```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split, GridSearchCV, RandomizedSearchCV
from sklearn.preprocessing import LabelEncoder, StandardScaler, MinMaxScaler
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error, r2_score, mean_absolute_error
```

```
data = pd.read_csv("/content/sample_data/mission_3")
```

```
data.head(10)
```

	Brand	Model Year	Mileage (miles)	Fuel Type	Condition	Transmission	Resale Price
0	Ford	2009	148946	Electric	2	Automatic	22570
1	BMW	2020	158471	Electric	3	Automatic	19312
2	Ford	2005	112450	Diesel	2	Automatic	14972
3	Honda	2013	117547	Gasoline	4	Manual	25714
4	Honda	2016	55108	Diesel	4	Automatic	21456
5	Ford	2008	187479	Diesel	5	Manual	28403
6	Toyota	2021	95272	Electric	3	Manual	16683
7	Ford	2016	49064	Gasoline	1	Manual	5627
8	Honda	2010	75271	Diesel	1	Automatic	4105
9	Honda	2005	117893	Diesel	4	Manual	11580

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

	0
Brand	0
Model Year	0
Mileage (miles)	0
Fuel Type	0
Condition	0
Transmission	0
Resale Price	0

dtype: int64

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Brand            1000 non-null   object
 1   Model Year       1000 non-null   int64 
 2   Mileage (miles)  1000 non-null   int64 
 3   Fuel Type        1000 non-null   object
 4   Condition        1000 non-null   int64 
 5   Transmission     1000 non-null   object
 6   Resale Price     1000 non-null   int64 
dtypes: int64(4), object(3)
memory usage: 54.8+ KB
```

```
le = {}
encoding_cols = ['Brand', 'Fuel Type', 'Transmission']
for col in encoding_cols:
  le[col] = LabelEncoder()
```

```
  data[col] = le[col].fit_transform(data[col])
print(le)
```

```
{'Brand': LabelEncoder(), 'Fuel Type': LabelEncoder(), 'Transmission': LabelEncoder()}
```

```
data.head()
```

	Brand	Model Year	Mileage (miles)	Fuel Type	Condition	Transmission	Resale Price
0	2	2009	148946	1	2	0	22570
1	0	2020	158471	1	3	0	19312
2	2	2005	112450	0	2	0	14972
3	3	2013	117547	2	4	1	25714
4	3	2016	55108	0	4	0	21456

```
scale_cols = ['Model Year', 'Mileage (miles)', 'Condition']
scaler = MinMaxScaler()
data[scale_cols] = scaler.fit_transform(data[scale_cols])
```

