In [1]:
```python
# Import necessary libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.svm import SVR
from sklearn.metrics import mean_squared_error, r2_score
```

In [2]:
```python
# Load the dataset
data = pd.read_csv("Bengaluru_House_Data.csv")
```

In [3]:
```python
data
```

Out[3]:

	area_type	availability	location	size	society	total_sqft	bath	balcony	price
0	Super built-up Area	19-Dec	Electronic City Phase II	2 BHK	Coomee	1056	2.0	1.0	39.07
1	Plot Area	Ready To Move	Chikka Tirupathi	4 Bedroom	Theanmp	2600	5.0	3.0	120.00
2	Built-up Area	Ready To Move	Uttarahalli	3 BHK	NaN	1440	2.0	3.0	62.00
3	Super built-up Area	Ready To Move	Lingadheeranahalli	3 BHK	Soiewre	1521	3.0	1.0	95.00
4	Super built-up Area	Ready To Move	Kothanur	2 BHK	NaN	1200	2.0	1.0	51.00
...	...	...	...	...	...	...	...	...	...
13315	Built-up Area	Ready To Move	Whitefield	5 Bedroom	ArsiaEx	3453	4.0	0.0	231.00
13316	Super built-up Area	Ready To Move	Richards Town	4 BHK	NaN	3600	5.0	NaN	400.00
13317	Built-up Area	Ready To Move	Raja Rajeshwari Nagar	2 BHK	Mahla T	1141	2.0	1.0	60.00
13318	Super built-up Area	18-Jun	Padmanabhanagar	4 BHK	SollyCl	4689	4.0	1.0	488.00
13319	Super built-up Area	Ready To Move	Doddathoguru	1 BHK	NaN	550	1.0	1.0	17.00

13320 rows × 9 columns

In [4]:
```python
# Display basic information about the dataset
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 13320 entries, 0 to 13319
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   area_type     13320 non-null  object 
 1   availability  13320 non-null  object 
 2   location      13319 non-null  object 
 3   size          13304 non-null  object 
 4   society       7818 non-null   object 
 5   total_sqft    13320 non-null  object 
 6   bath          13247 non-null  float64
 7   balcony       12711 non-null  float64
 8   price         13320 non-null  float64
dtypes: float64(3), object(6)
memory usage: 936.7+ KB
```

In [5]:
```python
data.describe()
```

Out[5]:

	bath	balcony	price
count	13247.000000	12711.000000	13320.000000
mean	2.692610	1.584376	112.565627
std	1.341458	0.817263	148.971674
min	1.000000	0.000000	8.000000
25%	2.000000	1.000000	50.000000
50%	2.000000	2.000000	72.000000
75%	3.000000	2.000000	120.000000
max	40.000000	3.000000	3600.000000

