



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

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Project Title: Flood Risk Assessment for Real Estate in West Malaysia Using Machine Learning

Supervisor 1:

Supervisor 2 / Industry

Advisor(if any):

SECTION B: Project Proposal

Introduction:

Climate change poses significant threat to the global real estate market as the extreme weather events like floods are disrupting property value and investment stability. In West Malaysia, coastal state such as Selangor, Penang and Kelantan are faces to the increasing flood risk as those states are vulnerable to monsoonal rains, rising sea level and the rapid urbanization. Current risk assessment models remain insufficient as it does not address this hazard which threaten real estate portfolios, insurance liabilities and urban planning. Malaysia's current risk assessment tools have limitation as it often relies on global dataset, static risk model and lack of transparency and fairness. Here, we present a project that aim to develop a machine learning (ML) system to predict flood risk for real estate in West Malaysia, thereby will enable proactive city planning and financial management.

Problem Background:

As the climate change worsen, the property devaluation becomes one of the biggest concerns in real estate market. This is a challenge for West Malaysian real estate market as most of the states are exposed to the potential floods. It is reported that total loss was RM0.6 billion for flood alone in 2022. The current risk assessment model relies on outdated flood map and manual inspection thus suffer from critical shortcomings. In addition, it is geographically limited, temporally static and opaque which leave Malaysia unprepared for escalating climate risks.

Problem Statement:

The escalation of climate-driven floods in west Malaysia demands an automated, localized, and explainable flood risk assessment system for real estate. The real difficulty is to capture hyperlocal risks as previous model used coarse data. Besides, the model does not address dynamic climate scenarios and the temporal pattern as it based on static risk projections. In addition, the current ML tools lack comprehensibility and is risking biased outcomes for marginalized communities. This project aims to bridge these gaps by developing a scalable, equitable ML system for real-time flood risk assessment.

Aim of the Project:

To design a machine learning framework that integrates localized geospatial data, dynamic climate projections, and explainable AI to predict flood risks for real estate in West Malaysia, enabling data-driven financial and urban resilience strategies.

Objectives of the Project:

1. To develop a localized flood risk model using high-resolution data and mathematical spatial interpolation techniques
 2. To incorporate time-series climate projections and monsoon patterns to stimulate future risks.
 3. To create an interpretable model using SHAP/LIME to ensure transparency and fairness in risk scoring
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Scopes of the Project:

1. The scope of the analysis is confined to the dataset presented (JPS flood maps, JPPH property prices, MetMalaysia rainfall data, LiDAR/JUPEM elevation data)
 2. The analysis is not limited to textual data, it is multimodal data (geospatial, temporal, climate)
 3. The analysis involves learning geospatial Machine Learning skills, climate projection and fairness checks.
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Expected Contribution of the Project:

1. The system will predict the flood risk based on geospatial Machine learning
 2. The robust time-series framework will assist to stimulate risks under RCP 8.5 climate scenarios.
 3. We hope this project will be an open-source AI toolkit for equitable risk assessment, followed the Bank Negara Malaysia's climate requirement
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Project Requirements:

Technology/Technique/ Methodology/Algorithm:	Software:	• Programming Language: Python
		• Libraries/Frameworks: geopandas, xgboost, shap, TensorFlow, Scikit-learn, Pandas, NumPy, Matplotlib
	Hardware:	• Dev Environment: Jupyter Notebook, Google Earth Engine
		• CPU: Intel i5 or equivalent (16 GB recommended for large datasets)
		• RAM: Minimum of 8 GB
		• Storage: At least 50 GB of free space
		• GPU: Preferred for training complex models
		• Machine Learning Techniques: Random Forest, LSTM
		• Data Handling: Geospatial joins, rainfall interpolation, SHAP
		• Optimization: Google OR-Tools, Reinforcement Learning

Type of Project (Focusing on Data Science):

- | | |
|-----------------------------------------|---------------------------------------------|
| [<input checked="" type="checkbox"/>] | Data Preparation and Modeling |
| [<input checked="" type="checkbox"/>] | Data Analysis and Visualization |
| [<input type="checkbox"/>] | Business Intelligence and Analytics |
| [<input checked="" type="checkbox"/>] | Machine Learning and Prediction |
| [<input checked="" type="checkbox"/>] | Data Science Application in Business Domain |
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Status of Project:

[☒] New
[☐] Continued

If continued, what is the previous title? _____

SECTION C: Declaration

I declare that this project is proposed by:

[☒] Myself
[☐] Supervisor/Industry Advisor (_____)

Student Name: Nur Aina Farraain Binti Zahanizam

Signature

17th April 2025

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:

Name of Evaluator 1:

Name of Evaluator 2:	Signature	Date
	Signature	Date