

## Step-by-Step Ridge Regression Model - Canada Per Capita Income

### Step 1: Prepare the Data

```
x = df[['year']]
```

```
y = df['income']
```

### Step 2: Train/Test Split

```
from sklearn.model_selection import train_test_split
```

```
x_train, x_test, y_train, y_test = train_test_split(
```

```
    x, y, test_size=0.2, random_state=42
```

```
)
```

### Step 3: Fit Ridge Regression Model

```
from sklearn.linear_model import Ridge
```

```
ridge_model = Ridge(alpha=1.0)
```

```
ridge_model.fit(x_train, y_train)
```

### Step 4: Make Predictions

```
y_pred = ridge_model.predict(x_test)
```

### Step 5: Evaluate

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

```
mse = mean_squared_error(y_test, y_pred)
```

```
r2 = r2_score(y_test, y_pred)
```

```
print("MSE:", mse)
```

```
print("R2 Score:", r2)
```

### Step 6: Visualize

```
import matplotlib.pyplot as plt
```

```
plt.scatter(x, y, color='blue', label='Actual Data')
```

```
plt.plot(x_test, y_pred, color='orange', linewidth=2, label='Ridge Regression Line')
```

```
plt.xlabel('Year')  
plt.ylabel('Income')  
plt.title('Ridge Regression - Per Capita Income')  
plt.legend()  
plt.grid(True)  
plt.tight_layout()  
plt.show()
```

## Evaluation Output

Mean Squared Error: 15,150,327.51

R<sup>2</sup> Score: 0.875