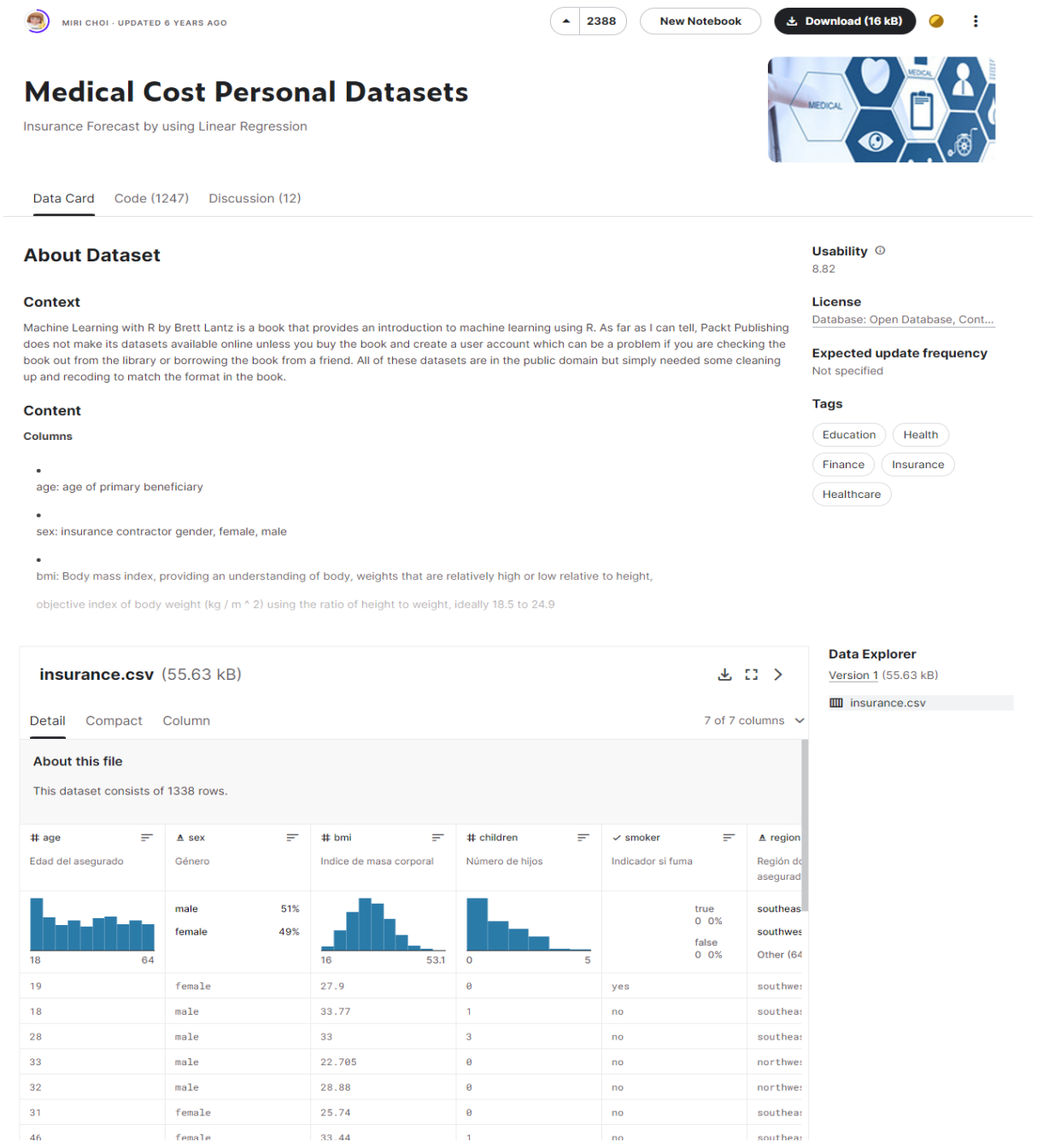
Assignment4 - Create Regression Model with Real Dataset & Model Deployment

1. Choose a real-world dataset that contains at least three features and a numeric target variable. that you want to predict. Ensure the dataset is suitable for regression analysis.



