Expt 2

Predicting the Electricity Bill based on multiple features using Multivariate Linear Regression

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

```
df = pd.read_csv("electricity_bill.csv")
```

```
df.head()
```

	num_rooms	num_people	housearea	is_ac	is_tv	is_flat	ave_monthly_income	nu
0	3	3	742.57	1	1	1	9675.93	
1	1	5	952.99	0	1	0	35064.79	
2	3	1	761.44	1	1	1	22292.44	
3	0	5	861.32	1	1	0	12139.08	
4	1	8	731.61	0	1	0	17230.10	

EDA

```
df.shape
```

```
(1000, 10)
```

```
df = df.drop_duplicates()
```

```
df.shape
```

```
(1000, 10)
```

```
df[df.isna()==False]
df.isna().sum()
```

```
num_rooms            0
num_people           0
housearea            0
is_ac                0
is_tv                0
is_flat              0
ave_monthly_income   0
num_children         0
is_urban             0
amount_paid          0
dtype: int64
```

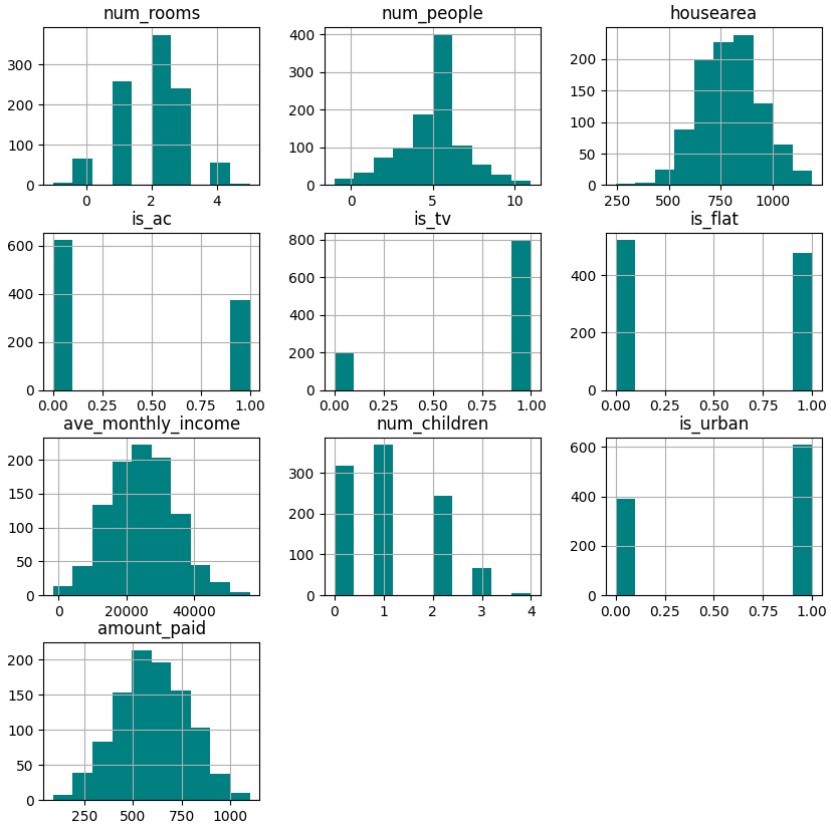
```
df.dtypes
```

```
num_rooms              int64
num_people             int64
housearea            float64
is_ac                  int64
is_tv                  int64
is_flat                int64
ave_monthly_income   float64
num_children           int64
is_urban               int64
amount_paid          float64
dtype: object
```

