



**AY 2024/2025 Trimester 2**

**AAI2002-ITP: Cross Domain Prototyping  
Project Plan**

**Done by:**

<b>Student Name</b>	<b>Student ID</b>
Javier Si Zhao Hong	2302655
Rianna Sophia Mendoza Hudencial	2303254
Wong Jun Kai	2302765
Brian Tham	2302672

**Declaration:**

We hereby pledge that this task is not plagiarised and has been written wholly as a result of our own research and compilation of information.

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# Project Summary

This project aims to develop an advanced property analytics system that leverages artificial intelligence to transform real estate decision-making. The system combines four key predictive components to provide comprehensive property insights through a sophisticated XGBoost machine learning model.

The primary focus is on delivering accurate property valuations and market insights through four integrated modules. The Property Price Forecasting component will analyze critical property features to generate price predictions. The Market Trend Analysis module will allow property owners to understand pricing patterns and market dynamics. Rental Yield Prediction system will calculate potential returns by integrating property values with rental data. Finally the demand forecasting component will predict market demand Trends over weekly to monthly timeframes.

From a technical perspective, the system will be developed using Docker containers for local implementation before being deployed on AWS infrastructure. Rather than utilizing Amazon SageMaker, the system will employ AWS ECS or EKS for enhanced execution capabilities. The architecture incorporates various AWS services including Lambda for API functionality, ensuring scalable and efficient operation.

Dataset Links:

1. **Resale Flat Prices** - <https://data.gov.sg/datasets?topics=housing&page=1&resultId=189>
2. **Renting Out of Flats 2024** - [https://data.gov.sg/datasets/d\\_c9f57187485a850908655db0e8cfe651/view](https://data.gov.sg/datasets/d_c9f57187485a850908655db0e8cfe651/view)

## Deliverables

### 1. Predictive Models Development

**Property Price Forecasting Model:** Predict future HDB property prices based on historical transaction data and key market indicators.

**Market Trend Analysis Model:** Identify and analyze trends in the real estate market using machine learning algorithms.

**Rental Yield Prediction Model:** Estimate expected rental yields for different property types and locations.

**Demand Forecasting Model:** Predict future demand for HDB properties based on economic conditions and historical data.

**Prediction Timeframe:** Models will generate forecasts within a 2-week to 1-month timeframe.

## 2. Testing and Evaluation

- Conduct rigorous testing for each predictive model to ensure accuracy and reliability.
- Compare different models (e.g., LSTM, XGBoost, etc.) to determine the most effective approach for each prediction task.
- Document test results and findings for future optimisation.

## 3. Model Deployment and Hosting

- Deployment: Use Amazon ECR to store and manage dockerized AI model images.
- Logging and Version Control: Host an MLflow instance on ECS to track hyperparameters, log metrics, and store different model versions for reproducibility.

### Suggested ML Pipeline with AWS Services

Architecture Portion	Service Name	Description
Data Ingestion and Storage	Amazon S3 (Batch Data Storage)	Stores CSV datasets for model training
	AWS EventBridge (Triggering ML Pipeline)	Triggers the ML pipeline when new data arrives
Model Training and Deployment	AWS Step Functions	Automates and manages the ML training process
	Amazon ECS (Batch-enabled)	Runs training jobs using containerized models
	Amazon ECR	Stores the trained model in a container
API and Real-Time Predictions	AWS Lambda (Auto Scaling enabled)	Runs model predictions when needed
	AWS API Gateway	Provides an API for users to get predictions
Monitoring and Security	Amazon Cloudwatch	Monitors logs, failures and system performance
	AWS IAM	Manages access control and security policies
	MLflow (hosted on ECS)	Keeps track of model versions and performance

## 4. Documentation and Reporting

- Provide technical documentation covering the AI models and deployment process.
- Prepare a final report summarising key findings, model performance, and deployment outcomes.
- Ensure deliverables align with the project's high-level objectives and architecture.