Dataset: https://www.kaggle.com/datasets/mirichoi0218/insurance

2. Create a regression model to predict a target variable based on features from the dataset.

Step 1: Create a Linear Regression Model

```
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error, r2_score
import numpy as np

# Load the dataset
df = pd.read_csv("insurance.csv")

# Define the features and target
features = ['age', 'bmi', 'children']
target = 'charges'

X = df[features]
y = df[target]

# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Create and train the Linear Regression model
model = LinearRegression()
model.fit(X_train, y_train)

# Make predictions on the test set
y_pred = model.predict(X_test)

# Calculate Mean Squared Error (MSE)
mse = mean_squared_error(y_test, y_pred)

# Calculate Root Mean Squared Error (RMSE)
rmse = np.sqrt(mse)

# Calculate R-squared (R^2)
r_squared = r2_score(y_test, y_pred)

print("Mean Squared Error (MSE):", mse)
print("Root Mean Squared Error (RMSE):", rmse)
print("R-squared (R^2):", r_squared)
```

```
Mean Squared Error (MSE): 131201335.64669806
Root Mean Squared Error (RMSE): 11454.315153980095
R-squared (R^2): 0.15489592484270753
```

Step 2: Save the Model

```
import joblib

# Save the model to a file
joblib.dump(model, 'linear_regression_model.pkl')
```

Step 3: Load the Model

```
import joblib

# Load the model
loaded_model = joblib.load('linear_regression_model.pkl')
```

Step 4: Show an Example of Prediction

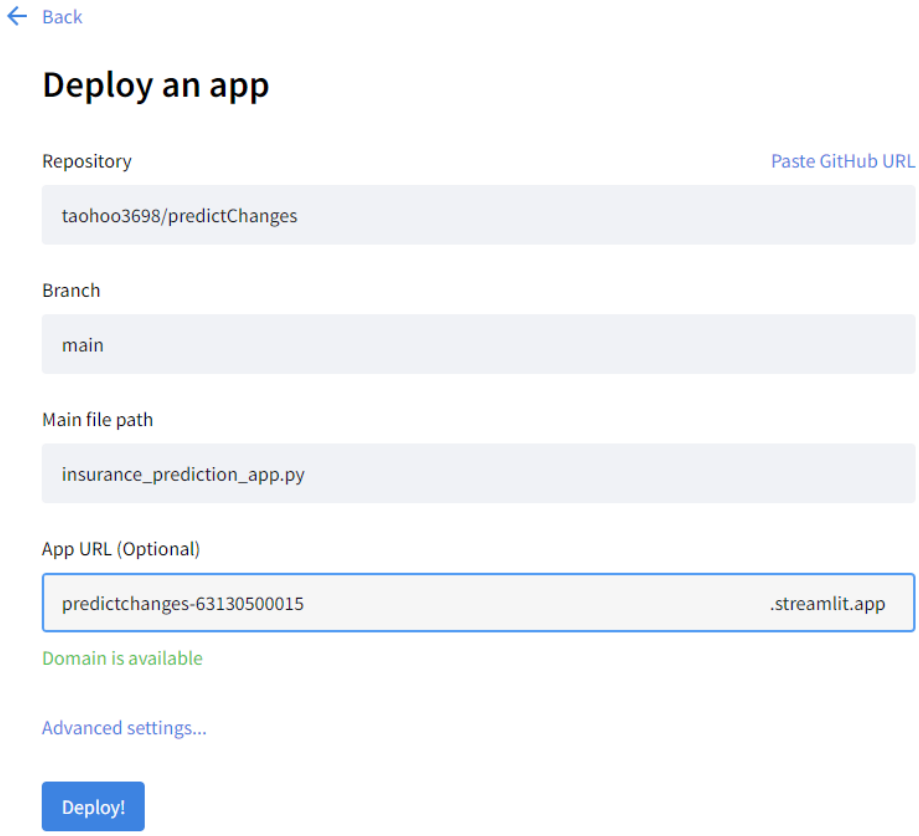
```
import pandas as pd

# Example of making a prediction using the loaded model
example_data = pd.DataFrame({'age': [30], 'bmi': [25.0], 'children': [2]})
predicted_charges = loaded_model.predict(example_data)
print("Predicted Charges:", predicted_charges[0])
```

```
Predicted Charges: 9935.787545096708
```

Step 5: Create a Streamlit App with new file ‘insurance_prediction_app.py’

