

SDSC2004: DATA VISUALIZATION

Effective Term

Semester B 2023/24

Part I Course Overview

Course Title

Data Visualization

Subject Code

SDSC - School of Data Science

Course Number

2004

Academic Unit

School of Data Science (DS)

College/School

School of Data Science (DS)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

GE2343 Data Visualization

Exclusive Courses

Nil

Part II Course Details

Abstract

Data visualization refers to the techniques used to communicate data or information by encoding it as visual objects (e.g., points, lines or bars) contained in graphics. The capability to interpret data in a visual way has become an essential skill.

Effective visualization helps users analyze and reason about data and evidence. It makes complex data more accessible, understandable and usable. This course introduces practical methods and tools to visualize data to communicate complex information clearly and efficiently. Students will learn how to present, visualize, and communicate data in various forms clearly and concisely. The ideas and principles in both aesthetic form and functionality will be emphasized.

The mainstream data visualization tools, including Python and Tableau, will be covered in this class. Students will become familiar with exploratory and explanatory visualization techniques for data storytelling. Additionally, students will work together on group projects to develop their creative and technical skills as well as to learn from their peers. The real-world data and applications will be used in this course.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the fundamental characteristics of effective graphical displays	10	x		
2	Familiarize with the type of diagrams and their functionality for expressing insights from the data.	20	x		
3	Understand design principles of data visualization	20	x	x	
4	Develop effective visualization for diverse types of datasets by using the software	30	x	x	x
5	Apply data visualization tools to real big datasets for clear communication and efficient stimulation of users' engagement	20	x	x	x

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Formal lectures	1, 2, 3, 4
			39 hours/Semester including group projects.

2	Two group projects	Student groups will be asked to complete two group projects: one project is in form of web visualization (online use), and another is in the format of poster form (print use). In both, the “storytelling” text (or report) for the visualization is a mandate to deliver a complete project.	2, 3, 4, 5	13 hours/Semester (included in the lecture hours)
3	Tutorial	Teach the use of software tools in computers	2, 3, 4, 5	13 hours/Semester

Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4	30
2	Group project	2, 3, 4, 5	40

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Additional Information for ATs

Note: To pass the course, apart from obtaining a minimum of 40% in the overall mark, a student must also obtain a minimum mark of 30% in both continuous assessment and examination components.

Assessment Rubrics (AR)**Assessment Task**

Assignments

Criterion

Based on submitted written work to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

Group projects

Criterion

Based on presentation and submitted written work to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

Examination

Criterion

Based on submitted written work to evaluate understanding of subject matter, evidence of knowledge base, capacity to analyse and synthesize, and evidence of original and critical thinking.

Excellent (A+, A, A-)

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Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

- Describing and summarizing data
- Data analysis, data analytics, big data analytics
- Principles of visual design, perception and color theory
- Basic charts and plots, multivariate data visualization, text rendering
- Examples of effective visualization for diverse types of datasets, e.g. matrices, graphs, trees, scalar fields, vector fields, high-dimensional data, etc.
- Annotation in data visualization
- Applications and case studies of data visualizations
- Software:
 - Plotting data in Python: the use of library matplotlib and pandas
 - Creating visualization in Tableau with dashboards and stories
 - Animated presentation for data is a plus but not necessary.

Reading List

Compulsory Readings

Title	
1	Lecture notes

Additional Readings

Title	
1	Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master By Ryan Sleeper (Author), Publisher: O'Reilly Media; 1 edition (April 30, 2018)
2	https://www.tableau.com/learnonline learning resource
3	Visualizing Data: Exploring and Explaining Data with the Processing Environment By Ben Fry, O'Reilly Media, 2007.
4	The Visual Display of Quantitative Information By Edward R. Tufte, 2001