

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures
from sklearn.svm import SVR
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor, AdaBoostRegressor
import xgboost as xgb
from keras.models import Sequential
from keras.layers import LSTM, Dense, Dropout, GRU, SimpleRNN, Conv1D, MaxPooling1D, Flatten
from keras.layers import Input, Attention
from sklearn.metrics import mean_squared_error
import tensorflow_probability as tfp
import networkx as nx
from keras.models import Model
import tensorflow as tf
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
from keras.models import Sequential
from keras.layers import LSTM, Dense, Dropout
from mpl_toolkits.mplot3d import Axes3D
from mpl_toolkits.mplot3d.art3d import Poly3DCollection
from scipy.interpolate import griddata

# Load the dataset
data = pd.read_csv("/content/sample_data/output.csv")

# Preprocess the dataset
# Drop unnecessary columns like Name
data = data.drop(columns=["Name"])

# Convert categorical variables to numerical using one-hot encoding
data_encoded = pd.get_dummies(data, columns=["Initial Continent", "Initial Climate", "Final Continent"])

# Split the dataset into features and target variables
X = data_encoded.drop(columns=["Impact"])
y = data_encoded[["Impact"]]

# 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)

# Standardize the features
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)

# Reshape the input data for LSTM
X_train_reshaped = np.reshape(X_train_scaled, (X_train_scaled.shape[0], 1, X_train_scaled.shape[1]))
X_test_reshaped = np.reshape(X_test_scaled, (X_test_scaled.shape[0], 1, X_test_scaled.shape[1]))

# Build the LSTM model
model = Sequential()
model.add(LSTM(units=50, return_sequences=True, input_shape=(1, X_train_scaled.shape[1])))
model.add(Dropout(0.2))
model.add(LSTM(units=50, return_sequences=True))
model.add(Dropout(0.2))
model.add(LSTM(units=50))
model.add(Dropout(0.2))
model.add(Dense(units=1)) # Output layer with 1 neuron for Impact

# Compile the model
model.compile(optimizer='adam', loss='mean_squared_error')
```



```
# Train the model
history = model.fit(X_train_reshaped, y_train, epochs=100, batch_size=32, validation_data=())

# Plot training and validation loss
plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.title('Training and Validation Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend()
plt.show()

# Evaluate the model
loss = model.evaluate(X_test_reshaped, y_test)
print("Test Loss:", loss)

# Make predictions
predictions = model.predict(X_test_reshaped)

# Convert predictions to DataFrame
predictions_df = pd.DataFrame(predictions, columns=["Predicted_Impact"])

# Reset index for y_test for concatenation
y_test.reset_index(drop=True, inplace=True)

# Concatenate actual and predicted values
results_df = pd.concat([y_test, predictions_df], axis=1)

# Print the results
print("Actual vs Predicted Impact:")
print(results_df)

# Perform PCA on the feature set
pca = PCA(n_components=2)
X_train_pca = pca.fit_transform(X_train_scaled)
X_test_pca = pca.transform(X_test_scaled)

# Convert predictions and actual values to numpy arrays for plotting
predictions_np = predictions.flatten()
y_test_np = y_test.values.flatten()

# Create a DataFrame with PCA components and predictions
pca_df = pd.DataFrame(data=X_test_pca, columns=["PC1", "PC2"])
pca_df["Actual_Impact"] = y_test_np
pca_df["Predicted_Impact"] = predictions_np

# Create a mesh grid for the wireframe plot
grid_x, grid_y = np.meshgrid(
    np.linspace(pca_df["PC1"].min(), pca_df["PC1"].max(), 100),
    np.linspace(pca_df["PC2"].min(), pca_df["PC2"].max(), 100)
)
```

```
# Interpolate the predicted impacts for the mesh grid
grid_z = griddata((pca_df["PC1"], pca_df["PC2"]), pca_df["Predicted_Impact"], (grid_x, grid_y))

# Plotting the 3D wireframe plot
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')

# Wireframe plot for predicted impacts
ax.plot_wireframe(grid_x, grid_y, grid_z, color='r')

# Labels and title
ax.set_xlabel('Principal Component 1')
ax.set_ylabel('Principal Component 2')
ax.set_zlabel('Predicted Impact')
ax.set_title('3D Wireframe Plot of Predicted Impact')

# Show the plot
plt.show()

plt.figure(figsize=(10, 6))
plt.scatter(X_train_pca[:, 0], X_train_pca[:, 1], c=y_train.values.flatten(), cmap='viridis')
plt.xlabel('Principal Component 1')
plt.ylabel('Principal Component 2')
plt.title('PCA Components Plot')
plt.colorbar(label='Impact Value')
plt.show()

residuals = y_test_np - predictions_np

plt.figure(figsize=(10, 6))
plt.scatter(predictions_np, residuals, alpha=0.7)
plt.axhline(0, color='r', linestyle='--')
plt.xlabel('Predicted Impact')
plt.ylabel('Residuals')
plt.title('Residual Plot')
plt.show()
```

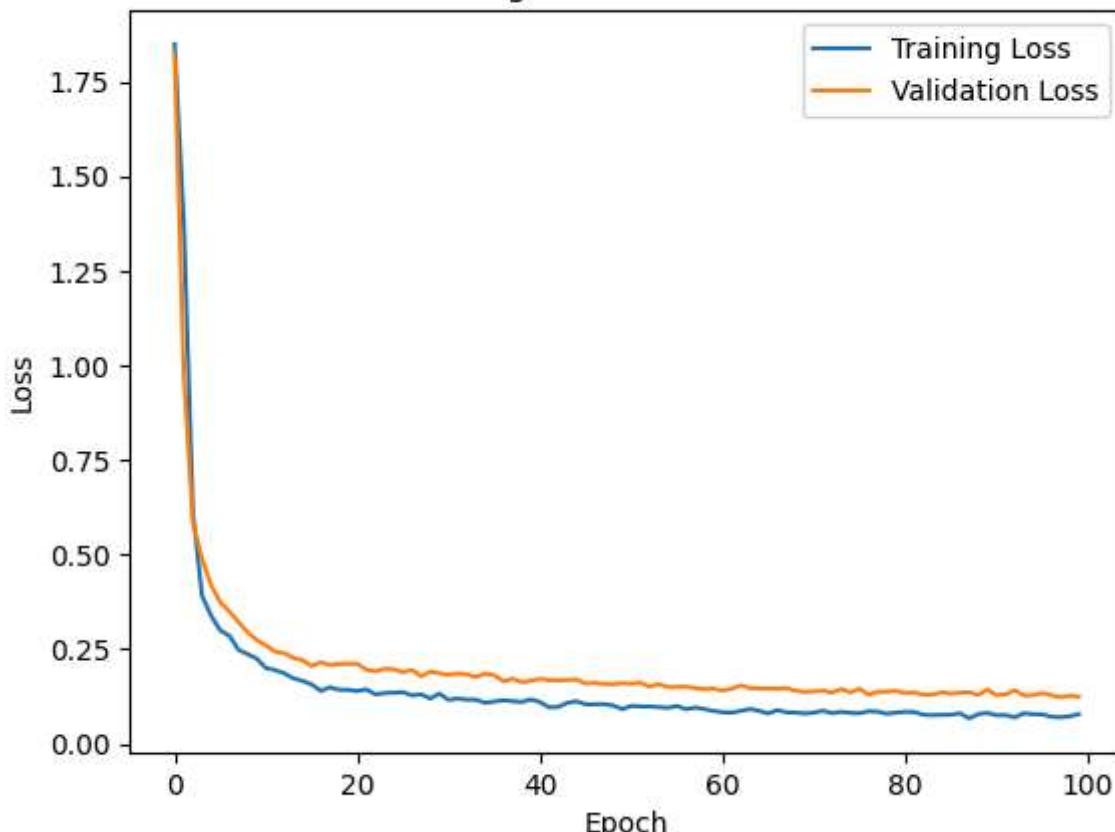
```
→ Epoch 1/100  
25/25 [=====] - 7s 66ms/step - loss: 1.8485 - val_loss: 1.8249  
Epoch 2/100  
25/25 [=====] - 0s 7ms/step - loss: 1.3784 - val_loss: 0.9803  
Epoch 3/100  
25/25 [=====] - 0s 8ms/step - loss: 0.6142 - val_loss: 0.5848  
Epoch 4/100  
25/25 [=====] - 0s 7ms/step - loss: 0.3911 - val_loss: 0.4890  
Epoch 5/100  
25/25 [=====] - 0s 7ms/step - loss: 0.3383 - val_loss: 0.4191  
Epoch 6/100  
25/25 [=====] - 0s 8ms/step - loss: 0.2991 - val_loss: 0.3741  
Epoch 7/100  
25/25 [=====] - 0s 7ms/step - loss: 0.2854 - val_loss: 0.3491  
Epoch 8/100  
25/25 [=====] - 0s 7ms/step - loss: 0.2482 - val_loss: 0.3216  
Epoch 9/100  
25/25 [=====] - 0s 7ms/step - loss: 0.2367 - val_loss: 0.2946  
Epoch 10/100  
25/25 [=====] - 0s 7ms/step - loss: 0.2250 - val_loss: 0.2738  
Epoch 11/100  
25/25 [=====] - 0s 8ms/step - loss: 0.2002 - val_loss: 0.2597  
Epoch 12/100  
25/25 [=====] - 0s 7ms/step - loss: 0.1947 - val_loss: 0.2433  
Epoch 13/100  
25/25 [=====] - 0s 8ms/step - loss: 0.1861 - val_loss: 0.2396  
Epoch 14/100  
25/25 [=====] - 0s 8ms/step - loss: 0.1729 - val_loss: 0.2268  
Epoch 15/100  
25/25 [=====] - 0s 7ms/step - loss: 0.1664 - val_loss: 0.2212  
Epoch 16/100  
25/25 [=====] - 0s 8ms/step - loss: 0.1567 - val_loss: 0.2057  
Epoch 17/100  
25/25 [=====] - 0s 7ms/step - loss: 0.1398 - val_loss: 0.2152  
Epoch 18/100  
25/25 [=====] - 0s 7ms/step - loss: 0.1492 - val_loss: 0.2080  
Epoch 19/100  
25/25 [=====] - 0s 10ms/step - loss: 0.1426 - val_loss: 0.2110  
Epoch 20/100  
25/25 [=====] - 0s 11ms/step - loss: 0.1424 - val_loss: 0.2115  
Epoch 21/100  
25/25 [=====] - 0s 11ms/step - loss: 0.1393 - val_loss: 0.2116  
Epoch 22/100  
25/25 [=====] - 0s 12ms/step - loss: 0.1436 - val_loss: 0.1954  
Epoch 23/100  
25/25 [=====] - 0s 12ms/step - loss: 0.1305 - val_loss: 0.1914  
Epoch 24/100  
25/25 [=====] - 0s 11ms/step - loss: 0.1340 - val_loss: 0.1982  
Epoch 25/100  
25/25 [=====] - 0s 10ms/step - loss: 0.1349 - val_loss: 0.1968  
Epoch 26/100  
25/25 [=====] - 0s 12ms/step - loss: 0.1364 - val_loss: 0.1891  
Epoch 27/100  
25/25 [=====] - 0s 12ms/step - loss: 0.1280 - val_loss: 0.1952  
Epoch 28/100  
25/25 [=====] - 0s 13ms/step - loss: 0.1305 - val_loss: 0.1781
```

