Satellite Property Valuation Using Tabular and Image Data

1. Introduction

House prices are usually predicted using structured details like size, location, and number of rooms.
However, these details do not fully describe the surroundings of a property.

In this project, I explore whether satellite images of the neighborhood can help improve house price prediction when combined with traditional housing data.

2. Dataset

The project uses two types of data:

Tabular Data

Includes property-related information such as:

- Bedrooms and bathrooms
- Living area and lot size
- Floors and condition
- Location (latitude and longitude)

The target variable is house price.

Satellite Images

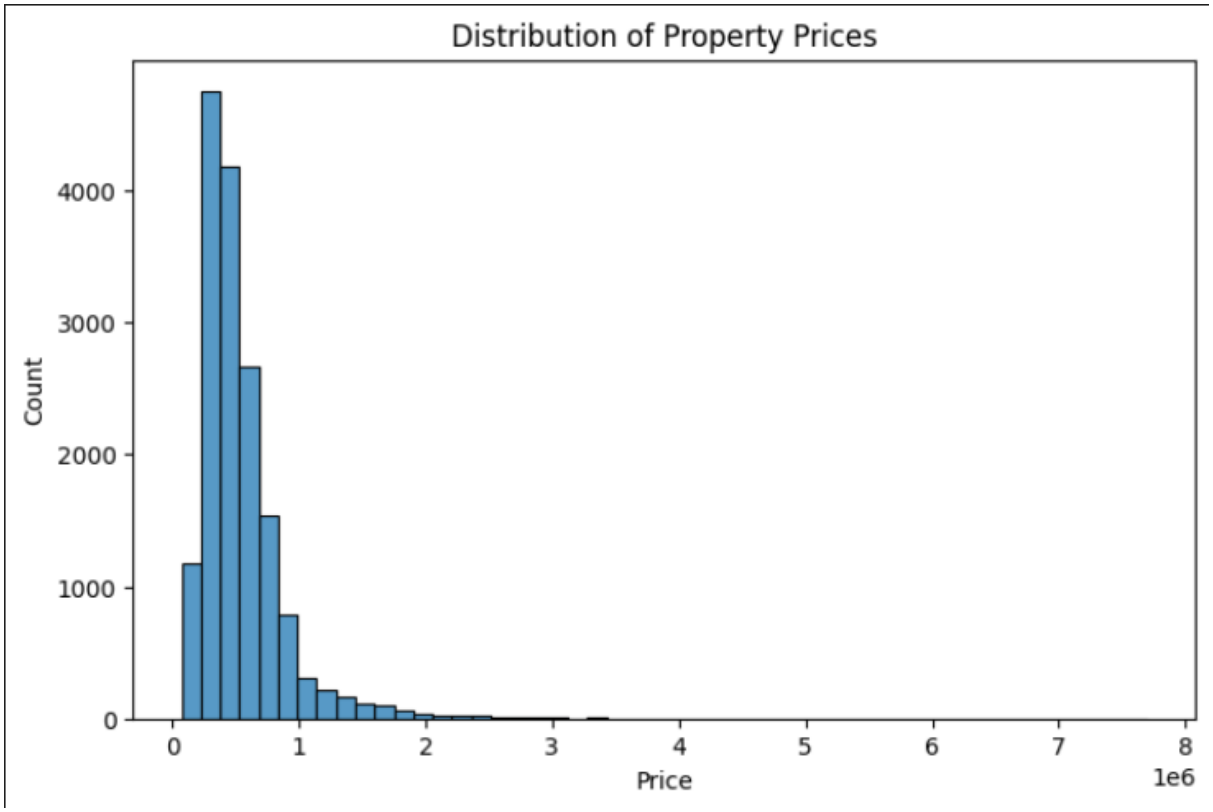
For each house, a satellite image of its surrounding area is used.
These images give visual information about:

- Green spaces
- Roads and density
- Nearby water bodies

3. Exploratory Data Analysis (EDA)

The house price distribution shows that most properties fall into a mid-price range, with fewer very expensive houses.

Larger homes and better locations generally have higher prices.



4. Methodology

4.1 Preprocessing

- Tabular features were scaled using StandardScaler
- Satellite images were resized and normalized
- Only houses with available images were used for multimodal training

4.2 Feature Extraction

A pre-trained ResNet-18 model was used to extract features from satellite images.
These image features were then combined with tabular features.

5. Models Used

Baseline Model

- Random Forest Regressor
- Uses only tabular data

Multimodal Model

- Random Forest Regressor
- Uses tabular data + satellite image features

6. Results

The multimodal model performed better than the tabular-only model.

```
from sklearn.metrics import mean_squared_error, r2_score
import numpy as np

y_pred = mm_model.predict(X_val)

rmse_mm = np.sqrt(mean_squared_error(y_val, y_pred))
r2_mm = r2_score(y_val, y_pred)

rmse_mm, r2_mm
```

[101] ✓ 0.0s

```
(np.float64(194914.10501742832), 0.6432542423229081)
```

7. Visual Insights from Satellite Images

Satellite images capture neighborhood-level information that tabular data cannot.

8. Conclusion

This project shows that satellite images provide useful information for house price prediction. When combined with traditional housing data, the model gives more accurate results.

The multimodal approach helps capture both property details and visual neighborhood context.

9. Tools Used

- Python
- Pandas, NumPy
- Scikit-learn

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