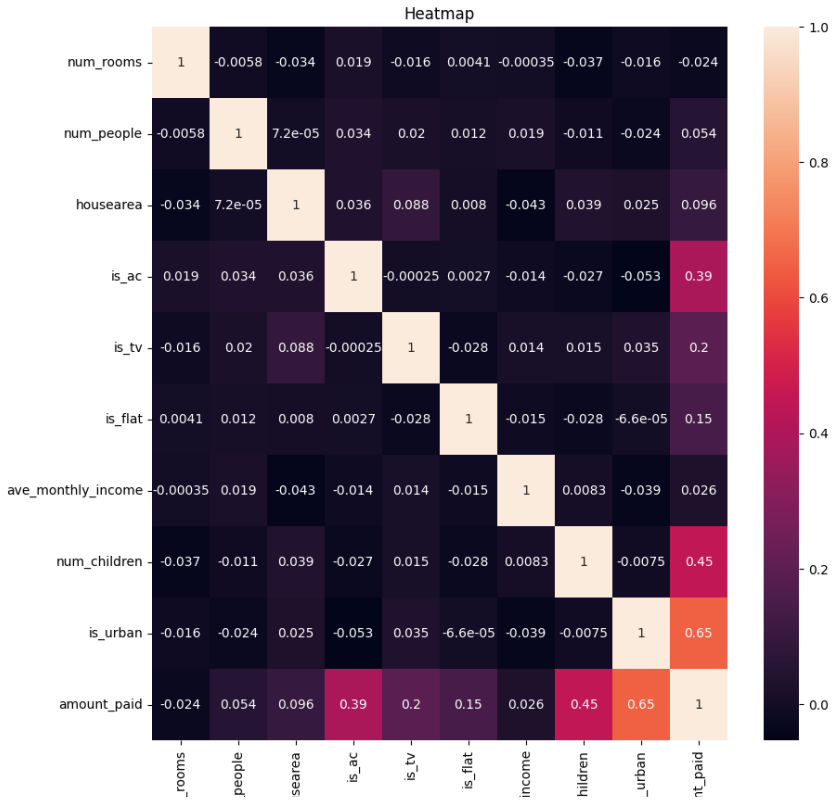
```
df.describe()
```

	num_rooms	num_people	housearea	is_ac	is_tv	is_flat
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000
mean	1.962000	4.897000	794.703420	0.376000	0.798000	0.477000
std	1.030348	2.007591	147.771736	0.484622	0.401693	0.499721

```
df.hist(figsize=(10,10), color='teal')
plt.title("Histogram Plot of the Features")
plt.show()
```




```
plt.figure(figsize=(10, 10))
sns.heatmap(df.corr(), annot=True)
plt.title("Heatmap")
plt.show()
```



Train-Test

```
df_features = df.drop(columns = ["amount_paid"])
df_target = df["amount_paid"]
```

```
df_features.head()
```

	num_rooms	num_people	housearea	is_ac	is_tv	is_flat	ave_monthly_income	nu
0	3	3	742.57	1	1	1	9675.93	
1	1	5	952.99	0	1	0	35064.79	
2	3	1	761.44	1	1	1	22292.44	
3	0	5	861.32	1	1	0	12139.08	
4	1	8	731.61	0	1	0	17230.10	

```
df_target.head()
```

```
0    560.481447
1    633.283679
2    511.879157
3    332.992035
4    658.285625
Name: amount_paid, dtype: float64
```

```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(df_features, df_target, test_size=0.2)
```

```
print("Training: ", X_train.shape, "   ", y_train.shape)
print("Testing: ",X_test.shape, "   ", y_test.shape)
```

```
Training:  (800, 9)     (800,)
Testing:  (200, 9)     (200,)
```

Fitting Model

```
from sklearn.linear_model import LinearRegression
```

```
lr_model = LinearRegression()
```

```
lr_model.fit(X_train, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
y_pred = lr_model.predict(X_test)
```

Accuracy of Model

```
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score


mse = mean_squared_error(y_test, y_pred)
print("Mean Squared Error (MSE):", mse)

mae = mean_absolute_error(y_test, y_pred)
print("Mean Absolute Error (MAE):", mae)

r_squared = r2_score(y_test, y_pred)
print("R-squared:", r_squared)
```

```
Mean Squared Error (MSE): 3992.2427811817597
Mean Absolute Error (MAE): 53.737397747485595
R-squared: 0.8903766963611304
```