

Course 4: Minor - Data Analysis and Visualization

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Course Objectives

This course provides an introduction to Data Analysis and Visualization Techniques.

Course Outcomes

- Make inferences from the data. Preprocess the data using a programming language.
- Make storytelling using visualization tools. Distinguish qualitative and quantitative data.
- Make inferences out of different plots. Develop a story out of the data.

Syllabus

Unit	Topic	Contents	Periods
1	Data Preparation Techniques	Data Preparation, Data Cleaning, Data Transform	8
2	Data Wrangling	Data Workflow Frame, Dynamics of Wrangling, Transformation, Roles and Responsibilities, Data Wrangling Tools	10
3	Foundations in Graphs	Measures of Average, Measures of Variance, Measures of Correlation and Measures of Ratio. A brief history of graphs; graphical means for qualitative data; visual attributes: lines, histograms, bar plots, scatter plots and box plots, with inferences through examples.	12
4	Advanced Concepts in Data Visualization	Organizing, highlighting, integration, table design, general graph design, multi-variable display; fundamental variation of graphs; general design for communication; component-level graph design.	12
		Total	42

Practicals Suggested for Data Analysis and Data Visualization

Unit	Topic	Contents	Periods
1	Usage of Data Analysis and Visualization Tools	The techniques used in the theory can be implemented in the lab through a programming language such as Python or R, or a tool such as Power BI or any other visualization tool.	8
2	Case Studies	Take different datasets, perform preprocessing, visualize, and make insights out of the data.	28
		Total	28

Key Text(s)

- Jason Brownlee, Data Preparation For Machine Learning, Machine Learning Mastery, 2020. — Chapters 1–10 (Data Preparation Techniques covered in this text)
- Tye Rattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel and Connor Carreras, Principles of Data Wrangling: Practical Techniques for Data Preparation, O'Reilly, 2017. (Data Wrangling covered in this text)
- Stephen Few, Show Me the Numbers: Designing Tables and Graphs to Enlighten, 2nd Edition, Analytics Press, 2012. — Chapters 1–10 (Data Visualization covered in this text)