```
data.head(15)
```

	Brand	Model Year	Mileage (miles)	Fuel Type	Condition	Transmission	Resale Price
0	2	0.428571	0.743932	1	0.25	0	22570
1	0	0.952381	0.794159	1	0.50	0	19312
2	2	0.238095	0.551480	0	0.25	0	14972
3	3	0.619048	0.578358	2	0.75	1	25714
4	3	0.761905	0.249102	0	0.75	0	21456
5	2	0.380952	0.947125	0	1.00	1	28403
6	4	1.000000	0.460896	1	0.50	1	16683
7	2	0.761905	0.217231	2	0.00	1	5627
8	3	0.476190	0.355426	0	0.00	0	4105
9	3	0.238095	0.580182	0	0.75	1	11580
10	2	0.761905	0.649631	1	0.50	0	23233
11	1	0.142857	0.234052	2	0.75	1	3542
12	2	0.952381	0.531848	2	0.50	1	15807
13	3	0.476190	0.355426	0	0.00	0	4105
14	0	0.666667	0.515828	2	0.75	1	17368

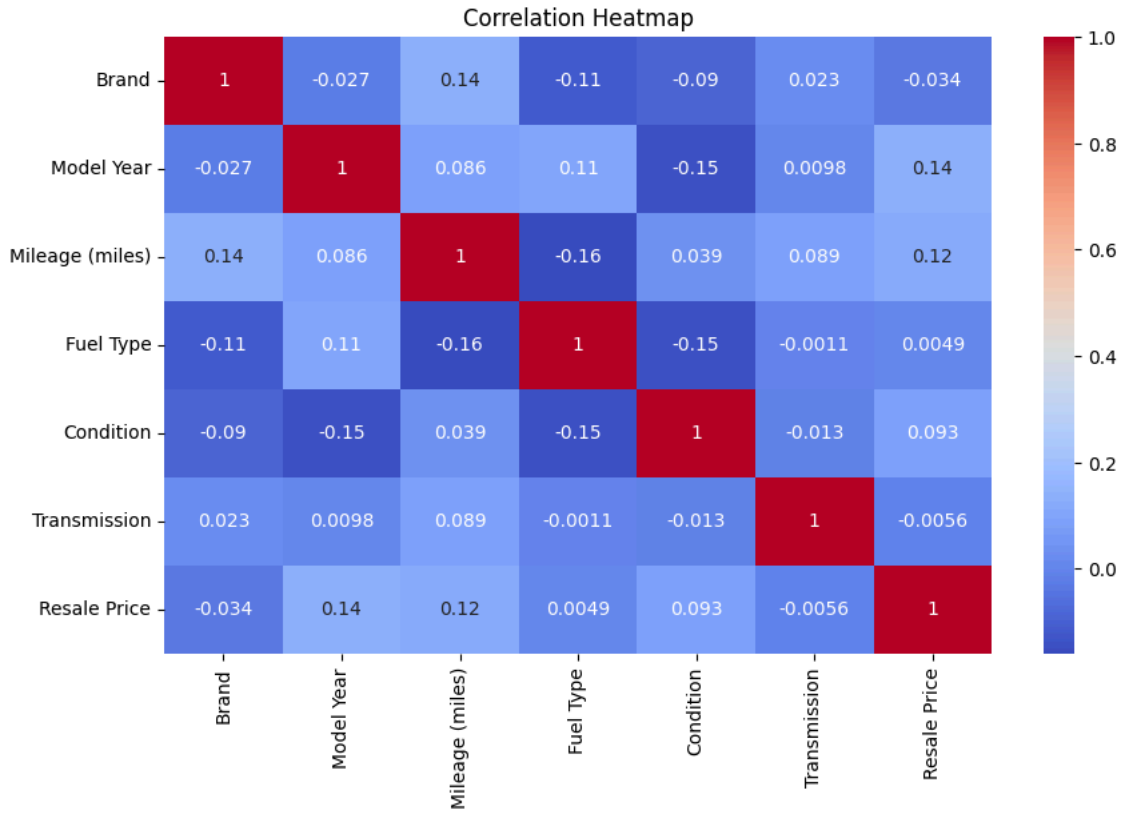
```
# # prompt: make oversampling for data  with path /content/sample_data/Worksheet in C  Users abdel Downloads AMHM-ITAI-03.csv to be 1 thousa

# import pandas as pd
# from sklearn.utils import resample

# # Load the data (replace with the actual path)
# try:
#   data = pd.read_csv("/content/sample_data/Worksheet in C  Users abdel Downloads AMHM-ITAI-03.csv")
# except FileNotFoundError:
#   print("Error: File not found. Please provide the correct file path.")
#   # You might want to exit the script or handle the error differently
#   exit()


# # Separate majority and minority classes
# # Assuming 'Class' is the column you want to oversample. Replace if necessary.
# if 'Resale Price' not in data.columns:
#     print("Error: 'Class' column not found in the DataFrame. Please specify the correct column name for oversampling.")
#     exit()
```

```
# # Identify minority class
# minority_class = data['Resale Price'].value_counts().idxmin()
# minority_data = data[data['Resale Price'] == minority_class]

# # Oversample minority class to 1000 rows
# oversampled_minority = resample(minority_data, replace=True, n_samples=1000, random_state=123)