```
Epoch 29/100
25/25 [=====] - 0s 13ms/step - loss: 0.1195 - val_loss: 0.1905
Epoch 30/100
25/25 [=====] - 0s 10ms/step - loss: 0.1327 - val_loss: 0.1865
Epoch 31/100
25/25 [=====] - 0s 7ms/step - loss: 0.1159 - val_loss: 0.1824
Epoch 32/100
25/25 [=====] - 0s 7ms/step - loss: 0.1195 - val_loss: 0.1857
Epoch 33/100
25/25 [=====] - 0s 7ms/step - loss: 0.1165 - val_loss: 0.1836
Epoch 34/100
25/25 [=====] - 0s 7ms/step - loss: 0.1164 - val_loss: 0.1767
Epoch 35/100
25/25 [=====] - 0s 7ms/step - loss: 0.1082 - val_loss: 0.1854
Epoch 36/100
25/25 [=====] - 0s 8ms/step - loss: 0.1118 - val_loss: 0.1813
Epoch 37/100
25/25 [=====] - 0s 8ms/step - loss: 0.1148 - val_loss: 0.1650
Epoch 38/100
25/25 [=====] - 0s 7ms/step - loss: 0.1128 - val_loss: 0.1718
Epoch 39/100
25/25 [=====] - 0s 7ms/step - loss: 0.1101 - val_loss: 0.1628
Epoch 40/100
25/25 [=====] - 0s 7ms/step - loss: 0.1176 - val_loss: 0.1666
Epoch 41/100
25/25 [=====] - 0s 7ms/step - loss: 0.1103 - val_loss: 0.1713
Epoch 42/100
25/25 [=====] - 0s 8ms/step - loss: 0.0965 - val_loss: 0.1683
Epoch 43/100
25/25 [=====] - 0s 7ms/step - loss: 0.0973 - val_loss: 0.1675
Epoch 44/100
25/25 [=====] - 0s 7ms/step - loss: 0.1082 - val_loss: 0.1688
Epoch 45/100
25/25 [=====] - 0s 7ms/step - loss: 0.1124 - val_loss: 0.1700
Epoch 46/100
25/25 [=====] - 0s 7ms/step - loss: 0.1043 - val_loss: 0.1591
Epoch 47/100
25/25 [=====] - 0s 8ms/step - loss: 0.1041 - val_loss: 0.1609
Epoch 48/100
25/25 [=====] - 0s 7ms/step - loss: 0.1050 - val_loss: 0.1582
Epoch 49/100
25/25 [=====] - 0s 7ms/step - loss: 0.1012 - val_loss: 0.1576
Epoch 50/100
25/25 [=====] - 0s 7ms/step - loss: 0.0916 - val_loss: 0.1602
Epoch 51/100
25/25 [=====] - 0s 6ms/step - loss: 0.1002 - val_loss: 0.1589
Epoch 52/100
25/25 [=====] - 0s 7ms/step - loss: 0.0987 - val_loss: 0.1610
Epoch 53/100
25/25 [=====] - 0s 8ms/step - loss: 0.0984 - val_loss: 0.1512
Epoch 54/100
25/25 [=====] - 0s 7ms/step - loss: 0.0970 - val_loss: 0.1577
Epoch 55/100
25/25 [=====] - 0s 7ms/step - loss: 0.0950 - val_loss: 0.1501
Epoch 56/100
25/25 [=====] - 0s 7ms/step - loss: 0.0999 - val_loss: 0.1501
Epoch 57/100
```

```
[Epoch 57/100]
25/25 [=====] - 0s 7ms/step - loss: 0.0913 - val_loss: 0.1507
Epoch 58/100
25/25 [=====] - 0s 9ms/step - loss: 0.0957 - val_loss: 0.1473
Epoch 59/100
25/25 [=====] - 0s 7ms/step - loss: 0.0920 - val_loss: 0.1439
Epoch 60/100
25/25 [=====] - 0s 6ms/step - loss: 0.0867 - val_loss: 0.1461
Epoch 61/100
25/25 [=====] - 0s 7ms/step - loss: 0.0835 - val_loss: 0.1407
Epoch 62/100
25/25 [=====] - 0s 7ms/step - loss: 0.0823 - val_loss: 0.1458
Epoch 63/100
25/25 [=====] - 0s 6ms/step - loss: 0.0871 - val_loss: 0.1542
Epoch 64/100
25/25 [=====] - 0s 9ms/step - loss: 0.0920 - val_loss: 0.1472
Epoch 65/100
25/25 [=====] - 0s 7ms/step - loss: 0.0871 - val_loss: 0.1461
Epoch 66/100
25/25 [=====] - 0s 7ms/step - loss: 0.0802 - val_loss: 0.1460
Epoch 67/100
25/25 [=====] - 0s 7ms/step - loss: 0.0890 - val_loss: 0.1456
Epoch 68/100
25/25 [=====] - 0s 7ms/step - loss: 0.0830 - val_loss: 0.1468
Epoch 69/100
25/25 [=====] - 0s 9ms/step - loss: 0.0824 - val_loss: 0.1401
Epoch 70/100
25/25 [=====] - 0s 7ms/step - loss: 0.0800 - val_loss: 0.1375
Epoch 71/100
25/25 [=====] - 0s 8ms/step - loss: 0.0825 - val_loss: 0.1384
Epoch 72/100
25/25 [=====] - 0s 9ms/step - loss: 0.0873 - val_loss: 0.1401
Epoch 73/100
25/25 [=====] - 1s 21ms/step - loss: 0.0808 - val_loss: 0.1354
Epoch 74/100
25/25 [=====] - 0s 14ms/step - loss: 0.0845 - val_loss: 0.1447
Epoch 75/100
25/25 [=====] - 0s 15ms/step - loss: 0.0816 - val_loss: 0.1360
Epoch 76/100
25/25 [=====] - 0s 16ms/step - loss: 0.0809 - val_loss: 0.1451
Epoch 77/100
25/25 [=====] - 0s 16ms/step - loss: 0.0860 - val_loss: 0.1292
Epoch 78/100
25/25 [=====] - 1s 21ms/step - loss: 0.0848 - val_loss: 0.1375
Epoch 79/100
25/25 [=====] - 0s 13ms/step - loss: 0.0793 - val_loss: 0.1377
Epoch 80/100
25/25 [=====] - 0s 15ms/step - loss: 0.0823 - val_loss: 0.1395
Epoch 81/100
25/25 [=====] - 0s 17ms/step - loss: 0.0848 - val_loss: 0.1343
Epoch 82/100
25/25 [=====] - 0s 16ms/step - loss: 0.0838 - val_loss: 0.1352
Epoch 83/100
25/25 [=====] - 1s 21ms/step - loss: 0.0766 - val_loss: 0.1296
Epoch 84/100
25/25 [=====] - 0s 16ms/step - loss: 0.0756 - val_loss: 0.1296
Epoch 85/100
```

