HARSHITHA J
B00979447

House Rent Prediction with Machine Learning and Power BI

1. Introduction:

Renting a house is a tough decision for both tenants and landlords. Tenants need to ensure they are paying a fair price for the property they are interested in, while landlords need to set rents that reflect the value of their properties accurately. In this project, my aim is to develop a machine learning model that can predict house rents accurately based on various features such as city, locality, number of bedrooms, furnishing, and other relevant factors. This predictive model will serve as a valuable tool for both tenants and landlords in negotiating rental agreements and making informed decisions.

2. Data Collection and Preprocessing:

I have obtained a dataset with details on rental houses in India, including furnishing, city, number of bedrooms, locality, rent costs etc.. I have sorted missing data during preprocessing by deleting incomplete information, null values, or missing values. I have included various visualizations to learn more about the distribution of attributes and how they relate to rent pricing, data exploration and visualization approaches.

```
print(data.isnull().sum())
```

```
Posted On             0
BHK                   0
Rent                  0
Size                  0
Floor                 0
Area Type             0
Area Locality         0
City                  0
Furnishing Status     0
Tenant Preferred      0
Bathroom              0
Point of Contact      0
dtype: int64
```

```
print(data.describe())
```

```
                BHK          Rent          Size      Bathroom
count   4746.000000  4.746000e+03   4746.000000  4746.000000
mean       2.083860  3.499345e+04    967.490729     1.965866
std        0.832256  7.810641e+04    634.202328     0.884532
min        1.000000  1.200000e+03     10.000000     1.000000
25%        2.000000  1.000000e+04    550.000000     1.000000
50%        2.000000  1.600000e+04    850.000000     2.000000
75%        3.000000  3.300000e+04   1200.000000     2.000000
max        6.000000  3.500000e+06   8000.000000    10.000000
```

3. Feature Engineering:

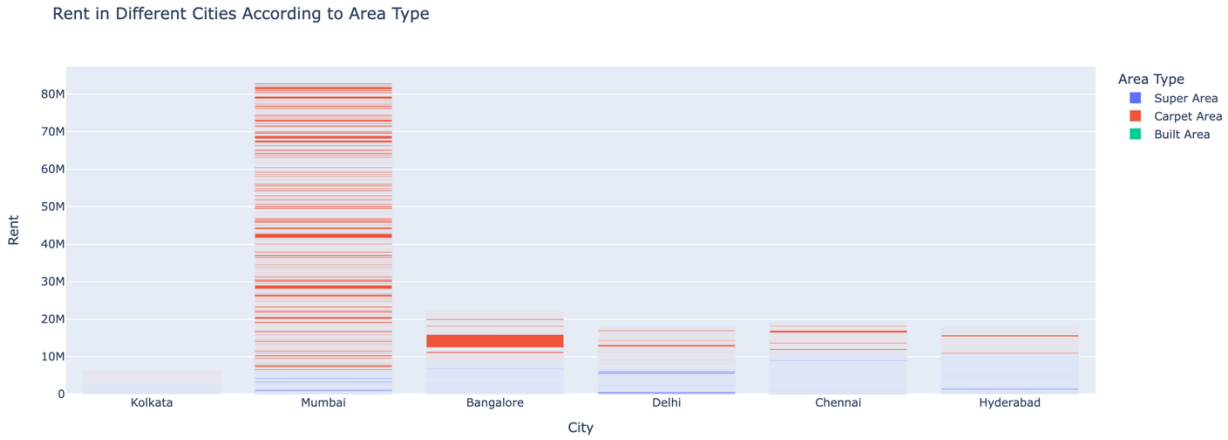
To enhance the prediction model's performance, feature engineering and modification was used for better understanding. When adding new features or changing old ones, I considered variables like the property's condition, the neighborhood's demographics, and how close facilities were.

4. Machine Learning Model Selection and Training:

After exploring several machine learning algorithms, I have decided regression model would work well for predicting continuous rent values. The selected model was trained with the dataset, and its performance was improved by optimizing its hyperparameters through cross-validation.

