

FINAL YEAR PROJECT I

# PROPOSAL DEFENCE

**Forecasting Domestic  
Electricity Demand using  
Machine Learning**

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## FINAL YEAR PROJECT I

# Overview

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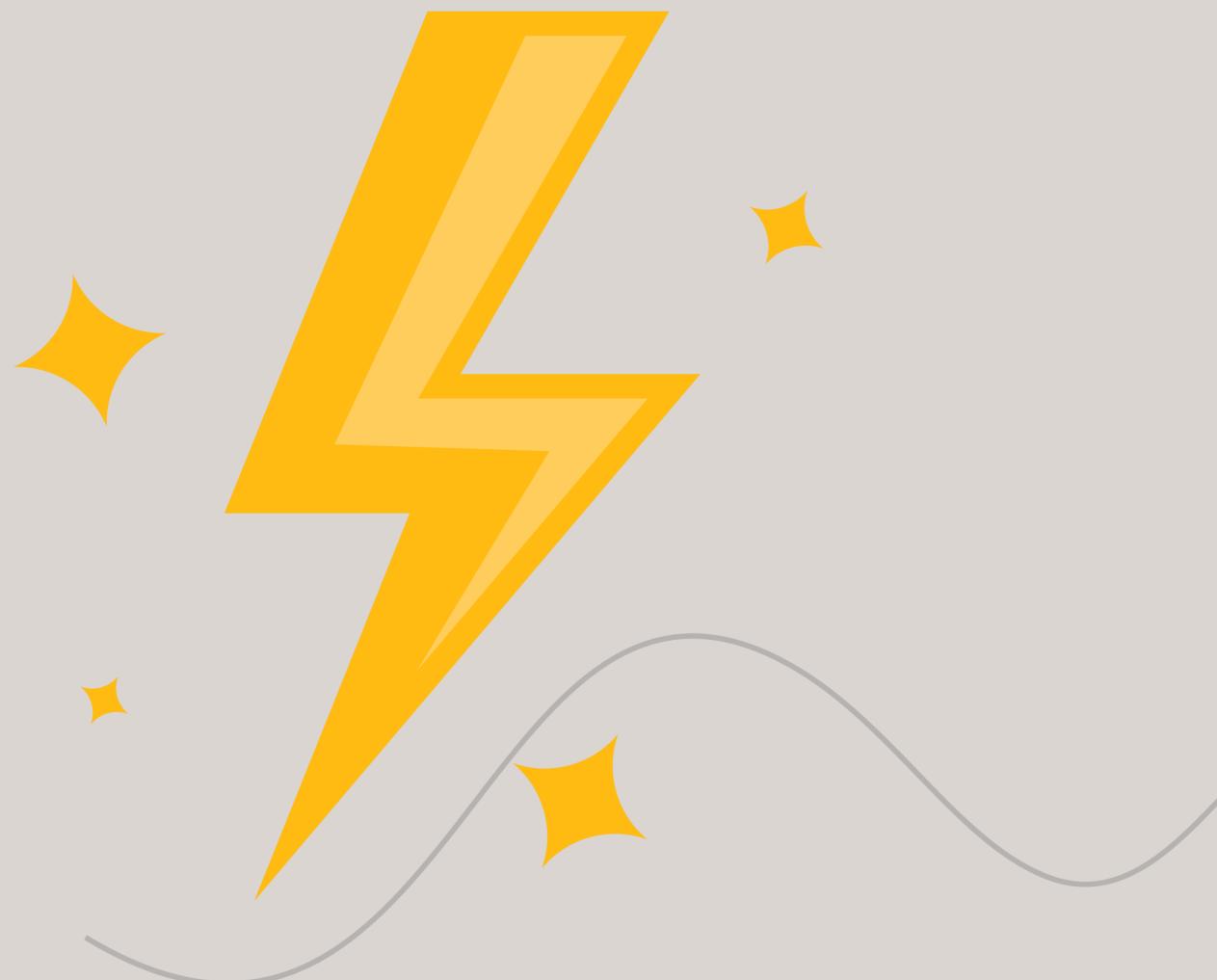
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# Introduction

One of the main issues facing modern civilization is the **depletion of the environment and energy efficiency.**

Forecasting domestic electricity demand abides **SDG 7: Affordable and Clean Energy** and **SDG 13: Climate Action.**

Through forecasting, utility companies can optimize the generation and distribution of electricity, reducing waste and improving efficiency. This helps reduce the overall carbon footprint of energy systems.