```
25/25 [=====] - 1s 22ms/step - loss: 0.0766 - val_loss: 0.1362
Epoch 86/100
25/25 [=====] - 1s 26ms/step - loss: 0.0766 - val_loss: 0.1324
Epoch 87/100
25/25 [=====] - 1s 23ms/step - loss: 0.0807 - val_loss: 0.1351
Epoch 88/100
25/25 [=====] - 0s 19ms/step - loss: 0.0672 - val_loss: 0.1359
Epoch 89/100
25/25 [=====] - 0s 14ms/step - loss: 0.0787 - val_loss: 0.1297
Epoch 90/100
25/25 [=====] - 0s 14ms/step - loss: 0.0815 - val_loss: 0.1428
Epoch 91/100
25/25 [=====] - 0s 14ms/step - loss: 0.0753 - val_loss: 0.1284
Epoch 92/100
25/25 [=====] - 0s 11ms/step - loss: 0.0760 - val_loss: 0.1311
Epoch 93/100
25/25 [=====] - 0s 12ms/step - loss: 0.0699 - val_loss: 0.1413
Epoch 94/100
25/25 [=====] - 0s 13ms/step - loss: 0.0807 - val_loss: 0.1276
Epoch 95/100
25/25 [=====] - 0s 10ms/step - loss: 0.0780 - val_loss: 0.1285
Epoch 96/100
25/25 [=====] - 0s 12ms/step - loss: 0.0777 - val_loss: 0.1341
Epoch 97/100
25/25 [=====] - 0s 14ms/step - loss: 0.0715 - val_loss: 0.1283
Epoch 98/100
25/25 [=====] - 0s 12ms/step - loss: 0.0701 - val_loss: 0.1229
Epoch 99/100
25/25 [=====] - 0s 11ms/step - loss: 0.0728 - val_loss: 0.1275
Epoch 100/100
25/25 [=====] - 0s 14ms/step - loss: 0.0782 - val_loss: 0.1240
```

Training and Validation Loss



```
7/7 [=====] - 0s 3ms/step - loss: 0.1240
```

Test Loss: 0.12397323548793793

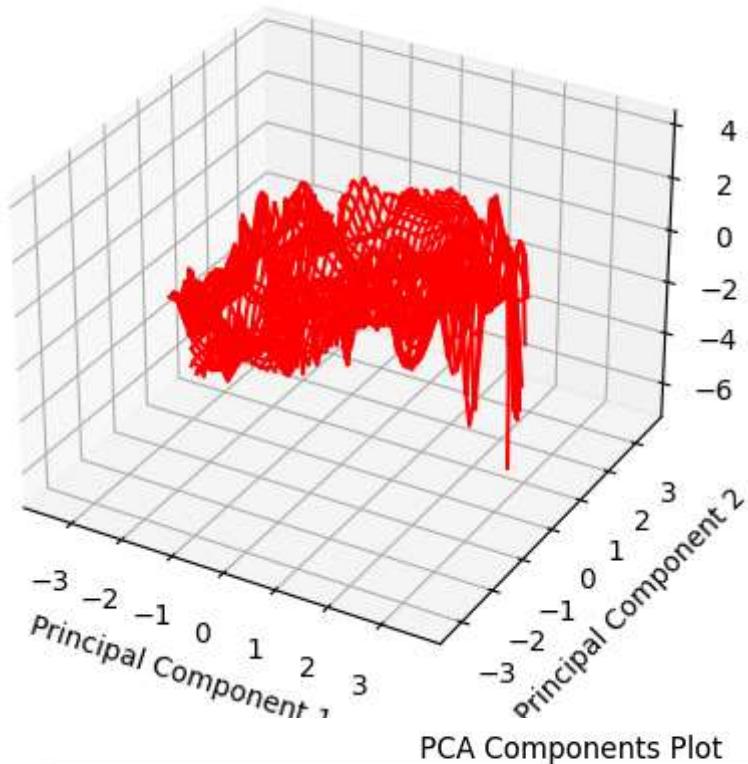
```
7/7 [=====] - 1s 3ms/step
```

Actual vs Predicted Impact:

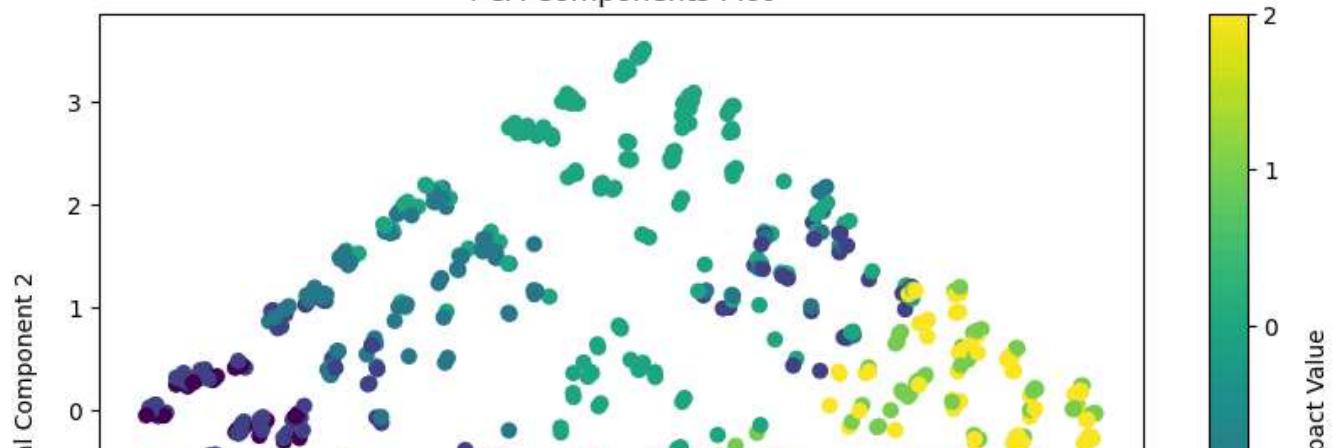
	Impact	Predicted_Impact
0	0	-0.591395
1	1	1.347256
2	1	0.889158
3	2	1.781840
4	-1	-1.216825
..
195	-1	-0.910000
196	0	0.022339
197	1	0.791042
198	-2	-1.620710
199	2	1.796133

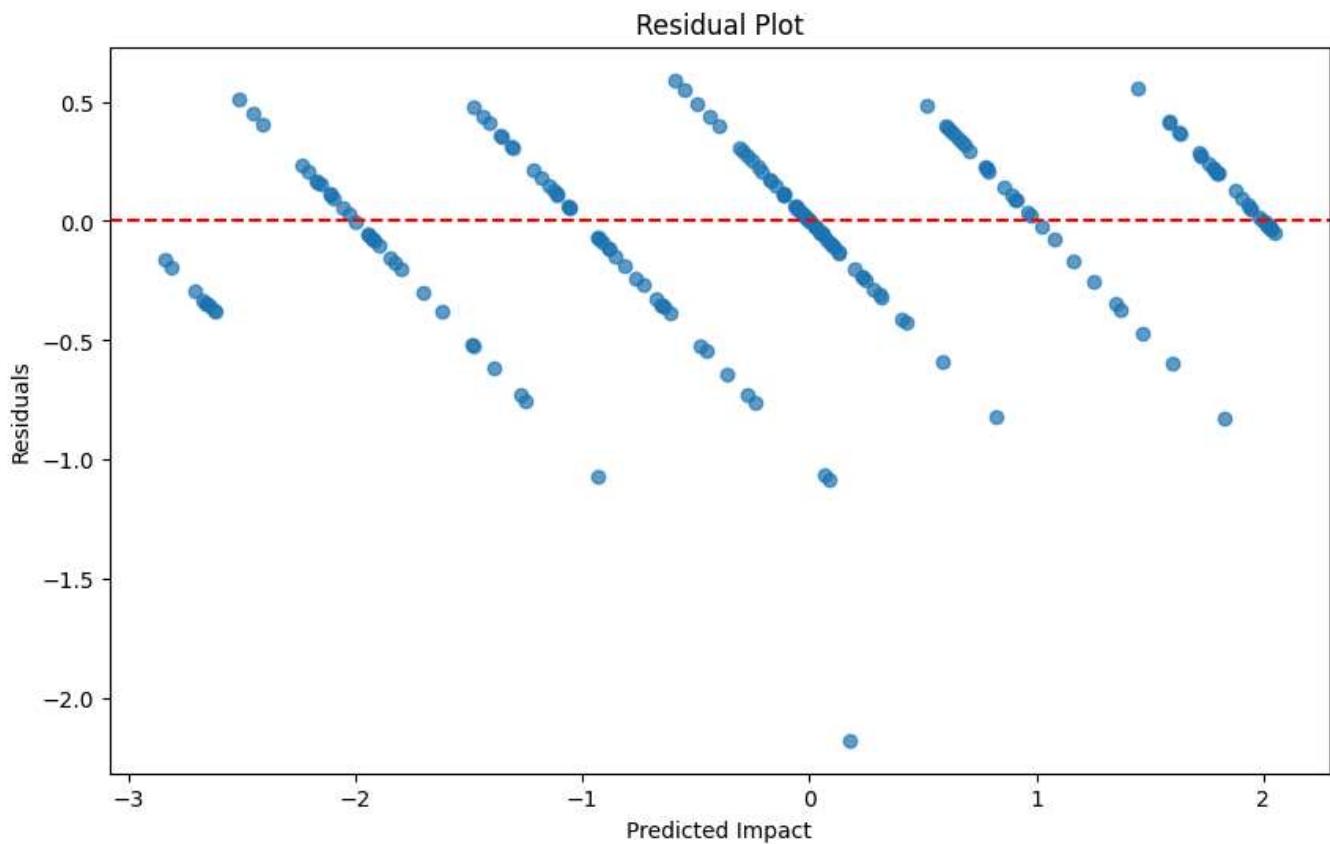
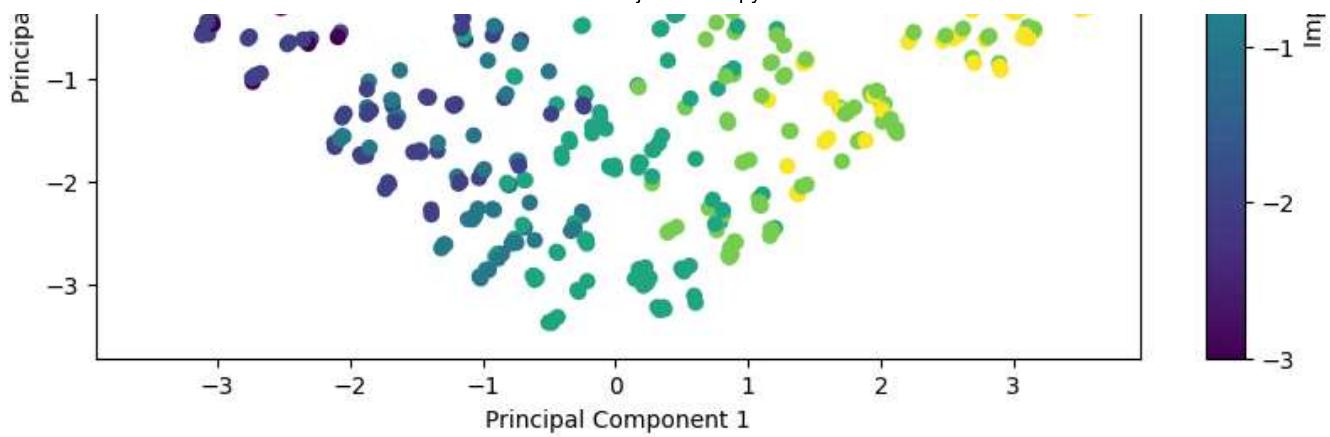
[200 rows x 2 columns]

3D Wireframe Plot of Predicted Impact



PCA Components Plot