5. Model Evaluation:

A trained model is used on existing to generalize to new data. To evaluate the model's accuracy and pinpoint any areas that needed work and plotted the expected rentals versus the actual rents. Furthermore, sensitivity analysis was performed to bring out the influence of various variables on rent projections example BHK, area type, furnishing status, size , number of houses available for rent, and types of tenants existing in a region.



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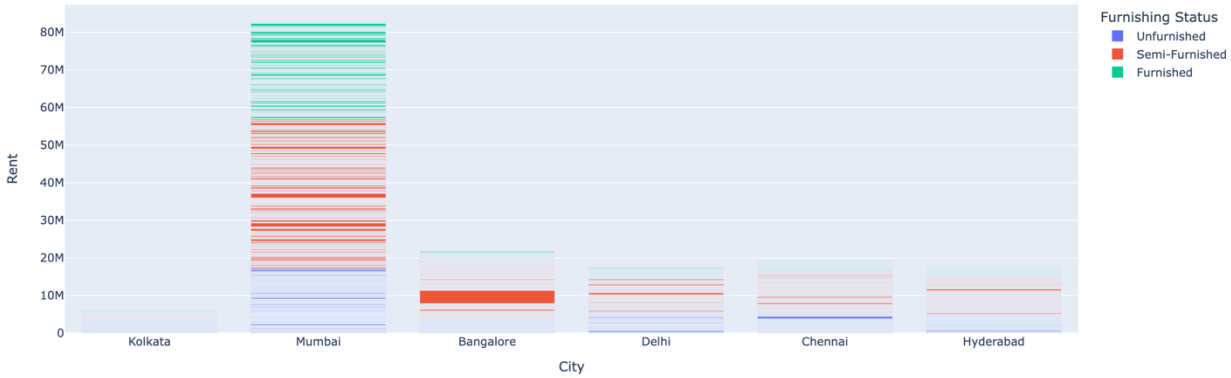
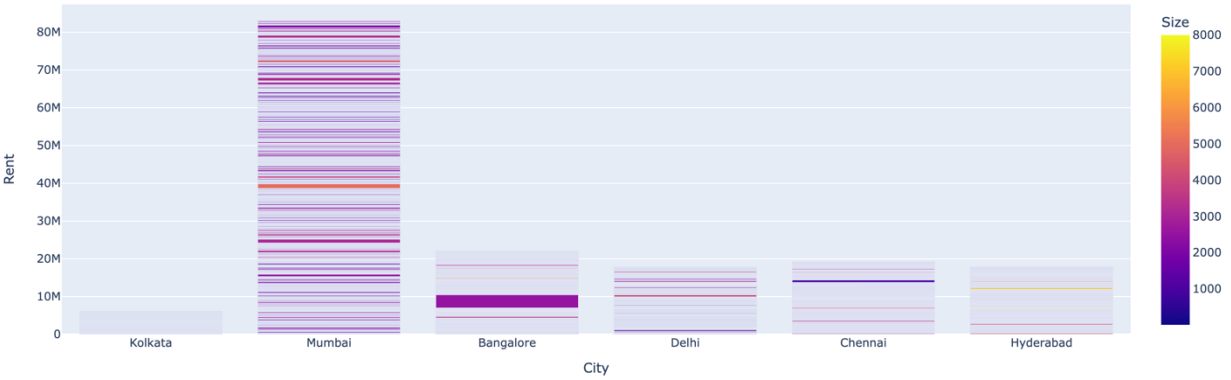
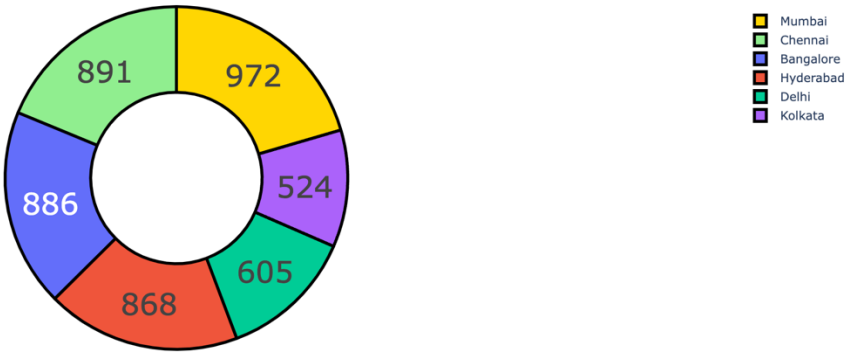
Rent in Different Cities According to Furnishing Status