# Problem Statement

01

Existing forecasting methods often struggle to **account** for the **complex** and variable nature of residential energy use

02

Traditional statistical approaches may **fail** to capture the **nonlinear relationships** inherent in energy consumption data

03

**Limited number of studies** addressing day-ahead forecasting, which is critical for efficient energy planning and minimizing the risks of overproduction and underproduction.

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# Objectives

01

Developing a scalable  
deep learning model  
capable of handling  
varying numbers of  
households data

02

Extract novel domain-  
specific time series  
features that allows for  
deeper insights

03

Evaluate the proposed  
model extensively by  
comparing it to various  
machine learning and  
deep learning

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## Literature Review

Study Year	Algorithm	Application	Major Contribution	Outcomes
2020	Faster k-medoids clustering Support Vector Machine (SVM) Artificial Neural Network (ANN)	Forecasting electrical appliance consumption  Predicting customers' peak demand	Developed a hybrid machine learning method for forecasting appliance consumption and peak demand	This accuracy is reported to be significantly better than state-of-the-art methods in the same field
2022	Gaussian mixture clustering eXtreme Gradient Boosting (XGBoost) classification Artificial Neural Network (ANN)	Forecasting day-ahead electricity consumption for residential households, particularly where irregular human behavior occurs	Developed a novel approach to forecast residential electricity consumption using only fiscal smart meter data	When using the novel approach, Mean Absolute Percentage Error (MAPEd) was reduced by 7%

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## Literature Review

Study Year	Algorithm	Application	Major Contribution	Outcomes
2021	ARIMA TBATS	Analyzing energy consumption and production patterns in a household equipped with: Photovoltaic panels An energy management system	Analyzed patterns in electrical energy consumption and production for a house with photovoltaic panels	This result was significantly better than those obtained using neural forecasting methods

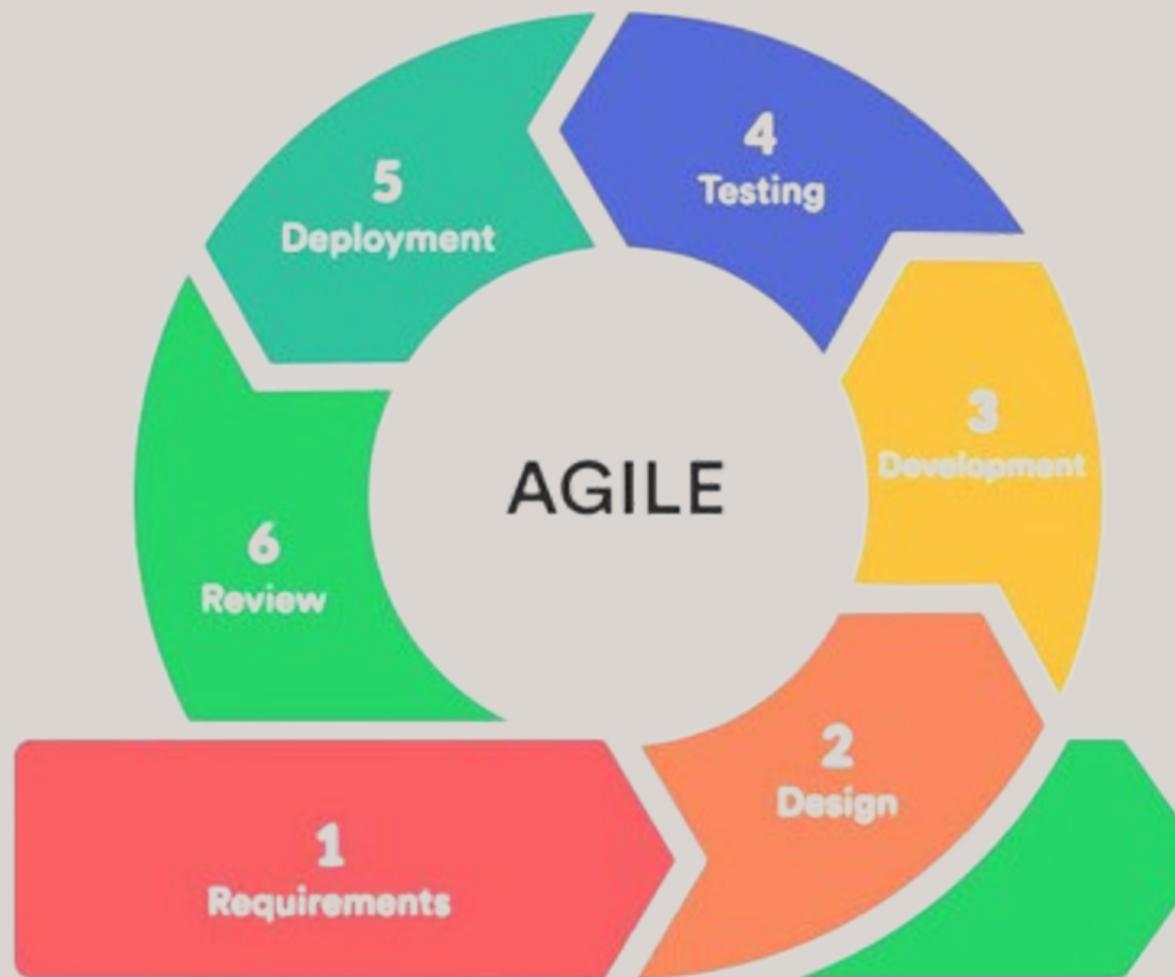
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## Literature Review

