

GE2343: DATA VISUALIZATION

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Data Visualization

Subject Code

GE - Gateway Education

Course Number

2343

Academic Unit

Data Science (DS)

College/School

College of Computing (CC)

Course Duration

One Semester

Credit Units

3

Level

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

GE Area (Primary)

Area 3 - Science and Technology

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

SDSC2004

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	Describe the fundamental characteristics of effective graphical displays	10	x		
2	Discuss the type of diagrams and their functionality for expressing insights from the data.	20	x		
3	Explain design principles of data visualization	20	x	x	
4	Design 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.

Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures to gain knowledge about data visualization	1, 2, 3, 4
			39 hours/Semester including group projects.

2	Group project	Students will participate in groups to consolidate their learning as they produce two reports (or text) integrating “storytelling” text and visualization, using Python and Tableau, respectively, and will actively engage as audience members during peers’ presentations in order to expand and develop their own knowledge.	2, 3, 4, 5	13 hours/Semester (included in the lecture hours)
3	Tutorial	Students will engage in tutorial activities to extend their use of computer software tools for data visualization.	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-)

High

Good (B+, B, B-)

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, including matrices, graphs, trees, scalar fields, vector fields, high-dimensional data, etc.
- Annotation in data visualization
- Applications and case studies of and 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

Annex (for GE courses only)

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)

PILO 1: Demonstrate the capacity for self-directed learning

4, 5

PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology

1, 2, 3, 5

PILO 3: Demonstrate critical thinking skills

3, 4, 5

PILO 4: Interpret information and numerical data

1, 2, 3, 4, 5

PILO 5: Produce structured, well-organised and fluent text

4, 5

PILO 6: Demonstrate effective oral communication skills

1, 2, 5

PILO 7: Demonstrate an ability to work effectively in a team

4, 5

PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues

3, 4, 5

PILO 9: Value ethical and socially responsible actions

1, 2, 3, 4, 5

PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation

4, 5

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task

Group project report and product.