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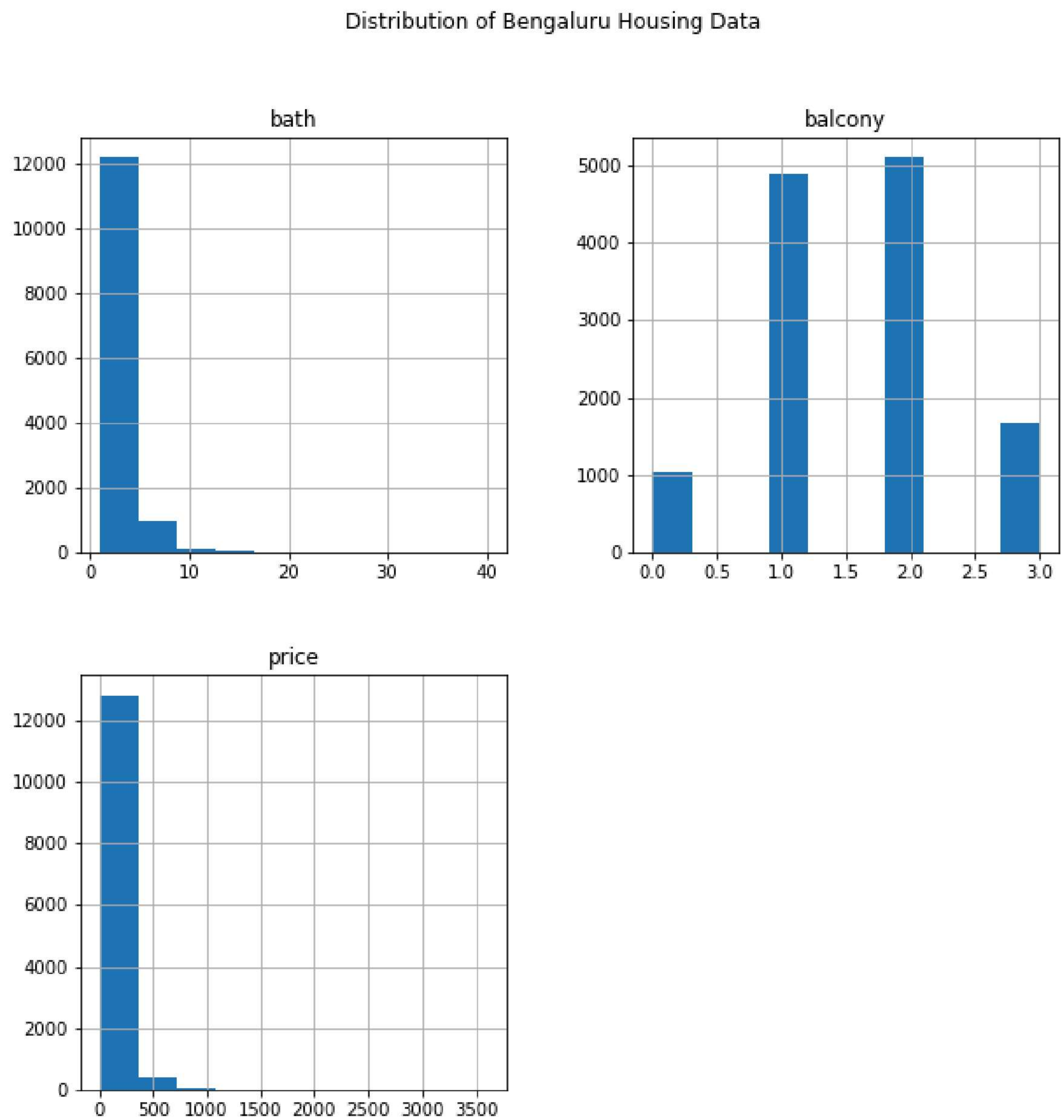
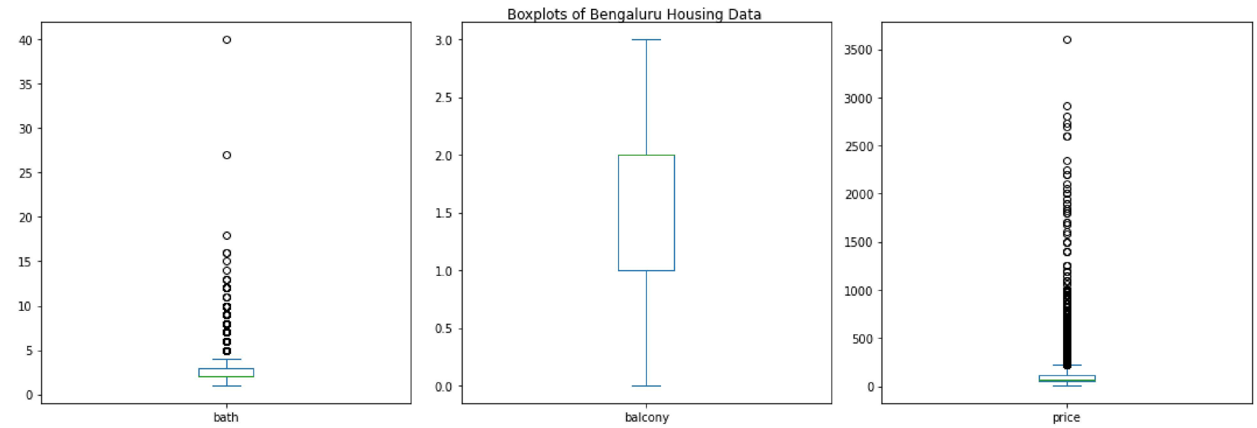
In [6]:
```
# Explore data distribution (histograms, boxplots)
data.hist(figsize=(10, 10))
plt.suptitle("Distribution of Bengaluru Housing Data")
plt.show()

data.plot(kind="box", subplots=True, layout=(3, 3), figsize=(15, 15))
plt.suptitle("Boxplots of Bengaluru Housing Data")
plt.tight_layout()
plt.show()

# Analyze numerical features (descriptive statistics, correlations)
print(data.describe(include="all"))

correlation = data.corr(method="spearman")  # Use Spearman's rank for mixed data types
print("Correlation matrix:\n", correlation)
```