```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from keras.models import Sequential
from keras.layers import Bidirectional, LSTM, Dense, Dropout

# Load the dataset
data = pd.read_csv("/content/sample_data/output.csv")

# Preprocess the dataset
# Drop unnecessary columns like Name
data = data.drop(columns=["Name"])

# Convert categorical variables to numerical using one-hot encoding
data_encoded = pd.get_dummies(data, columns=["Initial Continent", "Initial Climate", "Final Continent"])

# Split the dataset into features and target variables
X = data_encoded.drop(columns=["Impact"])
y = data_encoded[["Impact"]]

# 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)

# Standardize the features
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)

# Reshape the input data for Bi-LSTM
X_train_reshaped = np.reshape(X_train_scaled, (X_train_scaled.shape[0], 1, X_train_scaled.shape[1]))
X_test_reshaped = np.reshape(X_test_scaled, (X_test_scaled.shape[0], 1, X_test_scaled.shape[1]))

# Build the Bi-LSTM model
model = Sequential()
model.add(Bidirectional(LSTM(units=50, return_sequences=True), input_shape=(1, X_train_scaled.shape[2])))
model.add(Dropout(0.2))
model.add(Bidirectional(LSTM(units=50, return_sequences=True)))
model.add(Dropout(0.2))
model.add(Bidirectional(LSTM(units=50)))
model.add(Dropout(0.2))
model.add(Dense(units=1)) # Output layer with 1 neuron for Impact

# Compile the model
model.compile(optimizer='adam', loss='mean_squared_error')

# Train the model
history = model.fit(X_train_reshaped, y_train, epochs=300, batch_size=32, validation_data=(X_test_reshaped, y_test))

# Plot training and validation loss
```

```
plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.title('Training and Validation Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend()
plt.show()

# Evaluate the model
loss = model.evaluate(X_test_reshaped, y_test)
print("Test Loss:", loss)

# Make predictions
predictions = model.predict(X_test_reshaped)

# Plot actual vs predicted values
plt.scatter(y_test, predictions)
plt.xlabel('Actual Impact')
plt.ylabel('Predicted Impact')
plt.title('Actual vs Predicted Impact')
plt.show()
```

```
→ Epoch 1/300
25/25 [=====] - 14s 105ms/step - loss: 1.7083 - val_loss: 1.371
Epoch 2/300
25/25 [=====] - 0s 9ms/step - loss: 0.7276 - val_loss: 0.5271
Epoch 3/300
25/25 [=====] - 0s 11ms/step - loss: 0.3946 - val_loss: 0.4207
Epoch 4/300
25/25 [=====] - 0s 13ms/step - loss: 0.3117 - val_loss: 0.3706
Epoch 5/300
25/25 [=====] - 0s 9ms/step - loss: 0.2684 - val_loss: 0.3278
Epoch 6/300
25/25 [=====] - 0s 9ms/step - loss: 0.2412 - val_loss: 0.2971
Epoch 7/300
25/25 [=====] - 0s 10ms/step - loss: 0.2213 - val_loss: 0.2748
Epoch 8/300
25/25 [=====] - 0s 10ms/step - loss: 0.2019 - val_loss: 0.2569
Epoch 9/300
25/25 [=====] - 0s 9ms/step - loss: 0.1971 - val_loss: 0.2511
Epoch 10/300
25/25 [=====] - 0s 9ms/step - loss: 0.1807 - val_loss: 0.2285
Epoch 11/300
25/25 [=====] - 1s 21ms/step - loss: 0.1647 - val_loss: 0.2229
Epoch 12/300
25/25 [=====] - 0s 19ms/step - loss: 0.1701 - val_loss: 0.2177
Epoch 13/300
25/25 [=====] - 1s 30ms/step - loss: 0.1493 - val_loss: 0.2186
Epoch 14/300
25/25 [=====] - 1s 26ms/step - loss: 0.1482 - val_loss: 0.2126
Epoch 15/300
25/25 [=====] - 1s 31ms/step - loss: 0.1374 - val_loss: 0.2099
Epoch 16/300
25/25 [=====] - 1s 40ms/step - loss: 0.1321 - val_loss: 0.1990
Epoch 17/300
25/25 [=====] - 1s 24ms/step - loss: 0.1354 - val_loss: 0.1948
Epoch 18/300
25/25 [=====] - 1s 34ms/step - loss: 0.1344 - val_loss: 0.2019
Epoch 19/300
25/25 [=====] - 1s 24ms/step - loss: 0.1136 - val_loss: 0.1914
Epoch 20/300
25/25 [=====] - 1s 20ms/step - loss: 0.1226 - val_loss: 0.1908
Epoch 21/300
25/25 [=====] - 0s 18ms/step - loss: 0.1165 - val_loss: 0.1819
Epoch 22/300
25/25 [=====] - 0s 20ms/step - loss: 0.1088 - val_loss: 0.1876
Epoch 23/300
25/25 [=====] - 0s 17ms/step - loss: 0.1032 - val_loss: 0.1819
Epoch 24/300
25/25 [=====] - 0s 18ms/step - loss: 0.1090 - val_loss: 0.1722
Epoch 25/300
25/25 [=====] - 0s 18ms/step - loss: 0.1023 - val_loss: 0.1878
Epoch 26/300
25/25 [=====] - 0s 19ms/step - loss: 0.1027 - val_loss: 0.1734
Epoch 27/300
25/25 [=====] - 0s 19ms/step - loss: 0.1049 - val_loss: 0.1874
Epoch 28/300
25/25 [=====] - 1s 24ms/step - loss: 0.1021 - val_loss: 0.1734
```