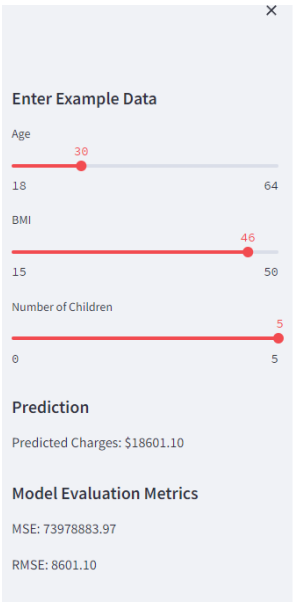
```python
import streamlit as st
import joblib
import pandas as pd
from sklearn.metrics import mean_squared_error
import numpy as np

# Load the saved model
loaded_model = joblib.load('linear_regression_model.pkl')

# Define the features for input
features = ['age', 'bmi', 'children']

# Define the Streamlit app
st.title("Insurance Charges Prediction")

# Create a sidebar for user input
st.sidebar.header('Enter Example Data')

age = st.sidebar.slider("Age", min_value=18, max_value=64, value=30)
bmi = st.sidebar.slider("BMI", min_value=15, max_value=50, value=25)
children = st.sidebar.slider("Number of Children", min_value=0, max_value=5, value=2)

# Create a DataFrame with the user input
example_data = pd.DataFrame([[age, bmi, children]], columns=features)

# Make predictions
predicted_charges = loaded_model.predict(example_data)

# Display the prediction
st.sidebar.header('Prediction')
st.sidebar.write(f"Predicted Charges: ${predicted_charges[0]:.2f}")

# Calculate Mean Squared Error (MSE) and Root Mean Squared Error (RMSE)
actual_charges = 10000  # Replace with the actual charges if available

if actual_charges:
    mse = mean_squared_error([actual_charges], [predicted_charges[0]])
    rmse = np.sqrt(mse)
    st.sidebar.header('Model Evaluation Metrics')
    st.sidebar.write(f"MSE: {mse:.2f}")
    st.sidebar.write(f"RMSE: {rmse:.2f}")
else:
    st.sidebar.write("Actual charges not provided. Unable to calculate MSE and RMSE.")

# Main content area
st.header('Insurance Charges Prediction')
```

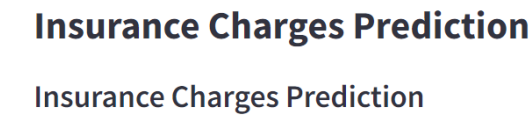
3. Deploy the regression model as a web application using Streamlit.io.



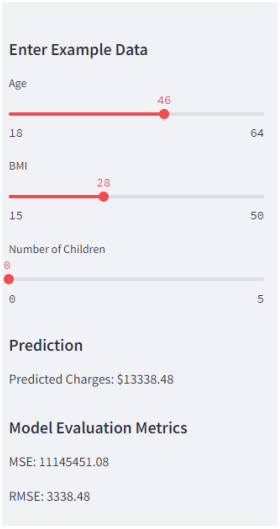
4. Put the evaluation result on your web app.

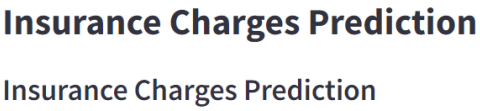
Result 1



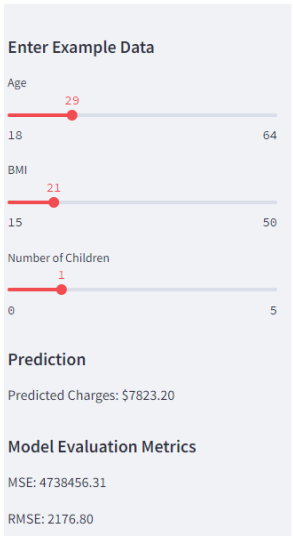


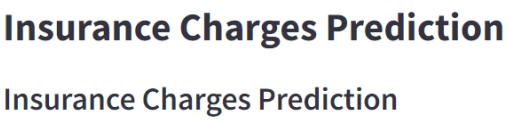
Result 2





Result 3





5. In the Streamlit Sharing settings for your app, make sure to set it to "Public" or "Anyone with the link can view.

Link: https://predictchanges-63130500015.streamlit.app/