# # Concatenate the oversampled minority class with the original data
# data_oversampled = pd.concat([data, oversampled_minority])
# data_oversampled.to_csv("/content/sample_data/mission 3.csv", index=False)
# # Check the new class distribution
# print(data_oversampled['Resale Price'].value_counts())

# # Now data_oversampled contains the oversampled data


data.describe()
```

	Brand	Model Year	Mileage (miles)	Fuel Type	Condition	Transmission	Resale Price
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000
mean	2.029000	0.442238	0.493318	0.932000	0.529250	0.464000	16783.906000
std	1.362356	0.299797	0.292928	0.828289	0.360155	0.498952	8686.868036
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	2504.000000
25%	1.000000	0.190476	0.234052	0.000000	0.250000	0.000000	8588.000000
50%	2.000000	0.380952	0.515828	1.000000	0.500000	0.000000	17485.000000
75%	3.000000	0.666667	0.691395	2.000000	0.750000	1.000000	24756.250000
max	4.000000	1.000000	1.000000	2.000000	1.000000	1.000000	29870.000000

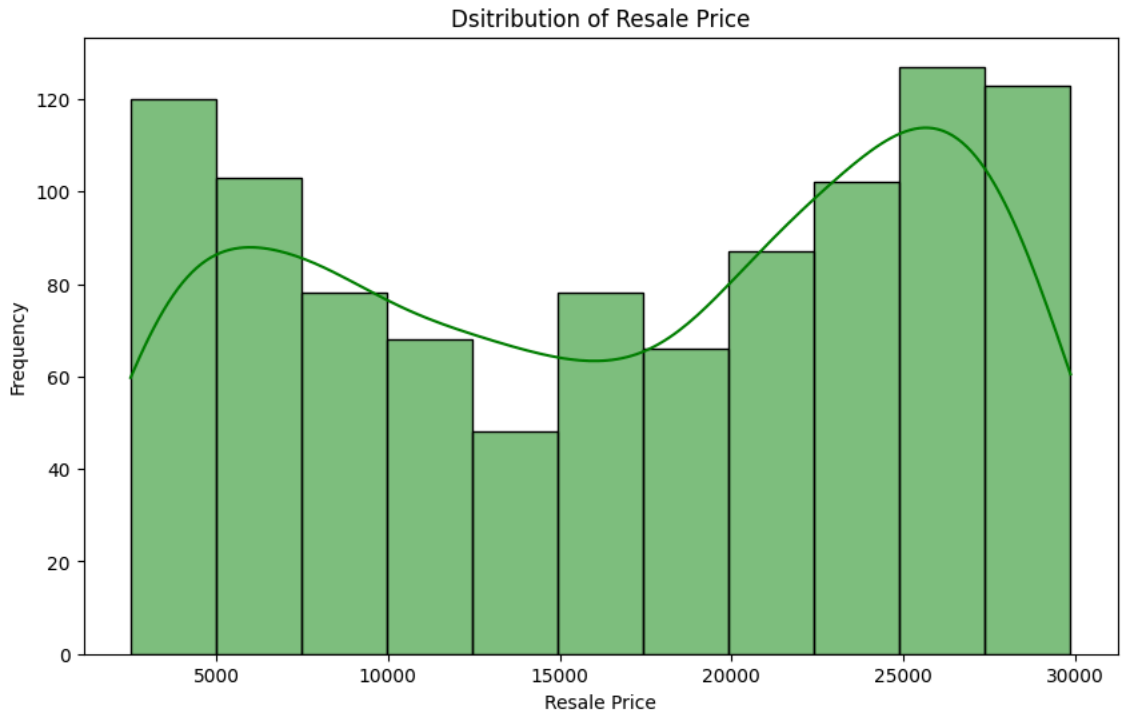
```
plt.figure(figsize=(10, 6))
sns.heatmap(data.corr(), annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt
```

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/matplotlib/pyplot.py'>
```



