PROJECT SYNOPSIS

Smart Home Location Selector

1. Introduction

Rapid urbanization has made the process of selecting a suitable residential location increasingly complex. A good home location depends on several factors such as safety, pollution level, affordability, accessibility to essential services, and overall lifestyle quality. Traditionally, people rely on personal opinions, brokers, or limited information, which may lead to biased or inefficient decisions. Moreover, comparing multiple locations manually becomes time-consuming and often fails to consider all influencing factors effectively.

With the advancement of data analytics and machine learning, it is possible to analyze multiple parameters simultaneously and provide data-driven recommendations. This project focuses on developing a Smart Home Location Selector that uses machine learning techniques to evaluate different residential areas and recommend the most suitable locations for smart home setup. The system aims to improve decision accuracy by integrating multiple urban indicators into a unified scoring model. It also enhances user convenience through an interactive and easy-to-use interface.

2. Literature Review

Several studies have explored residential location recommendation systems using data mining and machine learning techniques. Early research primarily used multi-criteria decision-making methods such as weighted scoring, AHP, and TOPSIS to evaluate locations based on factors like safety, cost, accessibility, and environmental conditions. Other studies focused on housing price prediction using machine learning models, while some analyzed urban indicators such as pollution, crime rates, and infrastructure using statistical and spatial analysis methods. These approaches provide useful insights but often consider limited factors independently.

However, most existing systems lack an integrated approach that combines multiple urban indicators into a single recommendation framework. Many models depend on manual weighting or focus on a single objective, which reduces accuracy and flexibility. Additionally, limited use of advanced machine learning techniques and the absence of user-friendly interfaces restrict practical applicability. This project aims to overcome these limitations by integrating multiple residential factors using a machine learning–based recommendation system with an interactive user interface.

3. Problem Statement

Selecting a suitable home location is a challenging task due to the involvement of multiple conflicting factors such as cost, safety, pollution, and accessibility. There is no unified system that analyzes all these parameters together and provides reliable recommendations. This creates confusion for individuals planning to invest in smart homes.

Problem Statement:
To design and develop a machine learning–based system that analyzes multiple residential location factors and recommends the most suitable smart home locations in a data-driven manner.

4. Objectives of the Project

The main objectives of this project are:

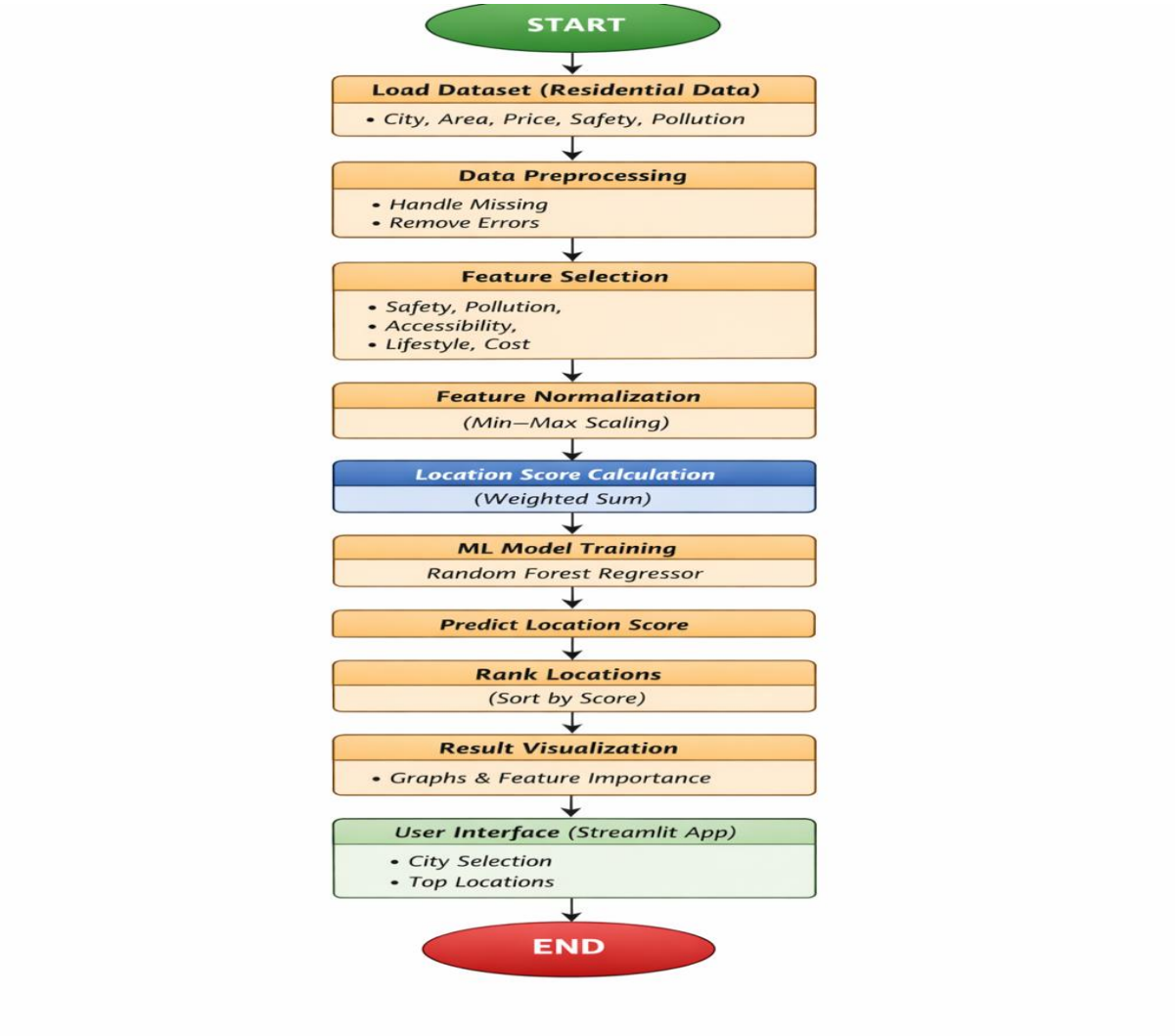
- To analyze residential location data using multiple parameters
- To compute a suitability score for each area
- To apply machine learning techniques for location ranking
- To recommend the best smart home locations
- To develop a simple and interactive user interface for recommendations

5. Tools & Technology

The following tools and technologies are used in this project:

- **Programming Language:** Python
- **Libraries:** Pandas, NumPy, Matplotlib, Scikit-learn
- **Machine Learning Algorithm:** Random Forest Regressor
- **Development Environment:** Jupyter Notebook
- **User Interface:** Streamlit
- **Version Control:** Git and GitHub

6.1 Flow Chart



6.2 Experimental Setup

- A synthetic dataset containing residential data from major Indian cities is used.
- Features such as safety score, pollution index, housing price, accessibility, and lifestyle indicators are considered.
- Data normalization is applied to avoid scale bias.
- The Random Forest Regressor model is trained to predict location suitability scores.
- The trained model is evaluated and results are visualized.
- A Streamlit-based UI displays top recommended locations city-wise.

7. Result / Outcomes

The system successfully identifies and ranks suitable smart home locations based on multiple factors. The machine learning model provides meaningful predictions, and feature importance analysis highlights key influencing parameters. The user interface allows users to easily select a city and view top recommended locations. The results demonstrate that a data-driven approach improves decision-making compared to traditional methods.

8. Conclusion

This project presents an effective machine learning–based solution for smart home location selection. By integrating multiple residential factors and applying ML techniques, the system provides reliable and unbiased recommendations. The developed model and UI together form a complete decision-support system for users planning smart home investments.

9. Future Scope

The project can be further enhanced by:

- Integrating real-time data sources
- Including map-based visualizations
- Expanding the system to more cities
- Deploying the system on cloud platforms