status of Project:

[] Continued

SECTION C: Declaration

[✓] Myself

[] Supervisor/Industry Advisor ()

7th April 2025

Date _____

SECTION D: Supervisor Acknowledgement

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

Signature

.....
Date

Signature

.....
Date

SECTION E: Evaluation Panel Approval

Result:

[] FULL APPROVAL

[] CONDITIONAL APPROVAL (Major)*

[] CONDITIONAL APPROVAL (Minor)

[] FAIL*

* Student has to submit new proposal form considering the evaluators' comments.

Handwriting practice area with 20 horizontal dotted lines.

Name of Evaluator 1: _____

Signature

Date

Name of Evaluator 2:

Signature

Date