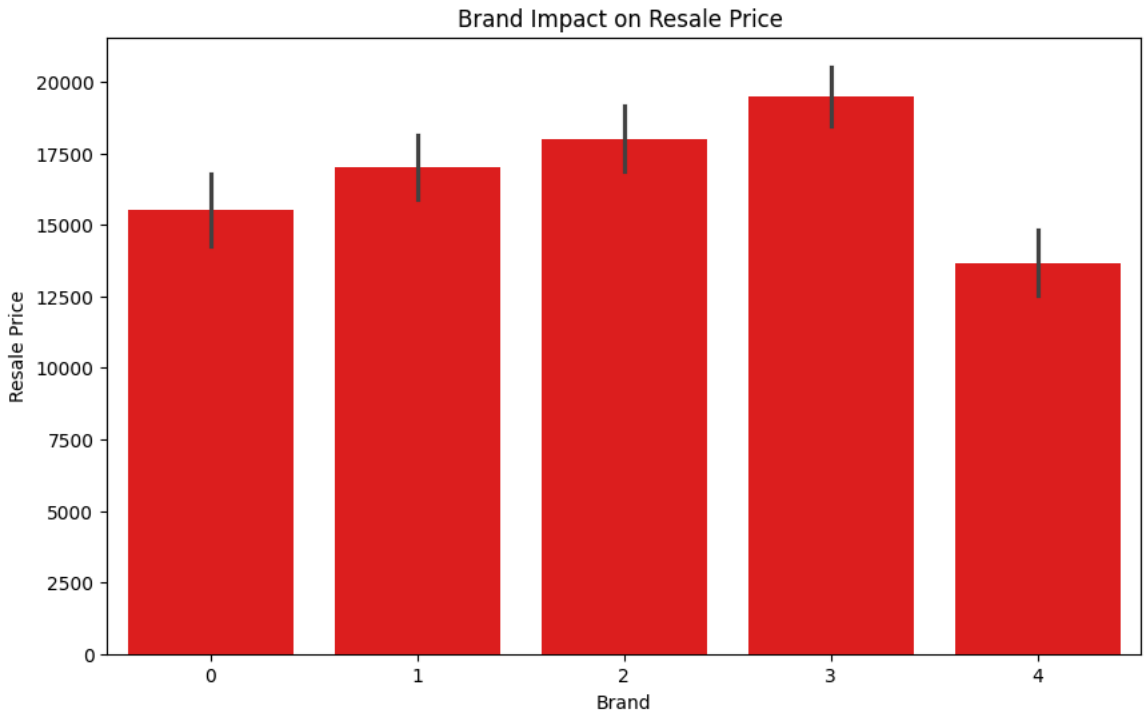

```
plt.figure(figsize=(10, 6))
sns.histplot(data['Resale Price'], kde=True, color="Green")
```

```
plt.title('Dsitribution of Resale Price')
plt.xlabel('Resale Price')
plt.ylabel('Frequency')
plt.show()
```




```
plt.figure(figsize=(10, 6))
sns.scatterplot(x=data['Mileage (miles)'],y=data['Resale Price'], color="Blue")
plt.title('Realtion between Mileage (miles) and Resale Price')
plt.ylabel('Resale Price')
plt.xlabel('Mileage')
plt.show()
```


```
plt.figure(figsize=(10, 6))
sns.barplot(x=data['Brand'],y=data['Resale Price'], color="red")
plt.title('Brand Impact on Resale Price ')
plt.xlabel('Brand')
plt.ylabel('Resale Price')
plt.show()
```




```
x = data.drop('Resale Price', axis=1)
y = data['Resale Price']
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=42)
```

```
x
```