Study Year	Algorithm	Application	Major Contribution	Outcomes
2020	Deep residual Neural network	HousEEC system for day-ahead household electrical energy consumption forecasting	Developed a scalable system (HousEEC) for day-ahead household energy consumption forecasting	For daily forecasting, significantly better than the benchmark model
2022	Several	General	Providing an overview of various forecasting methods used in electricity consumption prediction	Emphasis on the importance of classifying forecasts by horizon to consider the specifics of each type of forecasting, rather than to differentiate methods

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# Methodology



## Agile Methodology

The Agile methodology is a project management approach that involves breaking the project into phases and emphasizes continuous collaboration and improvement. It follows a cycle of planning, executing, and evaluating.

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# Tools Used



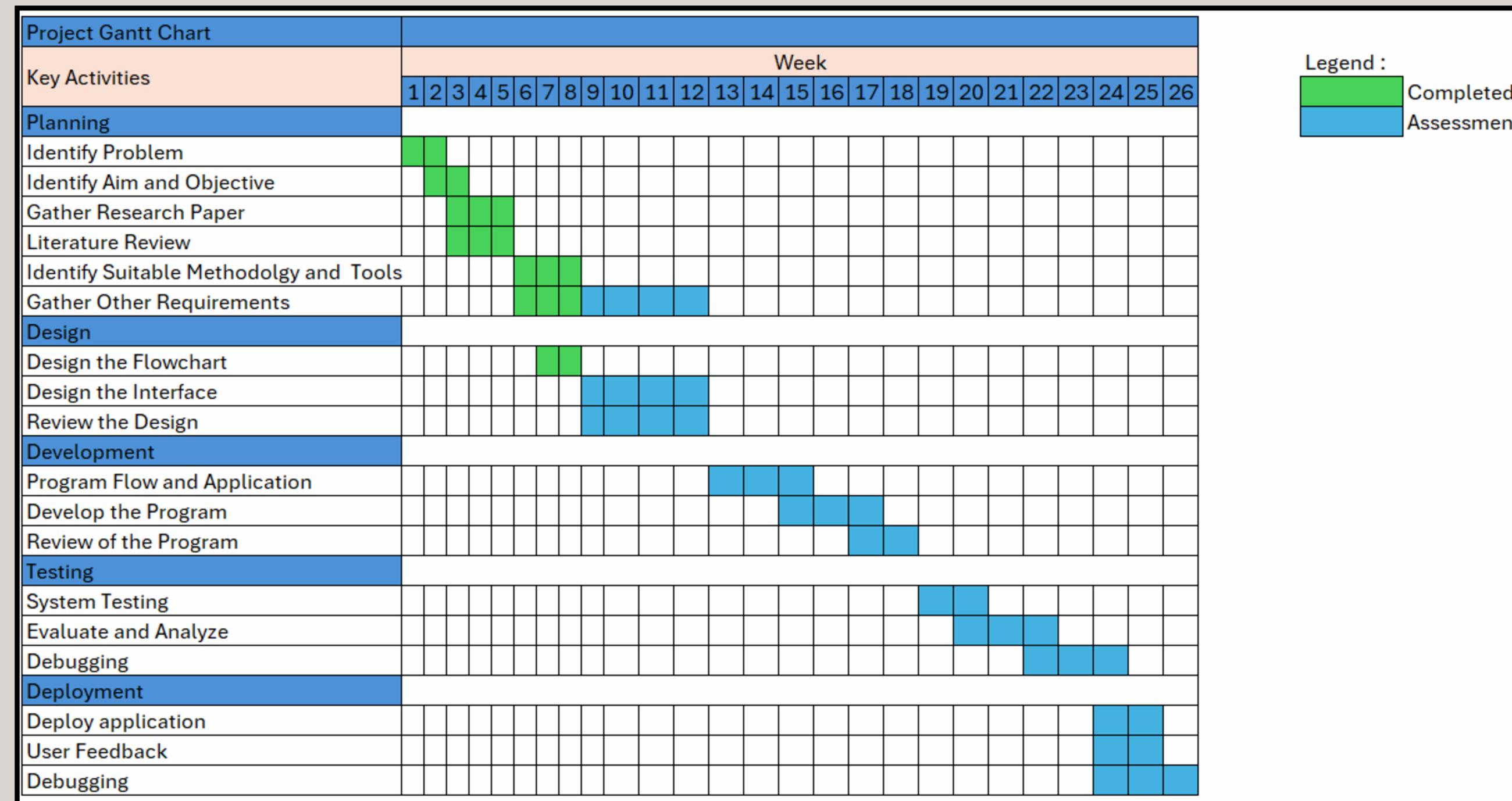
Google Colab is a free, cloud-based platform provided by Google that allows its users to write and execute Python code through a web browser.



XGBoost, is an advanced implementation of the gradient boosting algorithm designed for speed and performance

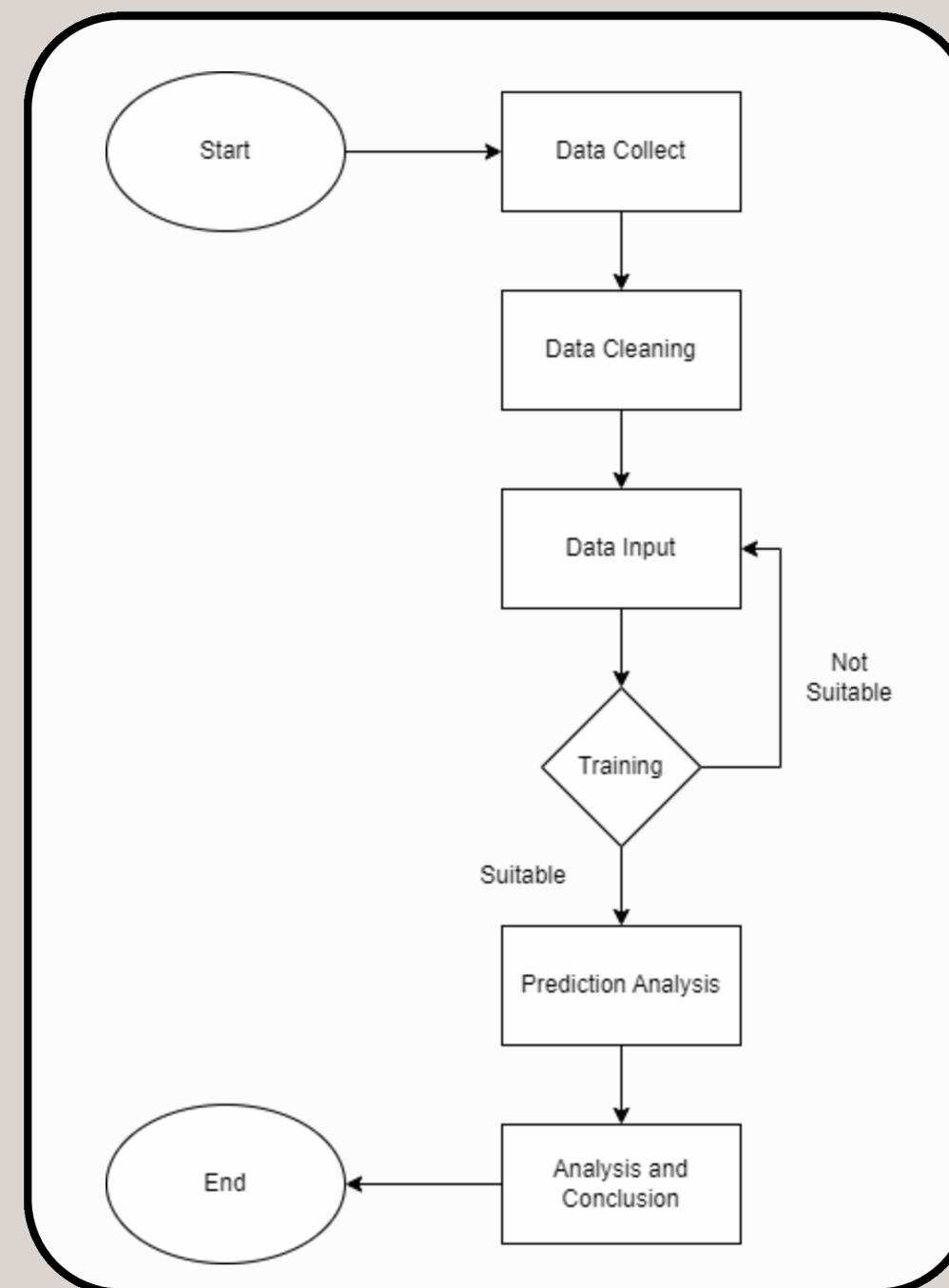
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# Gantt Chart

