# Import necessary libraries

import pandas as pd

import matplotlib.pyplot as plt

from statsmodels.tsa.seasonal import seasonal\_decompose

from statsmodels.tsa.holtwinters import ExponentialSmoothing

from sklearn.model\_selection import train\_test\_split

from sklearn.metrics import mean\_squared\_error

import numpy as np

# Load the ROC registration dataset (replace 'dataset.csv' with your dataset)

data = pd.read\_csv('dataset.csv')

# Data preprocessing (assumes a date column and registration count column)

data['Date'] = pd.to\_datetime(data['Date'])

data.set\_index('Date', inplace=True)

# Time Series Decomposition

result = seasonal\_decompose(data['Registrations'], model='additive')

result.plot()

plt.show()

# Split the data into training and testing sets

train\_size = int(len(data) \* 0.8)

train, test = data.iloc[:train\_size], data.iloc[train\_size:]

# Time Series Forecasting using Holt-Winters Exponential Smoothing

model = ExponentialSmoothing(train, seasonal='add', seasonal\_periods=12)

model\_fit = model.fit(optimized=True, use\_brute=True)

forecast = model\_fit.forecast(len(test))

# Evaluate the model

mse = mean\_squared\_error(test, forecast)

rmse = np.sqrt(mse)

print(f"Root Mean Squared Error: {rmse}")

# Visualize the forecast

plt.plot(train, label='Training Data')

plt.plot(test, label='Testing Data')

plt.plot(forecast, label='Forecast')

plt.legend()

plt.show()

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