	Brand	Model Year	Mileage (miles)	Fuel Type	Condition	Transmission
0	2	0.428571	0.743932	1	0.25	0
1	0	0.952381	0.794159	1	0.50	0
2	2	0.238095	0.551480	0	0.25	0
3	3	0.619048	0.578358	2	0.75	1
4	3	0.761905	0.249102	0	0.75	0
...	...	...	...	...	...	...
995	0	0.428571	0.043462	0	0.25	0
996	3	0.190476	0.393573	2	0.00	0
997	3	0.476190	0.763822	1	0.00	1
998	1	0.761905	0.613024	2	0.25	0
999	0	0.095238	0.477307	1	1.00	0

1000 rows × 6 columns

```
y
```

	Resale Price
0	22570
1	19312
2	14972
3	25714
4	21456
...	...
995	25625
996	27470
997	29569
998	15116
999	20540

1000 rows × 1 columns

dtype: int64

```
lr = LinearRegression()
lr.fit(x_train, y_train)
y_pred_lr = lr.predict(x_test)

dt = DecisionTreeRegressor()
dt.fit(x_train, y_train)
y_pred_dt = dt.predict(x_test)

rf = RandomForestRegressor()
rf.fit(x_train, y_train)
y_pred_rf = rf.predict(x_test)
```

```
print("MAE for Lr:", mean_absolute_error(y_test, y_pred_lr))
print("MAE for dt:", mean_absolute_error(y_test, y_pred_dt))
print("MAE for RF:", mean_absolute_error(y_test, y_pred_rf))
```

```
MAE for Lr: 7722.679898278405
MAE for dt: 0.0
MAE for RF: 55.37094999999999
```

```
print("MsE for Lr:", mean_squared_error(y_test, y_pred_lr))
print("MsE for dt:", mean_squared_error(y_test, y_pred_dt))
print("MsE for RF:", mean_squared_error(y_test, y_pred_rf))
```

```
MsE for Lr: 73958359.27137384
MsE for dt: 0.0
MsE for RF: 56140.84923550002
```

```
print("R2 Score for Lr:", r2_score(y_test, y_pred_lr))
print("R2 Score for dt:", r2_score(y_test, y_pred_dt))
print("R2 Score for RF:", r2_score(y_test, y_pred_rf))
```

```
R2 Score for Lr: 0.02408389484532769
R2 Score for dt: 1.0
R2 Score for RF: 0.9992591945053169
```

```
plt.figure(figsize=(10, 6))
plt.scatter(y_test, y_pred_lr, color="blue", label = "Linear Regression")
plt.scatter(y_test, y_pred_dt, color="green", label = "decision Tree Regressor")
plt.scatter(y_test, y_pred_rf, color="red", label = "Random Forest")
plt.xlabel("Actual Resale Price")
plt.ylabel("Predicted Resale Price")
plt.title("Actual vs Predicted Resale Price")
plt.legend()
plt.show()
```


```
grid_param = {
    'max_depth': [10,20,30,5,15,25,35], 'max_leaf_nodes': [5,7,10,15,20,24]
    }
grid_model = GridSearchCV(DecisionTreeRegressor(), grid_param, cv=5)
grid_model.fit(x_train, y_train)
print(grid_model.best_params_)
```

```
{'max_depth': 10, 'max_leaf_nodes': 24}
```

```
y_predict_grid = grid_model.best_estimator_.predict(x_test)
print("MAE for Grid:", mean_absolute_error(y_test, y_predict_grid))
print("MSE for Grid:", mean_squared_error(y_test, y_predict_grid))
print("r2 score for Grid:", r2_score(y_test, y_predict_grid))
```

```
MAE for Grid: 3015.926376209966
MSE for Grid: 16077007.958453264
r2 score for Grid: 0.7878561511649537
```

```
random_param = {
    'max_depth': [10,20,30,5,15,25,35], 'n_estimators': [100,200,300,350,250,50]
}
random_model = RandomizedSearchCV(RandomForestRegressor(), random_param, cv=5)
random_model.fit(x_train, y_train)
print(random_model.best_params_)
```

```
{'n_estimators': 100, 'max_depth': 35}
```

```
y_predict_rf = random_model.best_estimator_.predict(x_test)
print("MAE for Random:", mean_absolute_error(y_test, y_predict_rf))
print("MSE for Random:", mean_squared_error(y_test, y_predict_rf))
print("r2 score for Random:", r2_score(y_test, y_predict_rf))
```

```
MAE for Random: 51.596100000000035
MSE for Random: 38167.40534400004