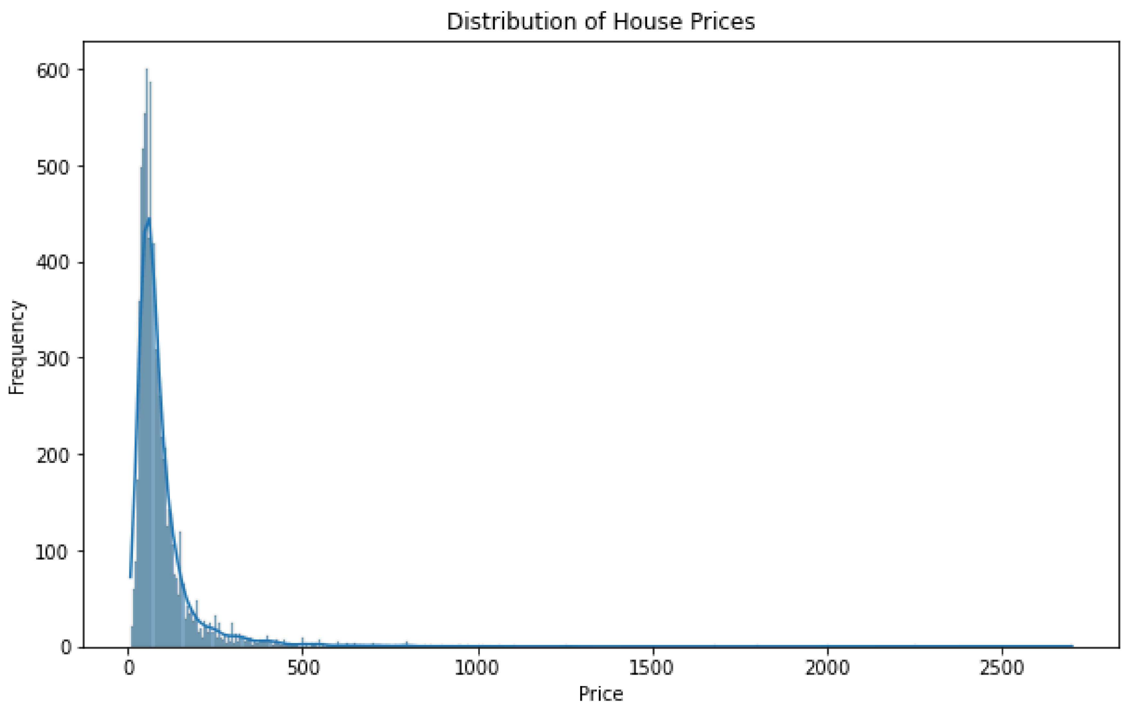

```
                area_type  availability    location   size  society  \
count               13320         13320       13319  13304     7818
unique                  4            81        1305     31     2688
top      Super built-up  Area  Ready To Move  Whitefield  2 BHK  GrrvaGr
freq                 8790         10581         540   5199       80
mean                  NaN           NaN         NaN    NaN      NaN
std                   NaN           NaN         NaN    NaN      NaN
min                   NaN           NaN         NaN    NaN      NaN
25%                   NaN           NaN         NaN    NaN      NaN
50%                   NaN           NaN         NaN    NaN      NaN
75%                   NaN           NaN         NaN    NaN      NaN
max                   NaN           NaN         NaN    NaN      NaN

       total_sqft          bath       balcony         price
count       13320  13247.000000  12711.000000  13320.000000
unique       2117           NaN           NaN           NaN
top          1200           NaN           NaN           NaN
freq          843           NaN           NaN           NaN
mean          NaN      2.692610      1.584376    112.565627
std           NaN      1.341458      0.817263    148.971674
min           NaN      1.000000      0.000000      8.000000
25%           NaN      2.000000      1.000000     50.000000
50%           NaN      2.000000      2.000000     72.000000
75%           NaN      3.000000      2.000000    120.000000
max           NaN     40.000000      3.000000   3600.000000
Correlation matrix:
             bath   balcony     price
bath     1.000000  0.295925  0.716047
balcony  0.295925  1.000000  0.208977
price    0.716047  0.208977  1.000000
```

