Dear all,

Please complete the **lab exercise** scheduled for today. Your day has been blocked **for lab work.** Once finished, please share the link to your **Python** workbook with me.

Attendance link: [https://forms.office.com/Pages/ResponsePage.aspx?id=vEn-2sNaEEOXtD5Eooy\_GMffkgiEcVhAkG6Gwu1FcnBUME82Qk9GOTFCVThLSUlWN0lESUVYN1NPRCQlQCNjPTEu](https://apc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fforms.office.com%2FPages%2FResponsePage.aspx%3Fid%3DvEn-2sNaEEOXtD5Eooy_GMffkgiEcVhAkG6Gwu1FcnBUME82Qk9GOTFCVThLSUlWN0lESUVYN1NPRCQlQCNjPTEu&data=05%7C02%7CYuvraj.Motwani%40exlservice.com%7C5689b660d4b44c518f2508dcce4d2fe7%7Cdafe49bc5ac3431097b43e44a28cbf18%7C0%7C0%7C638612078223950486%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=NTM3ixkGnERDWSbpaZlrjsQjFh1FA8z54l6gtBITz60%3D&reserved=0)

**Lab Questions:**

1. **Based on Moving Average Calculations:**

         Find the moving average for the list of integers [4, 8, 12, 16, 20, 24, 28, 32, 36, 40] with a window size of 3.

         Calculate the moving average using a window size of 4 for the list [5, 10, 15, 20, 25, 30, 35, 40, 45, 50].

         For the list [11, 22, 33, 44, 55, 66, 77, 88, 99, 110], find the moving average with a window size of 2.

         Determine the moving average with a window size of 3 for the list [9, 18, 27, 36, 45, 54, 63, 72, 81, 90].

1. **Perform an Augmented Dickey-Fuller (ADF) test on a dataset containing attrition data to determine whether the attrition rate is stationary:                                                                                                                                        -** Dats set link:[**python-su/Time Forecasting using Python/attrition\_data.csv at master · suyashi29/python-su (github.com)**](https://apc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgithub.com%2Fsuyashi29%2Fpython-su%2Fblob%2Fmaster%2FTime%2520Forecasting%2520using%2520Python%2Fattrition_data.csv&data=05%7C02%7CYuvraj.Motwani%40exlservice.com%7C5689b660d4b44c518f2508dcce4d2fe7%7Cdafe49bc5ac3431097b43e44a28cbf18%7C0%7C0%7C638612078223963623%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=x%2FQSrnIdaypja5DTbGBCWrDtvY%2Bvyqdv2g888x7S98I%3D&reserved=0)
2. **To implement an Autoregressive (AR) model of order 1 (AR(1)) using Python and analyze its performance**
   * + Generate synthetic data for an AR(1) process with known parameters.
     + Plot the generated time series to visualize the data.
     + Implement an AR(1) model using either NumPy or statsmodels.
     + Fit the AR(1) model to the generated data.
     + Print the summary of the model results to analyze the estimated coefficients and model performance.
     + Check the best lag

**Hint : Use following code for Synthetic Data Generation**

*# Set known parameters*

*c = 2*

*phi1 = 0.5*

*num\_steps = 100*

*# Step 1: Generate synthetic data for AR(1) process*

*np.random.seed(0)*

*epsilon = np.random.normal(0, 1, num\_steps)*

*X = np.zeros(num\_steps)*

*X[0] = c / (1 - phi1)  # Set initial value using steady state value*

*for t in range(1, num\_steps):*

*X[t] = c + phi1 \* X[t-1] + epsilon[t]*

1. **Predict attrition rate using Autoregression Model (use Attrition data )  and Moving Average Method**

**Dats set link:** [**python-su/Time Forecasting using Python/attrition\_data.csv at master · suyashi29/python-su (github.com)**](https://apc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgithub.com%2Fsuyashi29%2Fpython-su%2Fblob%2Fmaster%2FTime%2520Forecasting%2520using%2520Python%2Fattrition_data.csv&data=05%7C02%7CYuvraj.Motwani%40exlservice.com%7C5689b660d4b44c518f2508dcce4d2fe7%7Cdafe49bc5ac3431097b43e44a28cbf18%7C0%7C0%7C638612078223972420%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=UvR6XTMb3ZP4Q3n5ECBwozZFCosu6GkYRJSs6%2Fbvy%2Bc%3D&reserved=0)

Dear all,

Please find below session links for Day 1:

**Session Recording till date:**

* **Day 1:** [Time Series Forecasting using Python' - You are invited to the live virtual training \_ 4th – 13th Sep 2024 I 2\_00 PM – 4\_00 PM IST-20240904\_141529-Meeting Recording.mp4](https://exlservicenam-my.sharepoint.com/:v:/g/personal/suyashi144893_exlservice_com/Ea21u5tEcGpEo_bqunz9TD0B-7ffAxf9G5u8YHiT1WirTQ?nav=eyJyZWZlcnJhbEluZm8iOnsicmVmZXJyYWxBcHAiOiJTdHJlYW1XZWJBcHAiLCJyZWZlcnJhbFZpZXciOiJTaGFyZURpYWxvZy1MaW5rIiwicmVmZXJyYWxBcHBQbGF0Zm9ybSI6IldlYiIsInJlZmVycmFsTW9kZSI6InZpZXcifX0%3d&e=vH6zDq&xsdata=MDV8MDJ8WXV2cmFqLk1vdHdhbmlAZXhsc2VydmljZS5jb218Njc0M2E0ZTIxNmM3NDE3ZjZiYTkwOGRjY2NkMDZlYjh8ZGFmZTQ5YmM1YWMzNDMxMDk3YjQzZTQ0YTI4Y2JmMTh8MHwwfDYzODYxMDQ0MjgyODE2NjI1OXxVbmtub3dufFRXRnBiR1pzYjNkOGV5SldJam9pTUM0d0xqQXdNREFpTENKUUlqb2lWMmx1TXpJaUxDSkJUaUk2SWsxaGFXd2lMQ0pYVkNJNk1uMD18MHx8fA%3d%3d&sdata=OEw5Sm5oRmRuOGVVREovK3Ftc0lpZVQ4YzBSbDdPRHRkN2prTHJ5dW9Rdz0%3d)

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**Python file link:**

[python-su/Time Forecasting using Python at master · suyashi29/python-su (github.com)](https://apc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgithub.com%2Fsuyashi29%2Fpython-su%2Ftree%2Fmaster%2FTime%2520Forecasting%2520using%2520Python&data=05%7C02%7CYuvraj.Motwani%40exlservice.com%7C6743a4e216c7417f6ba908dcccd06eb8%7Cdafe49bc5ac3431097b43e44a28cbf18%7C0%7C0%7C638610442828190781%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=Z0XtZnRXvibLMGpImfthKCGlbu5zt0gX7ZeSC6WCxog%3D&reserved=0)