Rent in Different Cities According to Size



Number of Houses Available for Rent



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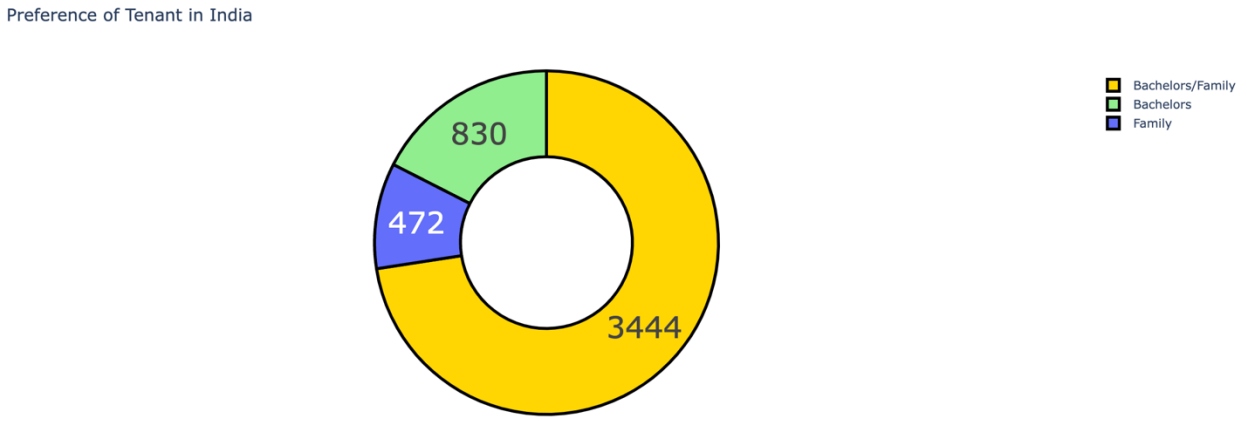
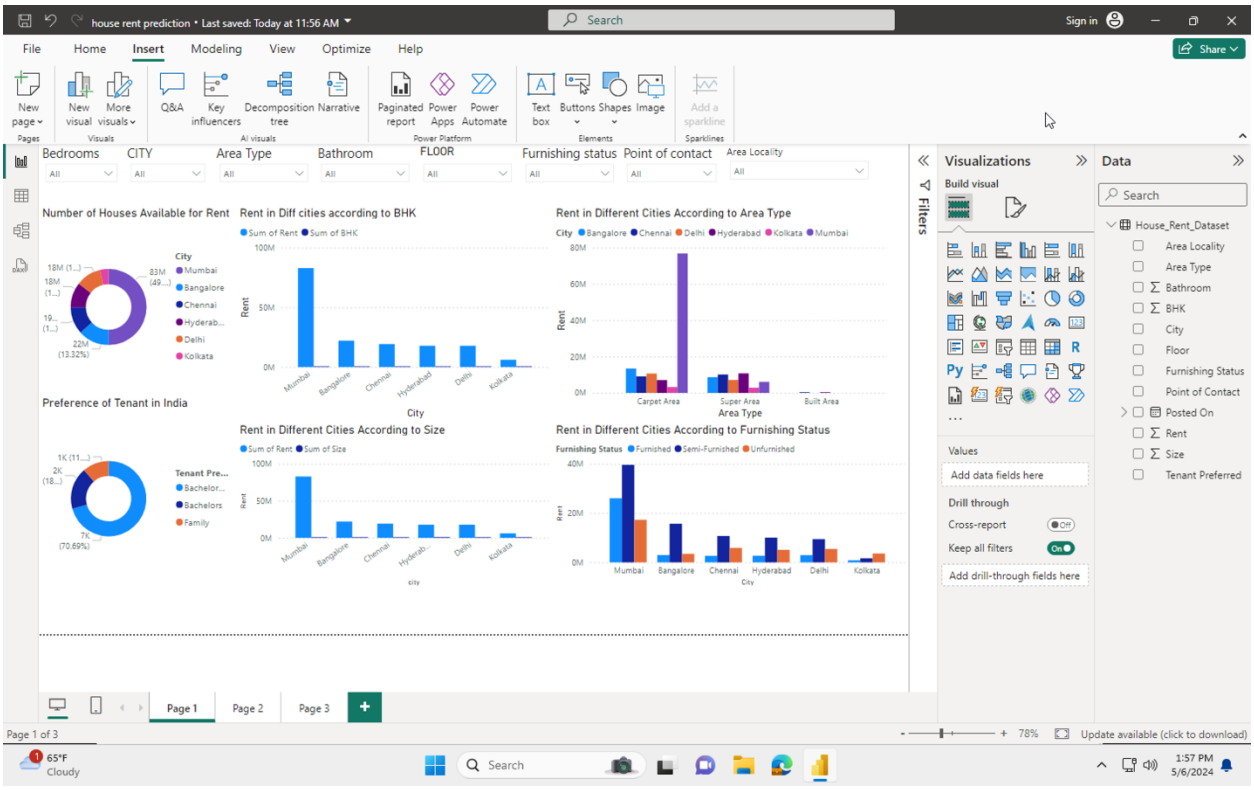


