CDS6324: Data Visualization
Trimester: 2510

Project: Creating Interactive Data Visualization

I. Project Specification

This group project focuses on creating an interactive data visualization dashboard using D3.js, a powerful JavaScript library for creating data-driven visualizations. The theme of the project will either be **Industry 4.0** or **Business Intelligence**, and it will showcase interactive charts designed to provide insights into real-world data related to these themes. The goal is to visualize complex datasets in a way that allows users to interact, explore, and derive meaningful insights.

Group Structure and Responsibilities

- **Team Members**: 4 students (can be from different lecture/tutorial sections)
- **Individual Tasks**:
    - Each student will create 2 distinct charts.
    - Each chart should be interactive and based on relevant data within the chosen theme (Industry 4.0 or Business Intelligence).
    - All the charts will be combined into a unified interactive dashboard or two dashboards.

Project Theme

- **Theme Selection**: Decide whether the team will focus on **Industry 4.0** or **Business Intelligence**.
- **Data Sources**: Identify and collect relevant datasets for the chosen theme. For example:
    - **Industry 4.0**: IoT and sensor data, smart factory metrics, production line performance, manufacturing efficiency, machine data, predictive maintenance, supply chain and logistics etc.
    - **Business Intelligence**: Market trends, sales data, customer segmentation, product performance, financial analysis, etc.
- The team can either generate synthetic data (for simulation) or use publicly available datasets relevant to Industry 4.0. Some potential data sources:
    - [Kaggle](#)
    - [UCI Machine Learning Repository](#)
    - [Industry 4.0 Sensor Data (Mock APIs)](#)
- The dataset(s) should contain at least **10 attributes and 3,000 records**.

Important Note: There should not be more than 3 groups using the same dataset.

Tools and Technologies

- **D3.js**: The primary tool for creating interactive visualizations.
- **HTML/CSS**: For structuring and styling the web page and dashboard layout.
- **JavaScript**: For integrating the D3.js visualizations, handling interactivity, and ensuring smooth data flow.
- **Optional Tools**:
    - **GitHub**: For version control and collaborative development.
    - **Data preprocessing tools** (e.g., Tableau Prep, Python, Excel, R) for cleaning and preparing the datasets before using them in D3.js.

Interactivity Features:

- **Hover tooltips** to show additional information when a user hovers over a data point.
- **Filters**: Enable users to filter data based on specific attributes (e.g., date range, product category, region).
- **Zooming**: Allow zooming into specific parts of the chart for a more detailed view.
- **Dynamic Updates**: Ensure that the charts are linked, so user interaction with one chart (e.g., selecting a region or time period) can update others.

II. Project Deliverables

1. **Source Code**:
   - **Individual Visualizations (2 charts per student)**:
     - **Total charts**: Minimum 8 (2 per student × 4 students).
     - Visualizations should be designed for clarity, interactivity, and user engagement (hover, zoom, filtering, etc.).
   - **Dashboard(s)**:
     - The individual charts will be combined into **one or two interactive dashboards**.
     - The dashboard(s) should present a cohesive, interactive user experience where users can explore data by interacting with different visualizations (e.g., by filtering, zooming, or clicking).
     - The dashboard should provide insight into the chosen theme and allow for seamless interaction between charts (e.g., clicking on one chart updates others).
   - Please ensure that the source code submitted is in working order. If any special instructions are needed for building or running your software, please include them in the write-up or provide a readme file. Marks for coding-related marking criteria will not be allocated for code that does not work.

2. **Documentation**:
   - A **written report** documenting the following:
     - **Data Sources**: Brief explanation of the datasets used (~1 page).
     - **Visualizations**: A description of the purpose and key insights of each visualization (~3 pages, including the charts/dashboard).
     - **Interactivity**: Explanation of the interactive features integrated into the charts (~1 page)
     - **Best data visualization practices**: State the visualization design principles (i.e. Shaffer's 4Cs or Cole Nussbaumer's 4As) used to guide your visualization and describe how the visualizations of your data story fulfil each of the design principles (<1 page)
     - **Challenges & Solutions**: Any issues faced during development and how they were solved (<1 page).
     - **Development processes**: Include a breakdown of how the work was split among the group members. Include a commentary on the development process, including answers to the following questions: Roughly how much time did you spend developing your application (in man-hour)? What aspects took the most time? (<1 page).