r2 score for Random: 0.9994963627379766
```

```
pip install gradio
```

```
Collecting gradio
  Downloading gradio-5.11.0-py3-none-any.whl.metadata (16 kB)
Collecting aiofiles<24.0,>=22.0 (from gradio)
  Downloading aiofiles-23.2.1-py3-none-any.whl.metadata (9.7 kB)
Requirement already satisfied: anyio<5.0,>=3.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (3.7.1)
Collecting fastapi<1.0,>=0.115.2 (from gradio)
  Downloading fastapi-0.115.6-py3-none-any.whl.metadata (27 kB)
Collecting ffmpy (from gradio)
  Downloading ffmpy-0.5.0-py3-none-any.whl.metadata (3.0 kB)
Collecting gradio-client==1.5.3 (from gradio)
  Downloading gradio_client-1.5.3-py3-none-any.whl.metadata (7.1 kB)
Requirement already satisfied: httpx>=0.24.1 in /usr/local/lib/python3.10/dist-packages (from gradio) (0.28.1)
Requirement already satisfied: huggingface-hub>=0.25.1 in /usr/local/lib/python3.10/dist-packages (from gradio) (0.27.1)
Requirement already satisfied: jinja2<4.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (3.1.5)
Collecting markupsafe~=2.0 (from gradio)
  Downloading MarkupSafe-2.1.5-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (3.0 kB)
Requirement already satisfied: numpy<3.0,>=1.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (1.26.4)
Requirement already satisfied: orjson~=3.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (3.10.13)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from gradio) (24.2)
Requirement already satisfied: pandas<3.0,>=1.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (2.2.2)
Requirement already satisfied: pillow<12.0,>=8.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (11.1.0)
Requirement already satisfied: pydantic>=2.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (2.10.4)
Collecting pydub (from gradio)
  Downloading pydub-0.25.1-py2.py3-none-any.whl.metadata (1.4 kB)
Collecting python-multipart>=0.0.18 (from gradio)
  Downloading python_multipart-0.0.20-py3-none-any.whl.metadata (1.8 kB)
Requirement already satisfied: pyyaml<7.0,>=5.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (6.0.2)
Collecting ruff>=0.2.2 (from gradio)
  Downloading ruff-0.9.0-py3-none-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (25 kB)
Collecting safehttpx<0.2.0,>=0.1.6 (from gradio)
  Downloading safehttpx-0.1.6-py3-none-any.whl.metadata (4.2 kB)
Collecting semantic-version~=2.0 (from gradio)
  Downloading semantic_version-2.10.0-py2.py3-none-any.whl.metadata (9.7 kB)
Collecting starlette<1.0,>=0.40.0 (from gradio)
  Downloading starlette-0.45.2-py3-none-any.whl.metadata (6.3 kB)
Collecting tomlkit<0.14.0,>=0.12.0 (from gradio)
  Downloading tomlkit-0.13.2-py3-none-any.whl.metadata (2.7 kB)
Requirement already satisfied: typer<1.0,>=0.12 in /usr/local/lib/python3.10/dist-packages (from gradio) (0.15.1)
Requirement already satisfied: typing-extensions~=4.0 in /usr/local/lib/python3.10/dist-packages (from gradio) (4.12.2)
Collecting uvicorn>=0.14.0 (from gradio)
  Downloading uvicorn-0.34.0-py3-none-any.whl.metadata (6.5 kB)
Requirement already satisfied: fsspec in /usr/local/lib/python3.10/dist-packages (from gradio-client==1.5.3->gradio) (2024.10.0)
Requirement already satisfied: websockets<15.0,>=10.0 in /usr/local/lib/python3.10/dist-packages (from gradio-client==1.5.3->gradio) (
Requirement already satisfied: idna>=2.8 in /usr/local/lib/python3.10/dist-packages (from anyio<5.0,>=3.0->gradio) (3.10)