```
Epoch 29/300
25/25 [=====] - 0s 20ms/step - loss: 0.0992 - val_loss: 0.1732
Epoch 30/300
25/25 [=====] - 1s 22ms/step - loss: 0.0981 - val_loss: 0.1729
Epoch 31/300
25/25 [=====] - 0s 18ms/step - loss: 0.0931 - val_loss: 0.1643
Epoch 32/300
25/25 [=====] - 1s 22ms/step - loss: 0.0893 - val_loss: 0.1654
Epoch 33/300
25/25 [=====] - 1s 21ms/step - loss: 0.0911 - val_loss: 0.1622
Epoch 34/300
25/25 [=====] - 0s 19ms/step - loss: 0.0925 - val_loss: 0.1683
Epoch 35/300
25/25 [=====] - 1s 23ms/step - loss: 0.0983 - val_loss: 0.1695
Epoch 36/300
25/25 [=====] - 0s 11ms/step - loss: 0.0982 - val_loss: 0.1694
Epoch 37/300
25/25 [=====] - 0s 9ms/step - loss: 0.0890 - val_loss: 0.1593
Epoch 38/300
25/25 [=====] - 0s 10ms/step - loss: 0.0905 - val_loss: 0.1643
Epoch 39/300
25/25 [=====] - 0s 10ms/step - loss: 0.0868 - val_loss: 0.1667
Epoch 40/300
25/25 [=====] - 0s 10ms/step - loss: 0.0798 - val_loss: 0.1527
Epoch 41/300
25/25 [=====] - 0s 9ms/step - loss: 0.0801 - val_loss: 0.1653
Epoch 42/300
25/25 [=====] - 0s 11ms/step - loss: 0.0903 - val_loss: 0.1543
Epoch 43/300
25/25 [=====] - 0s 17ms/step - loss: 0.0792 - val_loss: 0.1543
Epoch 44/300
25/25 [=====] - 0s 18ms/step - loss: 0.0808 - val_loss: 0.1486
Epoch 45/300
25/25 [=====] - 0s 19ms/step - loss: 0.0767 - val_loss: 0.1536
Epoch 46/300
25/25 [=====] - 0s 17ms/step - loss: 0.0822 - val_loss: 0.1556
Epoch 47/300
25/25 [=====] - 0s 18ms/step - loss: 0.0760 - val_loss: 0.1514
Epoch 48/300
25/25 [=====] - 0s 17ms/step - loss: 0.0791 - val_loss: 0.1484
Epoch 49/300
25/25 [=====] - 0s 16ms/step - loss: 0.0825 - val_loss: 0.1563
Epoch 50/300
25/25 [=====] - 0s 19ms/step - loss: 0.0796 - val_loss: 0.1510
Epoch 51/300
25/25 [=====] - 0s 11ms/step - loss: 0.0833 - val_loss: 0.1498
Epoch 52/300
25/25 [=====] - 0s 9ms/step - loss: 0.0756 - val_loss: 0.1476
Epoch 53/300
25/25 [=====] - 0s 12ms/step - loss: 0.0681 - val_loss: 0.1557
Epoch 54/300
25/25 [=====] - 0s 11ms/step - loss: 0.0723 - val_loss: 0.1548
Epoch 55/300
25/25 [=====] - 0s 9ms/step - loss: 0.0725 - val_loss: 0.1393
Epoch 56/300
25/25 [=====] - 0s 10ms/step - loss: 0.0723 - val_loss: 0.1530
Epoch 57/300
```

```
[Epoch 57/300]
25/25 [=====] - 0s 11ms/step - loss: 0.0746 - val_loss: 0.1542
Epoch 58/300
25/25 [=====] - 0s 9ms/step - loss: 0.0747 - val_loss: 0.1416
Epoch 59/300
25/25 [=====] - 0s 9ms/step - loss: 0.0704 - val_loss: 0.1523
Epoch 60/300
25/25 [=====] - 0s 9ms/step - loss: 0.0686 - val_loss: 0.1427
Epoch 61/300
25/25 [=====] - 0s 12ms/step - loss: 0.0675 - val_loss: 0.1437
Epoch 62/300
25/25 [=====] - 0s 9ms/step - loss: 0.0673 - val_loss: 0.1363
Epoch 63/300
25/25 [=====] - 0s 11ms/step - loss: 0.0689 - val_loss: 0.1459
Epoch 64/300
25/25 [=====] - 0s 10ms/step - loss: 0.0708 - val_loss: 0.1431
Epoch 65/300
25/25 [=====] - 0s 12ms/step - loss: 0.0723 - val_loss: 0.1421
Epoch 66/300
25/25 [=====] - 0s 9ms/step - loss: 0.0632 - val_loss: 0.1386
Epoch 67/300
25/25 [=====] - 0s 9ms/step - loss: 0.0665 - val_loss: 0.1383
Epoch 68/300
25/25 [=====] - 0s 11ms/step - loss: 0.0684 - val_loss: 0.1387
Epoch 69/300
25/25 [=====] - 0s 10ms/step - loss: 0.0635 - val_loss: 0.1478
Epoch 70/300
25/25 [=====] - 0s 10ms/step - loss: 0.0652 - val_loss: 0.1389
Epoch 71/300
25/25 [=====] - 0s 9ms/step - loss: 0.0637 - val_loss: 0.1361
Epoch 72/300
25/25 [=====] - 0s 11ms/step - loss: 0.0610 - val_loss: 0.1347
Epoch 73/300
25/25 [=====] - 0s 9ms/step - loss: 0.0598 - val_loss: 0.1377
Epoch 74/300
25/25 [=====] - 0s 9ms/step - loss: 0.0661 - val_loss: 0.1377
Epoch 75/300
25/25 [=====] - 0s 9ms/step - loss: 0.0622 - val_loss: 0.1384
Epoch 76/300
25/25 [=====] - 0s 12ms/step - loss: 0.0617 - val_loss: 0.1373
Epoch 77/300
25/25 [=====] - 0s 10ms/step - loss: 0.0641 - val_loss: 0.1379
Epoch 78/300
25/25 [=====] - 0s 9ms/step - loss: 0.0664 - val_loss: 0.1277
Epoch 79/300
25/25 [=====] - 0s 9ms/step - loss: 0.0645 - val_loss: 0.1316
Epoch 80/300
25/25 [=====] - 0s 11ms/step - loss: 0.0576 - val_loss: 0.1314
Epoch 81/300
25/25 [=====] - 0s 10ms/step - loss: 0.0596 - val_loss: 0.1287
Epoch 82/300
25/25 [=====] - 0s 10ms/step - loss: 0.0571 - val_loss: 0.1295
Epoch 83/300
25/25 [=====] - 0s 10ms/step - loss: 0.0595 - val_loss: 0.1276
Epoch 84/300
25/25 [=====] - 0s 11ms/step - loss: 0.0575 - val_loss: 0.1333
Epoch 85/300
```

```
25/25 [=====] - 0s 10ms/step - loss: 0.0596 - val_loss: 0.1308
Epoch 86/300
25/25 [=====] - 0s 10ms/step - loss: 0.0554 - val_loss: 0.1352
Epoch 87/300
25/25 [=====] - 0s 10ms/step - loss: 0.0569 - val_loss: 0.1262
Epoch 88/300
25/25 [=====] - 0s 11ms/step - loss: 0.0589 - val_loss: 0.1362
Epoch 89/300
25/25 [=====] - 0s 12ms/step - loss: 0.0596 - val_loss: 0.1316
Epoch 90/300
25/25 [=====] - 0s 16ms/step - loss: 0.0502 - val_loss: 0.1312
Epoch 91/300
25/25 [=====] - 0s 19ms/step - loss: 0.0557 - val_loss: 0.1291
Epoch 92/300
25/25 [=====] - 0s 16ms/step - loss: 0.0575 - val_loss: 0.1310
Epoch 93/300
25/25 [=====] - 0s 17ms/step - loss: 0.0580 - val_loss: 0.1306
Epoch 94/300
25/25 [=====] - 0s 18ms/step - loss: 0.0547 - val_loss: 0.1276
Epoch 95/300
25/25 [=====] - 0s 18ms/step - loss: 0.0527 - val_loss: 0.1257
Epoch 96/300
25/25 [=====] - 0s 18ms/step - loss: 0.0572 - val_loss: 0.1260
Epoch 97/300
25/25 [=====] - 0s 18ms/step - loss: 0.0515 - val_loss: 0.1307
Epoch 98/300
25/25 [=====] - 0s 10ms/step - loss: 0.0574 - val_loss: 0.1341
Epoch 99/300
25/25 [=====] - 0s 10ms/step - loss: 0.0582 - val_loss: 0.1264
Epoch 100/300
25/25 [=====] - 0s 10ms/step - loss: 0.0564 - val_loss: 0.1347
Epoch 101/300
25/25 [=====] - 0s 12ms/step - loss: 0.0530 - val_loss: 0.1251
Epoch 102/300
25/25 [=====] - 0s 9ms/step - loss: 0.0517 - val_loss: 0.1338
Epoch 103/300
25/25 [=====] - 0s 10ms/step - loss: 0.0545 - val_loss: 0.1230
Epoch 104/300
25/25 [=====] - 0s 9ms/step - loss: 0.0499 - val_loss: 0.1205
Epoch 105/300
25/25 [=====] - 0s 11ms/step - loss: 0.0522 - val_loss: 0.1237
Epoch 106/300
25/25 [=====] - 0s 9ms/step - loss: 0.0519 - val_loss: 0.1253
Epoch 107/300
25/25 [=====] - 0s 10ms/step - loss: 0.0497 - val_loss: 0.1312
Epoch 108/300
25/25 [=====] - 0s 9ms/step - loss: 0.0522 - val_loss: 0.1280
Epoch 109/300
25/25 [=====] - 0s 12ms/step - loss: 0.0515 - val_loss: 0.1250
Epoch 110/300
25/25 [=====] - 0s 10ms/step - loss: 0.0496 - val_loss: 0.1299
Epoch 111/300
25/25 [=====] - 0s 10ms/step - loss: 0.0486 - val_loss: 0.1267
Epoch 112/300
25/25 [=====] - 0s 10ms/step - loss: 0.0520 - val_loss: 0.1253
Epoch 113/300
25/25 [=====] - 0s 10ms/step - loss: 0.0499 - val_loss: 0.1335
```

