This problem statement is only for SE students

Problem Statement

Build a predictive model for the sales of a product based on time. The data set consists of time-stamped sales records. Your goal is to create a model that predicts future sales and analyze the rate of change of sales over time.

You are required to:

1. Formulate predictive model.
   (i) Explore the dataset to understand the distribution of sales over time.
   (ii) Visualize the data using line plots, histograms, or other appropriate plots to identify trends and patterns.
   (iii) Choose an appropriate predictive model for time-series data. Common models include linear regression.
2. Derivative analysis.
3. Integration with predictive model.
4. Provide analytical solution.
5. Graph the model by using PYTHON.
6. PYTHON solution is also required.

Program requirements

1. On every first run, the program must display the name of your software house, and your programming team along with student ids.
2. At this stage the program should ask the user to enter a year (e.g., 2025) for prediction of average global temperature. *Use this step to find the results of different years (2025, 2050, 2100) as required in the given tasks.*
3. After the user input, a message should be displayed ‘press any key to continue’.
4. Upon key press, the program should display the result of part 1. A message should then be displayed ‘press any key to continue’.
5. Upon key press, result of part 2 should be displayed along with a message ‘press any key to continue’.
6. Upon key press, the program should display the result of part 3. A message should then be displayed ‘press any key to continue’.
7. Upon key press, the program then should display the answers to part 4 and part 5 of the problem.
8. At this stage, the program must ask the user if they wish to continue or terminate the program. Based on user input, the program must act accordingly.

Your program should be well commented, and the results should be detailed. Necessary sentences should be displayed alongside the outputs. Do not simply display the values.

Report Requirements

Students are required to submit a complete report of the project prepared in MS Word in their own words. A report is written in third person, i.e., use of I, We, Us, are not used to write the report. The contents of the report must include:

Sr. No.	Deliverable	Marks
1.	**Objectives and Introduction:** Objectives and introduction of the problem. In this section briefly introduce the problem and the methodology that will be adopted by you to solve the problem.	5
2.	**Analytical Solution:** A step-by-step analytical solution (by-hand solution). Clearly state the assumptions and values that you use for the solution.	20
3.	**PYTHON Code:** Complete and well commented PYTHON code. This section must include the explanation of the commands, functions, and toolboxes used.	15
4.	**PYTHON Solution and Results:** Step-by-step example demonstrating the PYTHON solution. Clear retraceable steps should be listed to obtain the presented solution. Also, present detailed results and discussion in this section. Do not just paste the graphs or screenshot of the command window. Compare your by-hand and PYTHON solutions, and present physical interpretation of your results and graphs.	20
5.	**Flowchart:** Flowchart of the solution methodology or the program.	5
6.	**Conclusions:** In this section, include conclusions related to this assignment. The conclusion section stands independently from the report and gives the reader a comprehensive idea of the project; thus, the conclusion section should briefly explain the problem, solution methodology, results, and analysis. The conclusion section is not very large and typically consists of 1-2 paragraphs. The conclusions section can also include bullet points.	5
7.	**Contribution:** In this section clearly state the contribution of each group member. Generic statements such as 'each group member contributed equally' are not acceptable answers. In this section include difficulties that you faced during this assignment and how you overcame those difficulties.	5

Each report element should be documented under a separate heading. Each page should be numbered. The report should be written in Calibri or Times New Roman typeface only. The size of the font should be 12. The size of first and second level of headings should be 14 bold, and 12 bold, respectively. The alignment of the report should be justified, while pictures and tables should be center aligned with relevant captions. The option to align the text left, right, center, and justify can be found under paragraph options on *Home* tab. Line and paragraph spacing should be set as 1.5. Optimally utilize the available space on each page, do not leave blank space on a page unnecessarily.

Project Submission Guidelines

This project is an open-ended problem designed to demonstrate the application of differentiation in real life. The open-ended nature of the problem means that this problem can be solved in more than one way using various techniques and methodologies, some of these techniques have been covered in this course. You are free to adopt any technique and solution methodology to solve this problem. Solution techniques and methodologies that are not part of the course outline can also be used to solve the problem. However, you are required to take approval of such a solution technique before starting the project. You may have to do extensive research to completely solve the problem. If you have any confusion, you can discuss your query via email. Project guidelines are summarized below:

- This is a group project and carries 75 marks.
- A group can have a maximum of 3 students. One of the aims of this project is to enable students to work effectively in a team. **Therefore, this project cannot be done individually.** The project can be done in pairs.
- Plagiarized work (from internet or fellow students) will result in zero marks.
- Deadline for complete project submission on **google classroom** (one MS Word file and one pdf of the same Word file including all the codes and by-hand solutions) is **Thursday 05 Dec 2024 before 11:59pm**. Do not submit your project in a .zip or .rar format. You can submit additional files such as .m files, however, the single PDF and MS Word file must also include all the information such as codes and figures.
- Name of your project report file must be as per following format: **ID1_ID2_ID3_MT1003_Project_Section**.
- Do not submit your project via email, it will not be considered.
- Late submissions will not be considered.