A Practical Approach to Timeseries Forecasting using Python

- Time Series Motivation and Overview
- Features of Time Series
- Examples of Time Series

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Time Series: Introduction

- A Simple Time Series Referred to an **Ordered** collection of data (usually in time)
- Examples: Yearly Wages, Annual Production, Hourly Traffic Flow
- Data May be collected and regular or irregular intervals
- Many variables can be recorded simultaneously

Time Series: Motivation and Overview

- Vast applications in real time domains
- The reasons for doing time series analysis are as follows:
  - **Features:** Time series analysis can be used to track features like trend, seasonality, and variability.
  - **Forecasting:** Time series analysis can aid in the prediction of stock prices. It is used if you would like to know if the price will rise or fall and how much it will rise or fall.
  - **Inferences:** You can predict the value and draw inferences from data using Time series analysis.

Features of Time Series Data

- Stationarity and Non-Stationarity
- Periodicity
- Seasonality
- Non-Linearity

Examples of Time Series Data

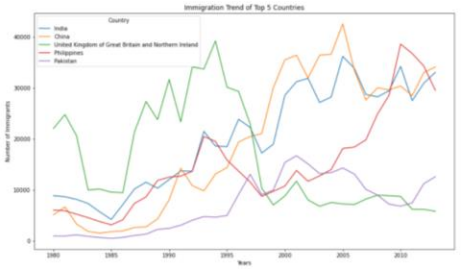
- Univariate Time Series Datasets
  - COVID-19 Prediction
  - Microsoft Corporation Stock Forecasting
  - Birthrate Forecasting
- Multivariate Time Series Datasets
  - Occupancy detection dataset

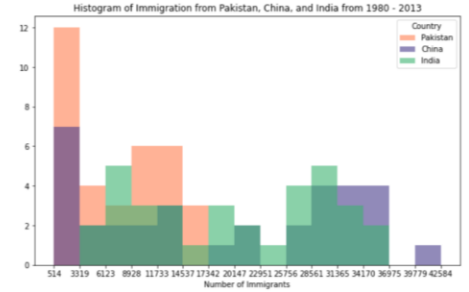
Stages of Time Series Data Analysis and Forecasting

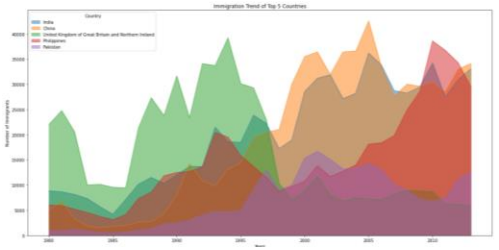
- Data Manipulation
- Data Preprocessing
- Data Visualization
- Computation of Time Series Parameters i.e., MAPE, RMSE, MAE
- Feature Check on Time Series Data
- Stationarity in Time Series
- Model Building and Processing Data for Forecasting
- Performance Comparison and Evaluation

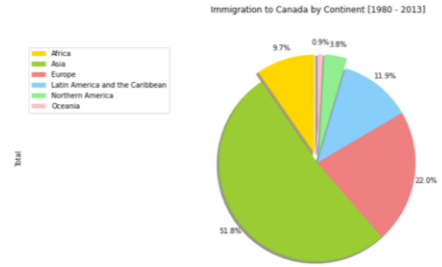
Basic Data Manipulation in Time Series

- Overview of Pandas, Numpy & Matplotlib
- Data slicing and sorting
- Area Plots in Time Series Dataset
- Histograms in Time Series Dataset
- Pie Charts in Time Series Dataset
- Manipulation of Charts in Time Series Dataset
- Overview of Time Series Parameters i.e., MAPE, RMSE, Correlation and MAE