```
--, -- L
Epoch 114/300
25/25 [=====] - 0s 9ms/step - loss: 0.0529 - val_loss: 0.1242
Epoch 115/300
25/25 [=====] - 0s 10ms/step - loss: 0.0442 - val_loss: 0.1319
Epoch 116/300
25/25 [=====] - 0s 9ms/step - loss: 0.0517 - val_loss: 0.1258
Epoch 117/300
25/25 [=====] - 0s 11ms/step - loss: 0.0487 - val_loss: 0.1312
Epoch 118/300
25/25 [=====] - 0s 9ms/step - loss: 0.0448 - val_loss: 0.1230
Epoch 119/300
25/25 [=====] - 0s 10ms/step - loss: 0.0473 - val_loss: 0.1229
Epoch 120/300
25/25 [=====] - 0s 9ms/step - loss: 0.0531 - val_loss: 0.1261
Epoch 121/300
25/25 [=====] - 0s 11ms/step - loss: 0.0501 - val_loss: 0.1248
Epoch 122/300
25/25 [=====] - 0s 9ms/step - loss: 0.0481 - val_loss: 0.1216
Epoch 123/300
25/25 [=====] - 0s 10ms/step - loss: 0.0473 - val_loss: 0.1198
Epoch 124/300
25/25 [=====] - 0s 11ms/step - loss: 0.0520 - val_loss: 0.1226
Epoch 125/300
25/25 [=====] - 0s 10ms/step - loss: 0.0481 - val_loss: 0.1276
Epoch 126/300
25/25 [=====] - 0s 10ms/step - loss: 0.0456 - val_loss: 0.1250
Epoch 127/300
25/25 [=====] - 0s 10ms/step - loss: 0.0494 - val_loss: 0.1211
Epoch 128/300
25/25 [=====] - 0s 12ms/step - loss: 0.0495 - val_loss: 0.1247
Epoch 129/300
25/25 [=====] - 0s 9ms/step - loss: 0.0447 - val_loss: 0.1251
Epoch 130/300
25/25 [=====] - 0s 10ms/step - loss: 0.0436 - val_loss: 0.1308
Epoch 131/300
25/25 [=====] - 0s 10ms/step - loss: 0.0447 - val_loss: 0.1233
Epoch 132/300
25/25 [=====] - 0s 11ms/step - loss: 0.0507 - val_loss: 0.1207
Epoch 133/300
25/25 [=====] - 0s 10ms/step - loss: 0.0484 - val_loss: 0.1221
Epoch 134/300
25/25 [=====] - 0s 9ms/step - loss: 0.0455 - val_loss: 0.1284
Epoch 135/300
25/25 [=====] - 0s 12ms/step - loss: 0.0448 - val_loss: 0.1224
Epoch 136/300
25/25 [=====] - 0s 15ms/step - loss: 0.0491 - val_loss: 0.1241
Epoch 137/300
25/25 [=====] - 0s 17ms/step - loss: 0.0455 - val_loss: 0.1244
Epoch 138/300
25/25 [=====] - 0s 17ms/step - loss: 0.0415 - val_loss: 0.1213
Epoch 139/300
25/25 [=====] - 0s 17ms/step - loss: 0.0424 - val_loss: 0.1212
Epoch 140/300
25/25 [=====] - 0s 18ms/step - loss: 0.0428 - val_loss: 0.1239
Epoch 141/300
25/25 [=====] - 0s 18ms/step - loss: 0.0433 - val_loss: 0.1211
```

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Epoch 142/300
25/25 [=====] - 0s 18ms/step - loss: 0.0405 - val_loss: 0.1173
Epoch 143/300
25/25 [=====] - 0s 20ms/step - loss: 0.0428 - val_loss: 0.1213
Epoch 144/300
25/25 [=====] - 0s 15ms/step - loss: 0.0424 - val_loss: 0.1255
Epoch 145/300
25/25 [=====] - 0s 11ms/step - loss: 0.0403 - val_loss: 0.1203
Epoch 146/300
25/25 [=====] - 0s 10ms/step - loss: 0.0404 - val_loss: 0.1225
Epoch 147/300
25/25 [=====] - 0s 9ms/step - loss: 0.0382 - val_loss: 0.1232
Epoch 148/300
25/25 [=====] - 0s 9ms/step - loss: 0.0416 - val_loss: 0.1232
Epoch 149/300
25/25 [=====] - 0s 13ms/step - loss: 0.0433 - val_loss: 0.1274
Epoch 150/300
25/25 [=====] - 0s 10ms/step - loss: 0.0422 - val_loss: 0.1274
Epoch 151/300
25/25 [=====] - 0s 10ms/step - loss: 0.0419 - val_loss: 0.1219
Epoch 152/300
25/25 [=====] - 0s 9ms/step - loss: 0.0385 - val_loss: 0.1225
Epoch 153/300
25/25 [=====] - 0s 12ms/step - loss: 0.0452 - val_loss: 0.1201
Epoch 154/300
25/25 [=====] - 0s 9ms/step - loss: 0.0430 - val_loss: 0.1266
Epoch 155/300
25/25 [=====] - 0s 10ms/step - loss: 0.0424 - val_loss: 0.1188
Epoch 156/300
25/25 [=====] - 0s 10ms/step - loss: 0.0413 - val_loss: 0.1266
Epoch 157/300
25/25 [=====] - 0s 12ms/step - loss: 0.0409 - val_loss: 0.1230
Epoch 158/300
25/25 [=====] - 0s 10ms/step - loss: 0.0450 - val_loss: 0.1251
Epoch 159/300
25/25 [=====] - 0s 9ms/step - loss: 0.0398 - val_loss: 0.1217
Epoch 160/300
25/25 [=====] - 0s 9ms/step - loss: 0.0420 - val_loss: 0.1270
Epoch 161/300
25/25 [=====] - 0s 12ms/step - loss: 0.0397 - val_loss: 0.1243
Epoch 162/300
25/25 [=====] - 0s 10ms/step - loss: 0.0423 - val_loss: 0.1238
Epoch 163/300
25/25 [=====] - 0s 10ms/step - loss: 0.0387 - val_loss: 0.1207
Epoch 164/300
25/25 [=====] - 0s 11ms/step - loss: 0.0417 - val_loss: 0.1221
Epoch 165/300
25/25 [=====] - 0s 11ms/step - loss: 0.0412 - val_loss: 0.1208
Epoch 166/300
25/25 [=====] - 0s 11ms/step - loss: 0.0395 - val_loss: 0.1249
Epoch 167/300
25/25 [=====] - 0s 11ms/step - loss: 0.0424 - val_loss: 0.1264
Epoch 168/300
25/25 [=====] - 0s 11ms/step - loss: 0.0397 - val_loss: 0.1235
Epoch 169/300
25/25 [=====] - 0s 10ms/step - loss: 0.0366 - val_loss: 0.1226
Epoch 170/300
```

```
[=====] - 0s 10ms/step - loss: 0.0398 - val_loss: 0.1318
Epoch 171/300
[=====] - 0s 10ms/step - loss: 0.0392 - val_loss: 0.1250
Epoch 172/300
[=====] - 0s 14ms/step - loss: 0.0355 - val_loss: 0.1228
Epoch 173/300
[=====] - 0s 10ms/step - loss: 0.0329 - val_loss: 0.1193
Epoch 174/300
[=====] - 0s 10ms/step - loss: 0.0385 - val_loss: 0.1249
Epoch 175/300
[=====] - 0s 11ms/step - loss: 0.0384 - val_loss: 0.1223
Epoch 176/300
[=====] - 0s 10ms/step - loss: 0.0336 - val_loss: 0.1206
Epoch 177/300
[=====] - 0s 10ms/step - loss: 0.0356 - val_loss: 0.1239
Epoch 178/300
[=====] - 0s 10ms/step - loss: 0.0363 - val_loss: 0.1187
Epoch 179/300
[=====] - 0s 11ms/step - loss: 0.0349 - val_loss: 0.1249
Epoch 180/300
[=====] - 0s 11ms/step - loss: 0.0347 - val_loss: 0.1186
Epoch 181/300
[=====] - 0s 10ms/step - loss: 0.0373 - val_loss: 0.1247
Epoch 182/300
[=====] - 0s 15ms/step - loss: 0.0354 - val_loss: 0.1237
Epoch 183/300
[=====] - 0s 18ms/step - loss: 0.0378 - val_loss: 0.1186
Epoch 184/300
[=====] - 0s 17ms/step - loss: 0.0369 - val_loss: 0.1227
Epoch 185/300
[=====] - 0s 17ms/step - loss: 0.0374 - val_loss: 0.1181
Epoch 186/300
[=====] - 0s 18ms/step - loss: 0.0346 - val_loss: 0.1222
Epoch 187/300
[=====] - 0s 19ms/step - loss: 0.0362 - val_loss: 0.1206
Epoch 188/300
[=====] - 0s 18ms/step - loss: 0.0350 - val_loss: 0.1183
Epoch 189/300
[=====] - 0s 19ms/step - loss: 0.0327 - val_loss: 0.1221
Epoch 190/300
[=====] - 0s 18ms/step - loss: 0.0346 - val_loss: 0.1210
Epoch 191/300
[=====] - 0s 11ms/step - loss: 0.0348 - val_loss: 0.1192
Epoch 192/300
[=====] - 0s 11ms/step - loss: 0.0371 - val_loss: 0.1186
Epoch 193/300
[=====] - 0s 10ms/step - loss: 0.0345 - val_loss: 0.1217
Epoch 194/300
[=====] - 0s 10ms/step - loss: 0.0350 - val_loss: 0.1223
Epoch 195/300
[=====] - 0s 10ms/step - loss: 0.0321 - val_loss: 0.1180
Epoch 196/300
[=====] - 0s 11ms/step - loss: 0.0322 - val_loss: 0.1166
Epoch 197/300
[=====] - 0s 10ms/step - loss: 0.0345 - val_loss: 0.1205
Epoch 198/300
```