Requirement already satisfied: sniffio>=1.1 in /usr/local/lib/python3.10/dist-packages (from anyio<5.0,>=3.0->gradio) (1.3.1)
Requirement already satisfied: exceptiongroup in /usr/local/lib/python3.10/dist-packages (from anyio<5.0,>=3.0->gradio) (1.2.2)
Collecting starlette<1.0,>=0.40.0 (from gradio)
  Downloading starlette-0.41.3-py3-none-any.whl.metadata (6.0 kB)
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from httpx>=0.24.1->gradio) (2024.12.14)
Requirement already satisfied: httpcore==1.* in /usr/local/lib/python3.10/dist-packages (from httpx>=0.24.1->gradio) (1.0.7)
Requirement already satisfied: h11<0.15,>=0.13 in /usr/local/lib/python3.10/dist-packages (from httpcore==1.*->httpx>=0.24.1->gradio)
Requirement already satisfied: filelock in /usr/local/lib/python3.10/dist-packages (from huggingface-hub>=0.25.1->gradio) (3.16.1)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from huggingface-hub>=0.25.1->gradio) (2.32.3)
Requirement already satisfied: tqdm>=4.42.1 in /usr/local/lib/python3.10/dist-packages (from huggingface-hub>=0.25.1->gradio) (4.67.1)
Requirement already satisfied: python-dateutil>=2.8.2 in /usr/local/lib/python3.10/dist-packages (from pandas<3.0,>=1.0->gradio) (2.8
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas<3.0,>=1.0->gradio) (2024.2)
Requirement already satisfied: tzdata>=2022.7 in /usr/local/lib/python3.10/dist-packages (from pandas<3.0,>=1.0->gradio) (2024.2)
```

```
data.columns
```

```
Index(['Brand', 'Model Year', 'Mileage (miles)', 'Fuel Type', 'Condition',
       'Transmission', 'Resale Price'],
      dtype='object')
```

```
import gradio as gr
def predict_resale_price(brand, model_year, miles, condition, fuel_type, transmission)
  try:
    input_data = pd.DataFrame({
        'Brand': [brand],
        'Model Year': [model_year],
        'Mileage (miles)': [miles],
        'Fuel Type': [fuel_type],
        'Condition': [condition],
```

```
            'Transmission': [transmission]
        })
        for col in encoding_cols:
          input_data[col] = le[col].transform(input_data[col])
        input_data[scale_cols] = scaler.transform(input_data[scale_cols])
        predict = random_model.best_estimator_.predict(input_data)
        return f"Predicted Resale Price: ${predict[0]:,.2f}"
      except Exception as e:
        return f"Error: {e}"
    gr.Interface(
        fn=predict_resale_price,
        inputs=[
            gr.Dropdown(['Ford', 'BMW', 'Honda', 'Chevrolet', 'Toyota'], label="Brand"),
            gr.Number(label="Model Year"),
            gr.Number(label="Mileage (miles)"),
            gr.Number(label="Condition (1-5)"),
            gr.Dropdown(['Gasoline', 'Diesel', 'Electric'], label="Fuel Type"),
            gr.Dropdown(['Manual', 'Automatic'], label="Transmission")
        ],
        outputs = gr.Textbox(label="Predicted Resale Price"),
        title="Resale Price Prediction"
```

```
Running Gradio in a Colab notebook requires sharing enabled. Automatically settin  `share=True` (you can turn this off by setting `share

Colab notebook detected. To show errors in colab notebook, set debug=True in laun h()
* Running on public URL: https://e12e6b83f8012dcb1d.gradio.live

This share link expires in 72 hours. For free permanent hosting and GPU upgrades, run `gradio deploy` from the terminal in the working d
```

No interface is running right now