In [7]:
```
# Check for missing values
print(data.isnull().sum())
```

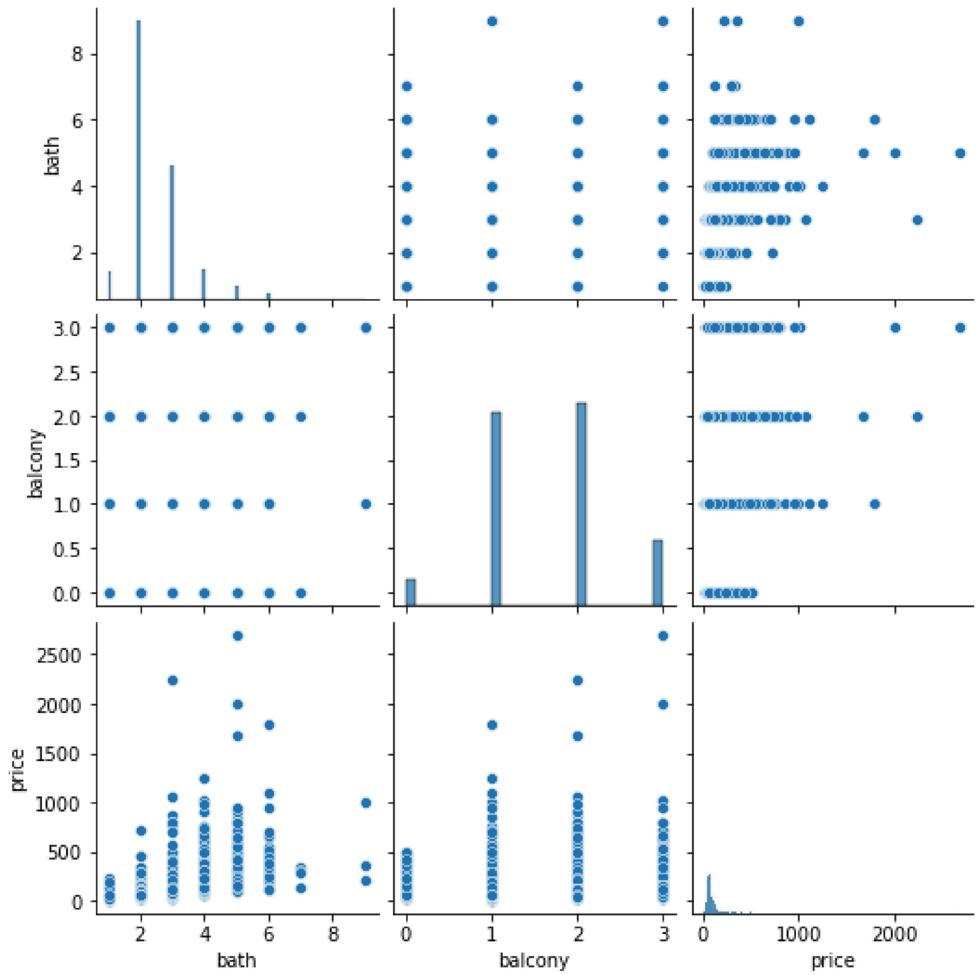
```
area_type          0
availability       0
location           1
size              16
society         5502
total_sqft         0
bath              73
balcony          609
price              0
dtype: int64
```

In [8]:
```
# Drop rows with missing values
data.dropna(inplace=True)
```

In [9]:
```
# Visualize distribution of target variable
plt.figure(figsize=(10, 6))
sns.histplot(data['price'], kde=True)
plt.title('Distribution of House Prices')
plt.xlabel('Price')
plt.ylabel('Frequency')
plt.show()
```



In [10]:
```
# Visualize relationship between numerical features and target variable
sns.pairplot(data[['total_sqft', 'bath', 'balcony', 'price']])
plt.show()
```



In [11]:
```
# Feature Engineering
# Convert categorical variables to numerical using one-hot encoding
data = pd.get_dummies(data, columns=['area_type', 'availability', 'location', 'size', 's
```

In [12]:
```
# Scale numerical features
scaler = StandardScaler()
numerical_cols = ['bath', 'balcony']
data[numerical_cols] = scaler.fit_transform(data[numerical_cols])
```

In [13]:
```
# Train-test split
X = data.drop(columns=['price'])
y = data['price']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42
```

In [14]:
```
# Model Training
svm_regressor = SVR(kernel='linear')
svm_regressor.fit(X_train, y_train)
```

Out[14]:
```
SVR
SVR(kernel='linear')
```

In [15]:
```
# Model Evaluation
y_pred_train = svm_regressor.predict(X_train)
y_pred_test = svm_regressor.predict(X_test)
train_mse = mean_squared_error(y_train, y_pred_train)
test_mse = mean_squared_error(y_test, y_pred_test)
print('Train MSE:', train_mse)
print('Test MSE:', test_mse)
```

```
Train MSE: 6522.786794210786
Test MSE: 6935.188814399246
```

In [16]:
```
train_r2 = r2_score(y_train, y_pred_train)
test_r2 = r2_score(y_test, y_pred_test)
print('Train R^2 Score:', train_r2)
print('Test R^2 Score:', test_r2)
```

```
Train R^2 Score: 0.4110994804169772
Test R^2 Score: 0.3815226398463971
```