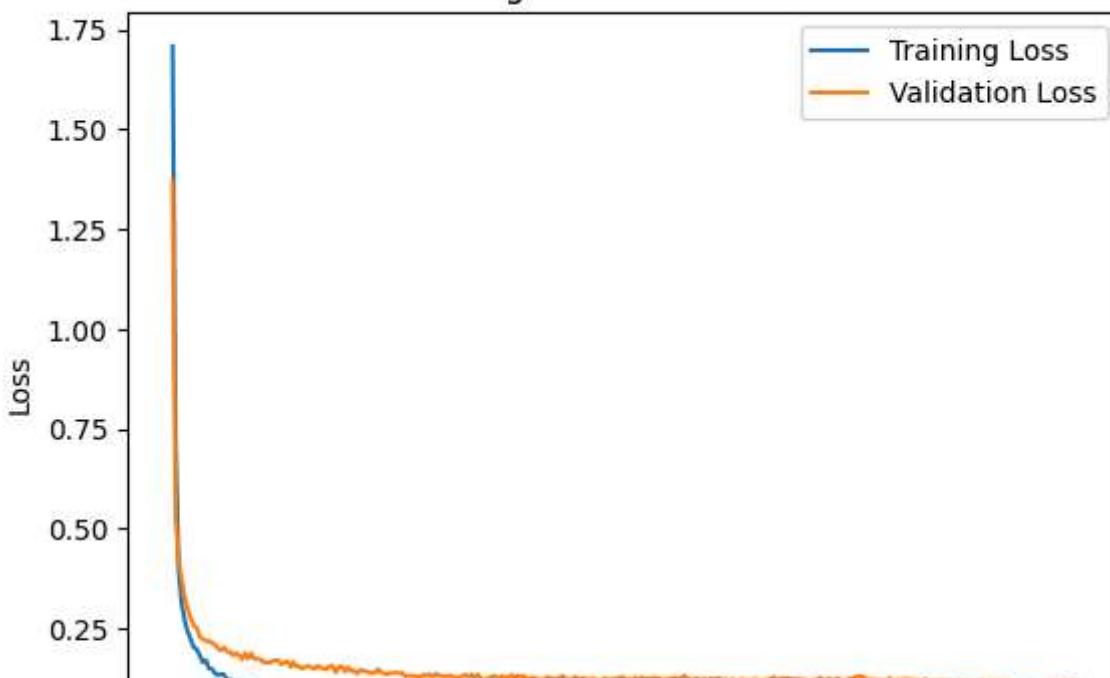
```
25/25 [=====] - 0s 10ms/step - loss: 0.0322 - val_loss: 0.1213
Epoch 199/300
25/25 [=====] - 0s 11ms/step - loss: 0.0347 - val_loss: 0.1245
Epoch 200/300
25/25 [=====] - 0s 10ms/step - loss: 0.0349 - val_loss: 0.1276
Epoch 201/300
25/25 [=====] - 0s 10ms/step - loss: 0.0346 - val_loss: 0.1195
Epoch 202/300
25/25 [=====] - 0s 10ms/step - loss: 0.0352 - val_loss: 0.1233
Epoch 203/300
25/25 [=====] - 0s 11ms/step - loss: 0.0321 - val_loss: 0.1244
Epoch 204/300
25/25 [=====] - 0s 10ms/step - loss: 0.0319 - val_loss: 0.1246
Epoch 205/300
25/25 [=====] - 0s 12ms/step - loss: 0.0325 - val_loss: 0.1238
Epoch 206/300
25/25 [=====] - 0s 10ms/step - loss: 0.0321 - val_loss: 0.1224
Epoch 207/300
25/25 [=====] - 0s 11ms/step - loss: 0.0343 - val_loss: 0.1217
Epoch 208/300
25/25 [=====] - 0s 10ms/step - loss: 0.0319 - val_loss: 0.1238
Epoch 209/300
25/25 [=====] - 0s 10ms/step - loss: 0.0320 - val_loss: 0.1209
Epoch 210/300
25/25 [=====] - 0s 11ms/step - loss: 0.0332 - val_loss: 0.1211
Epoch 211/300
25/25 [=====] - 0s 11ms/step - loss: 0.0323 - val_loss: 0.1146
Epoch 212/300
25/25 [=====] - 0s 10ms/step - loss: 0.0348 - val_loss: 0.1154
Epoch 213/300
25/25 [=====] - 0s 10ms/step - loss: 0.0326 - val_loss: 0.1206
Epoch 214/300
25/25 [=====] - 0s 12ms/step - loss: 0.0306 - val_loss: 0.1213
Epoch 215/300
25/25 [=====] - 0s 10ms/step - loss: 0.0323 - val_loss: 0.1223
Epoch 217/300
25/25 [=====] - 0s 11ms/step - loss: 0.0355 - val_loss: 0.1191
Epoch 218/300
25/25 [=====] - 0s 11ms/step - loss: 0.0322 - val_loss: 0.1243
Epoch 219/300
25/25 [=====] - 0s 10ms/step - loss: 0.0298 - val_loss: 0.1186
Epoch 220/300
25/25 [=====] - 0s 10ms/step - loss: 0.0336 - val_loss: 0.1218
Epoch 221/300
25/25 [=====] - 0s 10ms/step - loss: 0.0308 - val_loss: 0.1236
Epoch 222/300
25/25 [=====] - 0s 12ms/step - loss: 0.0303 - val_loss: 0.1216
Epoch 223/300
25/25 [=====] - 0s 10ms/step - loss: 0.0325 - val_loss: 0.1175
Epoch 224/300
25/25 [=====] - 0s 10ms/step - loss: 0.0319 - val_loss: 0.1216
Epoch 225/300
25/25 [=====] - 0s 11ms/step - loss: 0.0312 - val_loss: 0.1250
Epoch 226/300
25/25 [=====] - 0s 11ms/step - loss: 0.0301 - val_loss: 0.1220
```

