



## **Executive Post Graduate Certification in Electric Vehicle Design - Project**

## Problem Statement:

Understanding weather patterns and trends is essential for various applications such as agriculture, disaster management, and climate research. This project will involve analyzing and visualizing weather data to uncover insights and trends. By leveraging MATLAB's powerful data analysis and visualization capabilities, you will develop a comprehensive understanding of how to handle real-world data.

## Objective:

- To apply MATLAB fundamentals learned in previous assignments to a real-world data analysis project.
- To import, process, analyze, and visualize weather data using MATLAB.
- To develop a comprehensive report summarizing the findings.

## Tasks to be Performed:

### Data Acquisition and Preparation:

- **Task 1.1:** Import weather data from a CSV file containing historical weather records (e.g., temperature, humidity, precipitation, wind speed).
  - Use the `readmatrix` function to import data.
  - Inspect the data and handle any missing values or anomalies.
- **Task 1.2:** Organize the data into appropriate MATLAB data structures.
  - Use tables or matrices to store and manipulate the data.
  - Extract relevant columns for analysis.

### Basic Data Analysis:

- **Task 2.1:** Calculate basic statistical measures for each weather parameter (mean, median, standard deviation).
  - Use built-in MATLAB functions for statistical analysis.
- **Task 2.2:** Identify trends and patterns in the data.
  - Plot time series graphs for temperature, humidity, and precipitation.
  - Use moving averages to smooth the data and highlight trends.

### Advanced Data Analysis:

- **Task 3.1:** Perform correlation analysis between different weather parameters.
  - Calculate correlation coefficients and create scatter plots to visualize relationships.
- **Task 3.2:** Implement linear regression to model the relationship between temperature and other weather parameters.
  - Use the polyfit and polyval functions to fit and evaluate the regression model.
  - Plot the regression line and analyze the results.

### Data Visualization:

- **Task 4.1:** Create comprehensive visualizations to present the analysis.
  - Use subplot to create multiple plots in a single figure.
  - Customize plots with titles, labels, legends, and annotations.
- **Task 4.2:** Develop 3D surface plots to visualize temperature variation over time and space.
  - Use the surf and mesh functions to create 3D plots.

### Report Generation:

- **Task 5.1:** Compile the analysis and visualizations into a well-organized report.
  - Use MATLAB's publish feature to generate a report in PDF or HTML format.
  - Include descriptive text, code snippets, and visualizations.
- **Task 5.2:** Summarize the key findings and insights from the data analysis.
  - Discuss any notable trends, correlations, and anomalies.
  - Provide recommendations or potential applications of the findings.

### Project Presentation:

- **Task 6.1:** Prepare a presentation summarizing the project.
  - Create slides highlighting the problem statement, objectives, methodology, and key findings.
  - Include visualizations and key insights in the presentation.
- **Task 6.2:** Present the project to peers or instructors.
  - Deliver a clear and concise presentation.
  - Be prepared to answer questions and discuss the analysis in detail.

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