III. Project Milestones

A. Project Proposal:

Your project proposal should include the following details:
- **Project Members**
- **Project Title**
- **Proposed Dataset and Its Attributes**
- **Project Description**: Storyboard of the visualization charts/dashboards/interface you will create. Explain the features of your application and why the interaction techniques you will implement will be effective in the context of your data domain.

Submission
File name: StudentID1_ StudentID2_ StudentID3_StudentID4.zip
File size: 2MB (maximum)
Submission platform: eBwise
Submission deadline: 25th May 2025, 11:59pm
Assessment marks: 5%
Late submission: Deduction of 10% from total marks gained per day late

B. Final Project

Proposed Timeline (4 weeks):
    Week 1: Begin developing individual charts using D3.js, focusing on basic functionality.
    Week 2: Enhance charts with interactivity features and finalize designs.
    Week 3: Collaborate on integrating individual charts into one or two dashboards.
    Week 4: Conduct thorough testing for functionality, interactivity, and user experience.
            Prepare documentation to summarize the project's findings.

Submission
File name: StudentID1_ StudentID2_ StudentID3_StudentID4.zip
File size: 2MB (maximum)
Submission platform: eBwise
Submission deadline: 20th June 2025, 11:59pm (Week 13)
Assessment marks: 30%
Late submission: Deduction of 10% from total marks gained per day late

C. Project presentation

- A **final presentation** summarizing the work and demonstrating the dashboard(s).
- Show the functionality of the interactive features and discuss key insights derived from the data visualizations.

Presentation schedule: Week 14.
Assessment marks: 5%

IV. Project Rubrics

PROPOSAL (5%)	
Criteria	**Marks**
Data used is appropriate and sufficient for analysis	**1**
Clearly defined topic that answers a specific question or facilitates decision making (Does the visualization tells a good story?).	**1**
Description and design of proposed visualization	**3**
	5

PRESENTATION (5%)	
Criteria	**Marks**
Organization (slides and presentation)	**2**
Delivery	**2**
Preparedness / Participation / Group dynamic	**1**
TOTAL	**5**

PROJECT (30%)	
Criteria	**Marks**
Visualization Design	
Applies appropriate graphic variable types (visual encoding) for the data type and scale.	**2**
Appropriate choice of charts	**2**
Legends should describe and explain every graphic variable type employed.	**1**
Animation	**1**
Interactivity - the visualization is usable and actionable	**4**
Dashboard design	**2**
Design Principles and Impact	
Everything in the visualization conveys some information to the viewer (Data-Ink ratio)	**2**
Graphics integrity, and impact of the findings and analysis	**2**
Basic visualization rules and best practices are consistently applied (Shaffer's 4Cx or Cole Nussbaumer's 4As)	**2**
Data Storytelling	
Relevance to Industry 4.0 or Business Intelligence	**1**
Data used is appropriate and sufficient for analysis	**1**
Clearly defined topic that answers a specific question or facilitates decision making (Does the visualization tells a good story?).	**1**
Design of Data Story	**2**
Aesthetics	
Aesthetics appeal of visualization	**2**
Report	
Quality and Comprehensiveness of Report	**3**

Peer Evaluation	
Group teamwork	**2**
TOTAL	**30**

Peer Evaluation

Number of group members who submitted peer evaluation $= n$

Peer evaluation marks given to student by another member $= P_i \in [0,20]$

Peer evaluation score for a student,

$$PE = \frac{\frac{1}{n}\sum_{i=1}^{n} P_i}{10}\%3$$

$PE = 0\%$ for the member who did not submit peer evaluation form.

Example:

Number of group members: 4

Number of peers: 3

Maximum marks for evaluation by every peer: 20

Marks given by peers: **Peer 1– 16 marks, Peer 2 –14 marks, Peer 3–12 marks**

IF **the student submits peer evaluation form**, his peer evaluation marks is:

$$PE = \frac{\frac{1}{3}(16 + 14 + 12)}{10}\%$$
$$= \mathbf{1.2}\%$$

ELSE

$$PE = \mathbf{0\%}$$

END