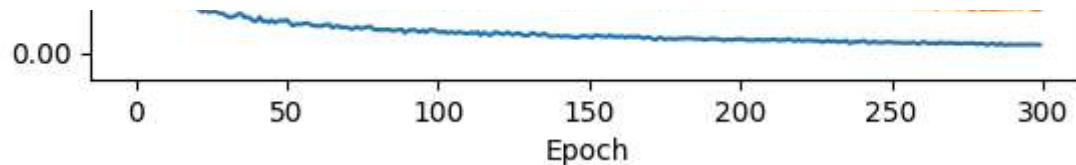
```
--, -- L
Epoch 227/300
25/25 [=====] - 0s 12ms/step - loss: 0.0306 - val_loss: 0.1291
Epoch 228/300
25/25 [=====] - 0s 13ms/step - loss: 0.0269 - val_loss: 0.1283
Epoch 229/300
25/25 [=====] - 0s 18ms/step - loss: 0.0291 - val_loss: 0.1303
Epoch 230/300
25/25 [=====] - 0s 17ms/step - loss: 0.0319 - val_loss: 0.1247
Epoch 231/300
25/25 [=====] - 0s 17ms/step - loss: 0.0284 - val_loss: 0.1204
Epoch 232/300
25/25 [=====] - 0s 17ms/step - loss: 0.0314 - val_loss: 0.1214
Epoch 233/300
25/25 [=====] - 1s 21ms/step - loss: 0.0276 - val_loss: 0.1203
Epoch 234/300
25/25 [=====] - 0s 17ms/step - loss: 0.0279 - val_loss: 0.1209
Epoch 235/300
25/25 [=====] - 0s 17ms/step - loss: 0.0290 - val_loss: 0.1203
Epoch 236/300
25/25 [=====] - 0s 19ms/step - loss: 0.0312 - val_loss: 0.1197
Epoch 237/300
25/25 [=====] - 0s 10ms/step - loss: 0.0245 - val_loss: 0.1187
Epoch 238/300
25/25 [=====] - 0s 10ms/step - loss: 0.0255 - val_loss: 0.1248
Epoch 239/300
25/25 [=====] - 0s 10ms/step - loss: 0.0293 - val_loss: 0.1190
Epoch 240/300
25/25 [=====] - 0s 10ms/step - loss: 0.0270 - val_loss: 0.1190
Epoch 241/300
25/25 [=====] - 0s 10ms/step - loss: 0.0299 - val_loss: 0.1216
Epoch 242/300
25/25 [=====] - 0s 11ms/step - loss: 0.0314 - val_loss: 0.1156
Epoch 243/300
25/25 [=====] - 0s 10ms/step - loss: 0.0257 - val_loss: 0.1234
Epoch 244/300
25/25 [=====] - 0s 10ms/step - loss: 0.0259 - val_loss: 0.1202
Epoch 245/300
25/25 [=====] - 0s 9ms/step - loss: 0.0290 - val_loss: 0.1213
Epoch 246/300
25/25 [=====] - 0s 11ms/step - loss: 0.0263 - val_loss: 0.1203
Epoch 247/300
25/25 [=====] - 0s 10ms/step - loss: 0.0263 - val_loss: 0.1193
Epoch 248/300
25/25 [=====] - 0s 10ms/step - loss: 0.0255 - val_loss: 0.1189
Epoch 249/300
25/25 [=====] - 0s 10ms/step - loss: 0.0276 - val_loss: 0.1181
Epoch 250/300
25/25 [=====] - 0s 11ms/step - loss: 0.0279 - val_loss: 0.1227
Epoch 251/300
25/25 [=====] - 0s 11ms/step - loss: 0.0270 - val_loss: 0.1141
Epoch 252/300
25/25 [=====] - 0s 10ms/step - loss: 0.0260 - val_loss: 0.1157
Epoch 253/300
25/25 [=====] - 0s 10ms/step - loss: 0.0266 - val_loss: 0.1168
Epoch 254/300
25/25 [=====] - 0s 11ms/step - loss: 0.0258 - val_loss: 0.1183
```

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Epoch 255/300
25/25 [=====] - 0s 10ms/step - loss: 0.0247 - val_loss: 0.1195
Epoch 256/300
25/25 [=====] - 0s 10ms/step - loss: 0.0259 - val_loss: 0.1182
Epoch 257/300
25/25 [=====] - 0s 11ms/step - loss: 0.0245 - val_loss: 0.1174
Epoch 258/300
25/25 [=====] - 0s 12ms/step - loss: 0.0273 - val_loss: 0.1175
Epoch 259/300
25/25 [=====] - 0s 10ms/step - loss: 0.0252 - val_loss: 0.1140
Epoch 260/300
25/25 [=====] - 0s 10ms/step - loss: 0.0223 - val_loss: 0.1150
Epoch 261/300
25/25 [=====] - 0s 11ms/step - loss: 0.0272 - val_loss: 0.1184
Epoch 262/300
25/25 [=====] - 0s 10ms/step - loss: 0.0277 - val_loss: 0.1160
Epoch 263/300
25/25 [=====] - 0s 10ms/step - loss: 0.0243 - val_loss: 0.1148
Epoch 264/300
25/25 [=====] - 0s 10ms/step - loss: 0.0242 - val_loss: 0.1178
Epoch 265/300
25/25 [=====] - 0s 11ms/step - loss: 0.0252 - val_loss: 0.1154
Epoch 266/300
25/25 [=====] - 0s 11ms/step - loss: 0.0225 - val_loss: 0.1110
Epoch 267/300
25/25 [=====] - 0s 11ms/step - loss: 0.0276 - val_loss: 0.1166
Epoch 268/300
25/25 [=====] - 0s 13ms/step - loss: 0.0246 - val_loss: 0.1145
Epoch 269/300
25/25 [=====] - 0s 10ms/step - loss: 0.0245 - val_loss: 0.1192
Epoch 270/300
25/25 [=====] - 0s 11ms/step - loss: 0.0255 - val_loss: 0.1147
Epoch 271/300
25/25 [=====] - 0s 10ms/step - loss: 0.0262 - val_loss: 0.1159
Epoch 272/300
25/25 [=====] - 0s 12ms/step - loss: 0.0234 - val_loss: 0.1147
Epoch 273/300
25/25 [=====] - 0s 12ms/step - loss: 0.0248 - val_loss: 0.1119
Epoch 274/300
25/25 [=====] - 0s 16ms/step - loss: 0.0227 - val_loss: 0.1169
Epoch 275/300
25/25 [=====] - 0s 19ms/step - loss: 0.0244 - val_loss: 0.1143
Epoch 276/300
25/25 [=====] - 0s 18ms/step - loss: 0.0248 - val_loss: 0.1137
Epoch 277/300
25/25 [=====] - 0s 19ms/step - loss: 0.0238 - val_loss: 0.1101
Epoch 278/300
25/25 [=====] - 0s 19ms/step - loss: 0.0254 - val_loss: 0.1076
Epoch 279/300
25/25 [=====] - 1s 39ms/step - loss: 0.0225 - val_loss: 0.1138
Epoch 280/300
25/25 [=====] - 1s 44ms/step - loss: 0.0239 - val_loss: 0.1125
Epoch 281/300
25/25 [=====] - 0s 16ms/step - loss: 0.0240 - val_loss: 0.1080
Epoch 282/300
25/25 [=====] - 0s 10ms/step - loss: 0.0216 - val_loss: 0.1110
Epoch 283/300
```

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-r--. --, --  
25/25 [=====] - 0s 12ms/step - loss: 0.0203 - val_loss: 0.1104  
Epoch 284/300  
25/25 [=====] - 0s 11ms/step - loss: 0.0245 - val_loss: 0.1099  
Epoch 285/300  
25/25 [=====] - 0s 9ms/step - loss: 0.0229 - val_loss: 0.1100  
Epoch 286/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0192 - val_loss: 0.1094  
Epoch 287/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0241 - val_loss: 0.1122  
Epoch 288/300  
25/25 [=====] - 0s 11ms/step - loss: 0.0209 - val_loss: 0.1119  
Epoch 289/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0196 - val_loss: 0.1119  
Epoch 290/300  
25/25 [=====] - 0s 12ms/step - loss: 0.0223 - val_loss: 0.1134  
Epoch 291/300  
25/25 [=====] - 0s 14ms/step - loss: 0.0203 - val_loss: 0.1108  
Epoch 292/300  
25/25 [=====] - 0s 11ms/step - loss: 0.0212 - val_loss: 0.1160  
Epoch 293/300  
25/25 [=====] - 0s 11ms/step - loss: 0.0209 - val_loss: 0.1113  
Epoch 294/300  
25/25 [=====] - 0s 12ms/step - loss: 0.0217 - val_loss: 0.1137  
Epoch 295/300  
25/25 [=====] - 0s 12ms/step - loss: 0.0209 - val_loss: 0.1146  
Epoch 296/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0211 - val_loss: 0.1143  
Epoch 297/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0217 - val_loss: 0.1126  
Epoch 298/300  
25/25 [=====] - 0s 12ms/step - loss: 0.0210 - val_loss: 0.1091  
Epoch 299/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0214 - val_loss: 0.1079  
Epoch 300/300  
25/25 [=====] - 0s 10ms/step - loss: 0.0205 - val_loss: 0.1096
```

Training and Validation Loss





7/7 [=====] - 0s 6ms/step - loss: 0.1096

Test Loss: 0.10959448665380478

7/7 [=====] - 2s 4ms/step

Actual vs Predicted Impact

