TSF Course Outline

Learning Outcomes:
After completing this course, you will be able to:

- **Transform the data to be suitable for Time Series analysis.**
- **EDA for Time Series components**
- **Selection of forecasting model**
- **Evaluate the performance of the model**
- **Deploy model for real forecasting**

Pedagogy:
The course is a mixture of online lectures, assignments and project presentations. Jupyter notebook will be the platform of coding in python.

Course Content

Session-1: Time Series - Basics

- Why forecast?
- How to forecast?
- What is a time series?
- Revisiting Regression
- Examples of Time series
- Special features of TS data
- Scope of the session
- EDA
- Components of TS
- Time Series Decomposition
- Moving average

Session-2: Smoothing Techniques

- Building forecasting model
- Model validation
- Measure of forecast accuracy
- Simple and Moving Average Forecast
- Exponential smoothing (ES)
- Simple ES
- Double Exponential
- Holt-Winters model

Session-3: Modeling and Forecasting with **ARMA** Processes

- Lag values in Time Series

*Additional session (6) allowed for final case study

- Autocorrelation Function and Partial Autocorrelation Function
- What is a Stationary Process?
- Properties of Stationary time series
- How to find Stationarity? Dicky Fuller test
- Time Series Differencing
- AR Processes
- MA Processes
- ARMA (p, q) Processes
- Forecasting stationary time series
- Parameter Estimation
- Case study - Stock Price Data

Session-4: Nonstationary and Seasonal Time Series Models

- ARIMA Models for Nonstationary Time Series
- Akaike Information Criterion
- Forecasting ARIMA Models
- Limitations of ARIMA Model
- Seasonal ARIMA Models (SARIMA)
- Case study – CO2 emission data

Session-5: Multivariate Time Series and Case study

- Multivariate Time Series
- Testing for Independence of Two Stationary Time Series
- Vector Autoregression (VAR)
- Vector Autoregression Moving Average
- Model Evaluation
- **Case Study ***

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