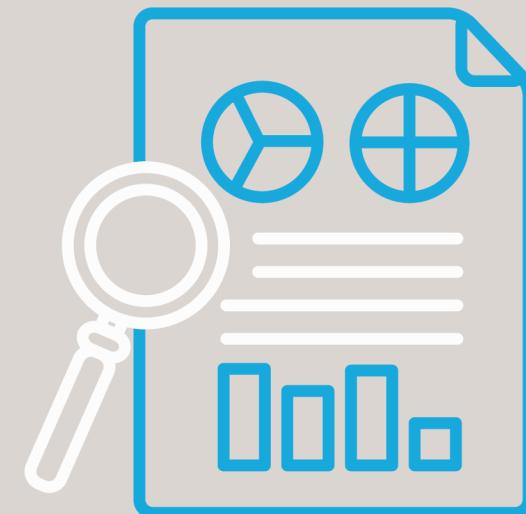


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# System Architecture



# Future Work



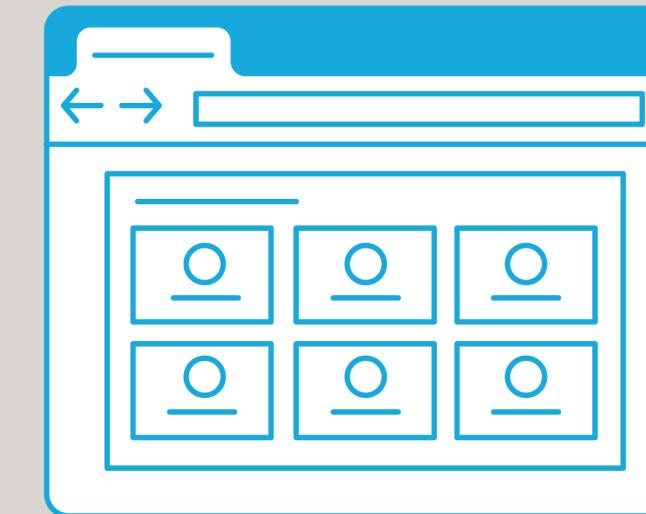
### Collecting reliable data

By using reliable data in the forecasting model, it can result in a more dependable forecast data



### Gain deeper understanding in forecasting

By learning and actively develop the forecasting model, it prevents possible bugs and errors



### Continuously enhance model

By implementing several forecasting models and selecting the best fit for the data