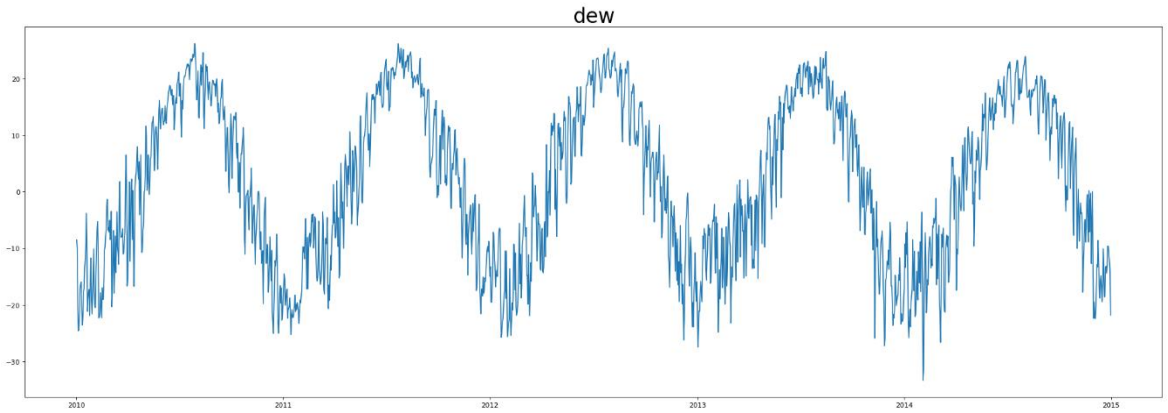
Basic matplotlib

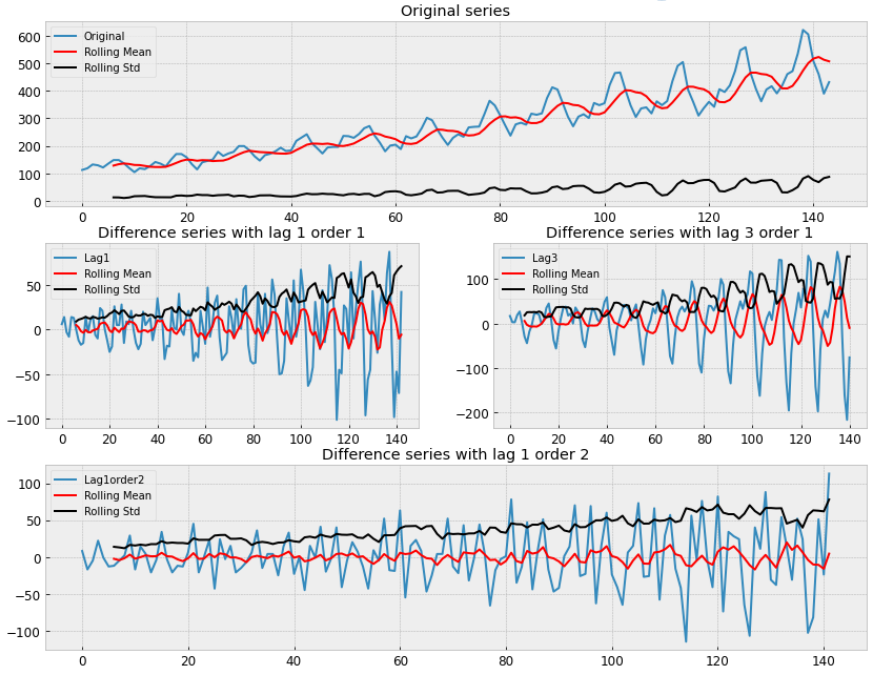
Area Plots, Histograms, and Bar Plots

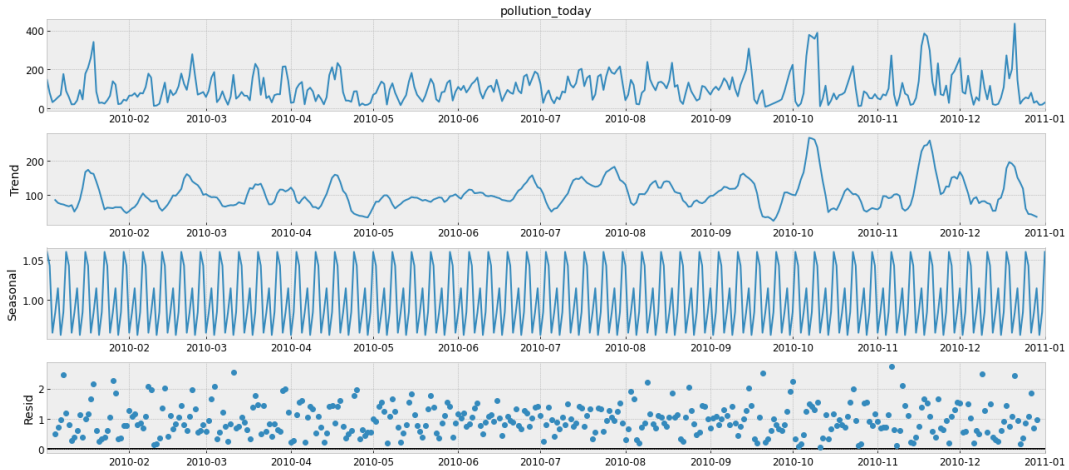
Pie Charts, Box Plots

Data Processing for Timeseries Forecasting

- Importance of Dataset and top sources
- Basic Data Preprocessing
- Resampling, Visualize and Transform (RVT)
- Automatic Time Series Decomposition
- Feature Engineering
- Stationarity in the Datasets