## Task Allocation

To ensure the successful execution of the HDB E-Bidding AI project, the team has allocated specific responsibilities to each member, focusing on different aspects of predictive analytics. The tasks are strategically divided to cover property price forecasting, market trend analysis, rental yield prediction, and demand forecasting while also ensuring seamless deployment using Docker for model training and hosting on AWS.

Team Member	Task	Description
Javier	Property Price Forecasting	<p>Responsible for predicting HDB resale prices using key features such as location, street, and floor level.</p> <p>Forecasting will be conducted on a weekly (preferred) or monthly basis to provide timely insights.</p>
Rianna	Market Trend Analysis	<p>Focused on identifying patterns and trends in the HDB resale market.</p> <p>Uses historical price movements and macroeconomic indicators to analyze market fluctuations.</p> <p>Forecasting will be performed on a weekly or monthly basis.</p>
Brian	Rental Yield Prediction	Initially focused on predicting property prices, which will then be used to compute

		<p>rental yields.</p> <p>Develops a model to estimate rental returns based on resale prices and rental market conditions.</p> <p>Ensures that rental yield calculations are tied to property price forecasts for consistency.</p>
Jun Kai	Demand Forecasting	<p>Predicts future HDB resale demand trends based on historical transaction data and external factors.</p> <p>Analyzes buyer preferences, seasonality, and economic conditions to estimate future demand.</p> <p>Forecasting will be performed on a weekly to monthly basis, with a maximum outlook of one year.</p>
All members	Docker Implementation	<p>Containerizing AI models using Docker to facilitate reproducibility and efficient deployment.</p> <p>Ensuring model training, validation, and inference pipelines are properly configured within Docker environments.</p> <p>Deploying Dockerized models on AWS (e.g., AWS SageMaker, ECS, or Lambda) for cloud-based execution.</p>

		Implementing version control and tracking to maintain model updates and improvements over time.
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# Proj Timeline (Gantt Chart)

## PROJECT TIMELINE

PROJECT TITLE	AOP with AI Project	COMPANY NAME	Wizvision
PROJECT GROUP	AAI Group 1	DATE	2/18/25

PHASE	DETAILS	ITP 1			Term Break	ITP 2		
		JAN	FEB	MAR	APR	MAY	JUN	JUL
	PROJECT WEEK: Enter the date of the first Monday of each month -->	6 13 20 27	3 10 17 24	3 10 17 24 31	7 14 21 28	5 12 19 26	2 9 16 23 30	7 14 21 28
1	<b>Project Definition and Planning</b> - Project Planning - AI Model and Docker Sampling - Midterm Report	Project Planning	AI Model and Docker Sampling	Midterm Report				
2	<b>Project Launch &amp; Execution</b> - Execution					Execution		

Link: [https://docs.google.com/spreadsheets/d/1FBYvGyylopAFkYG4DK6PWT\\_Yi3gw\\_qoQ7ShJrtcxpbE/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1FBYvGyylopAFkYG4DK6PWT_Yi3gw_qoQ7ShJrtcxpbE/edit?usp=sharing)

### Project Definition and Planning (ITP 1)

#### 1. Project Planning

- Define project scope - identify objectives and key deliverables
- Define success metrics - KPIs and what defines a successful AI model
- Technology stack selection - choose tools/frameworks
- Milestone deadline: Mar 2 (Sun)

#### 2. AI Model and Docker Sampling

- Containerize the AI model(s) on Docker - convert models into Docker container, write Dockerfile to install dependencies and test container locally
- Set up Amazon ECS for model training - configure ECS to spin up containers for model training automatically; test if ECS can pull datasets, train models and store outputs properly
- Deploy model with Amazon ECR



- Integrate MLflow for model tracking - set up MLflow inside ECS for logging hyperparameters, metrics and model version; store different model versions for comparison
- Validate AI model in Docker - run end-to-end testing on Dockerized AI model
- Milestone deadline: Mar 28 (Fri)

### 3. Midterm Report

- 20-30 page report including background, literature review, problem statement, potential proposed solution, current work and prospects
- Milestone deadline: Mar 30 (Sun)