CSE4142: Information Visualization

Programme: M.Tech. (CSE) Year: 1 Semester : I
Course : Program Elective Credits : 3 Hours : 40

Course Context and Overview:
The main goal of this course is to provide the knowledge and practical skills necessary to develop a strong foundation on information visualization and to design and develop advanced applications for visual data analysis. This course aims at introducing fundamental concepts of visual perception applied to information visualization. These concepts help the student ideate and evaluate visualization designs in terms of how well they leverage the capabilities of the human perceptual machinery.

Prerequisite Courses: NIL

Course Outcomes (COs):

On completion of this course, the students will have the ability to:	
CO1:	Select the right visualization methods for a given data analysis and presentation problem.
CO2:	Evaluate the quality of graphs according to their expressiveness and effectiveness
CO3:	Inspect Accuracy, Discriminability, Salience, and Separability, and their implications for design.
CO4:	Create data visualizations using D3.js

Course Topics:

Contents	**Lecture Hours**	
UNIT 1 **Foundations of Information Visualization**		8
Introduction to Information Visualization, Key Concepts and Definitions, Explanatory Visualizations, Quality Assessment	2	
Data Abstraction, Dataset Types, Attribute Semantics, Data Profiling	2	
Fundamental Graphs, Alternate Representations, Data Transformations	2	
Graphical Components, Quality of Visual Encoding, Evaluate Visualizations, Contextual Components	2	
UNIT 2 **Applied Perception**		8

Introduction, Visual Queries, Expressiveness of Visual Channel	2	
Effectiveness of Visual Channels, Implications of Design (Accuracy, Discriminability, Salience, Separability)	2	
Color Perception, Color Spaces	2	
Using Color in Visualization, Color Scales (Quantitative, Categorical, Diverging), Perceptual issues with Color	2	
UNIT 3 **Programming with D3.js**		12
Introduction to Web (HTML, CSS, Javascript), Introduction to D3, D3 Selections, Adding and Removing Elements, Changing Properties	3	
Dealing and Drawing with Data (Loading, Filtering, Sorting, Transforming, Binding, Scaling)	3	
Drawing Lines, Arcs and Maps, Choropleth Map	3	
Visualizing Networks, Hierarchical Data, Listening to Events, Brushing, Zoom	3	
UNIT 4 **Advanced Techniques**		12
Visualizing Geographical Data, Maps (Dot, Heat, Hexbin, Choropleth), Spatial Distributions, Map Projections	3	
Visualizing Network Data, Node-Link Diagrams, Trees (Node-Link Trees, Decision Trees)	3	
Visualizing Temporal Data, Temporal Information, Events with Duration, Periodic Phenomena	2	
Interaction and Multiple Views, Information Visualization Pipeline, Single/Multiple Views, Navigation, Scenarios	4	

Textbook references:
Reference Materials:

- Colin Ware: *"Information Visualization",* Morgan Kaufmann, 4th edition, 2019
- Scott Murray. *"Interactive Data Visualization for the Web"*, O'Reilly, 2nd edition, 2017

Evaluation Methods: Evaluation criteria will be shared by the concerned course instructor.

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