6. Integration with Power BI:

I have implemented an interactive dashboard for rent prediction and integration of the predictive algorithm with Power BI. Users can quickly get an estimate of rent pricing by entering property parameters like location, size, and amenities into the dashboard. Maps, histograms, and scatter plots are examples of visualizations that offer a clear understanding of rent distribution and trends across various geographies. This gives a view on price variations as per choices.



7. Neural Network Architecture for Rent Prediction:

Using the Keras toolkit, created a neural network architecture with two Long Short-Term Memory (LSTM) layers and two Dense layers in order of precedence. While the second LSTM layer has 64 units and does not return sequences, the first LSTM layer has 128 units and does. There are 25 and 1 unit(s) in the Dense layers, respectively. Tasks involving sequence prediction, such time series forecasting, are the focus of this architecture.

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 7, 128)            66560

 lstm_1 (LSTM)               (None, 64)                49408

 dense (Dense)               (None, 25)                1625

 dense_1 (Dense)             (None, 1)                 26

=================================================================
Total params: 117619 (459.45 KB)
Trainable params: 117619 (459.45 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

```
Enter House Details to Predict Rent
Number of BHK: 2
Size of the House: 3567
Area Type (Super Area = 1, Carpet Area = 2, Built Area = 3): 2
Pin Code of the City: 520012
Furnishing Status of the House (Unfurnished = 0, Semi-Furnished = 1, Furnished = 2): 1
Tenant Type (Bachelors = 1, Bachelors/Family = 2, Only Family = 3): 2
Number of bathrooms: 2
1/1 [==============================] - 1s 840ms/step
Predicted House Price =  [[32332.76]]
```

8. Deployment and Future Improvements:

The generated prediction model can be widely utilized by integrating it into current real estate platforms or releasing it as a web application. To increase the model's accuracy and usability, future updates can include adding more information like property age, rental market trends, and user comments.

9. Conclusion:

In conclusion, this research shows how machine learning can be used to accurately predict housing rents based on a variety of factors. Renters and landlords can now make educated decisions about rental agreements with ease and model's integration with Power BI and an intuitive user interface. This approach makes the rental market more transparent and efficient by providing precise rent pricing estimates.