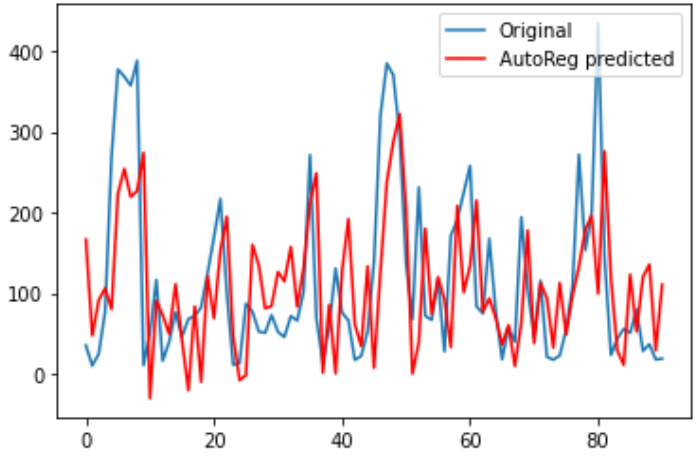


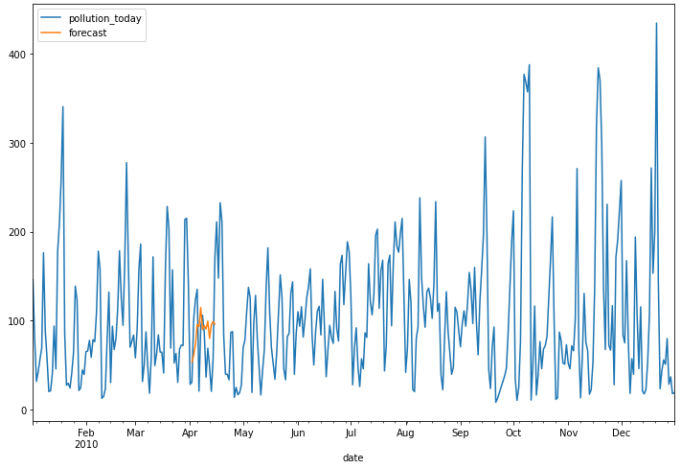


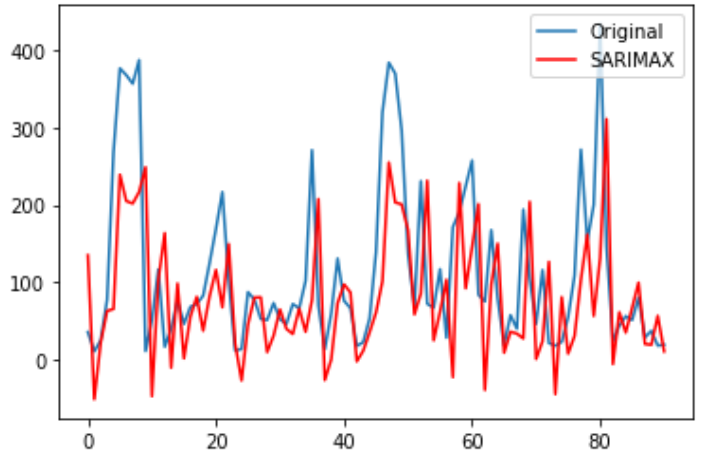


Machine Learning in Time Series Forecasting

- Applied Machine Learning in Time Series Forecasting
- Auto Regression and Moving Average
- Autoregressive Moving Average (ARMA)
- Auto ARIMA
- Seasonal Autoregressive Integrated Moving-Average (SARIMA)
- Auto SARIMA and SARIMAX

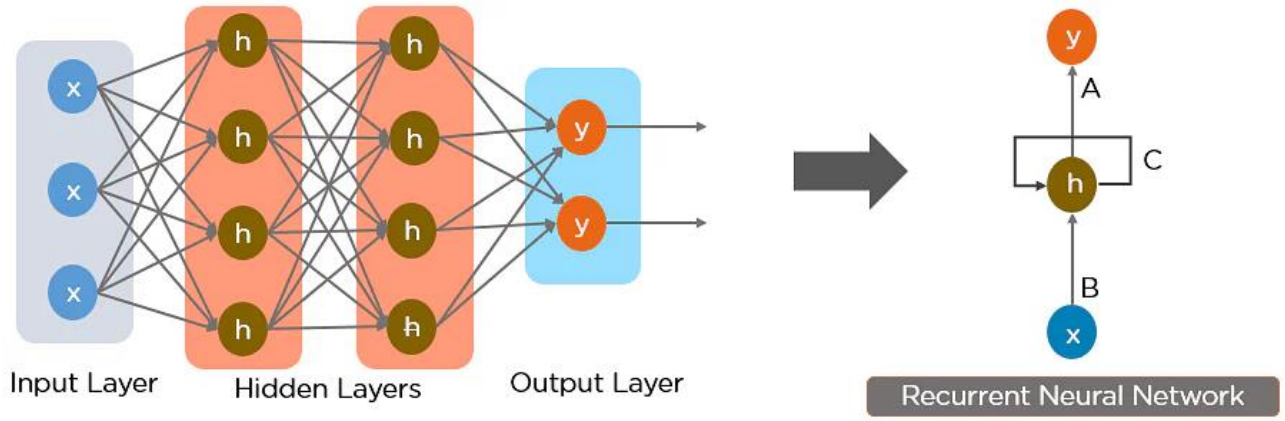






Recurrent Neural Networks for Time Series

- Overview of RNNs
- Bias, Variance, Underfitting, Overfitting
- Performance Analysis of LSTM, BiLSTM and GRU
- Underfitting and Overfitting in LSTM models
- Development and Implementation of LSTM, Stacked LSTM, BiLSTM and Stacked BiLSTM Models for Time Series Forecasting



Project 1: COVID-19 Prediction using Machine Learning Algorithms

- Data Preprocessing and Visualization
- Computation of Important Parameters
- Stationarity Check
- Making the Data Stationary
- Development of ARIMA and SARIMA for Prediction
- Performance Comparison for the Machine Learning Models

Project 2: Microsoft Corporation Stock Prediction using RNNs

- Overview of Data
- Feature Engineering and Data Manipulation
- Visualization of Autocorrelation, Mean over time and Std.
- Implementation of Adfuller Method on Time Series Data
- Development of LSTM and BiLST Models for Prediction
- Performance Comparison for the RNNs Models

Project 3: Birthrate Forecasting using RNNs with Advance Data Analysis

- Overview of Data
- Data Analysis and Advance Data Visualization
- Feature Relations, Feature Engineering and Data Manipulation
- Visualization for Time Series Parameters
- Stationarity Check
- Implementation of LSTM, Stacked LSTM, BiLSTM and Stacked BiLSTM Model for Time Series Forecasting
- Performance Comparison