GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

Data Visualization for and with AI (E061370)

Course size *(nominal values; actual values may depend on programme)*

Credits 3.0 **Study time 90 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	practical	15.0h
			lecture	15.0h

Lecturers in academic year 2024-2025

Lijffijt, Jefrey	TW06	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bridging Programme Master of Science in Bioinformatics(main subject Engineering)	3	A
Master of Science in Bioinformatics(main subject Engineering)	3	A
Master of Science in Industrial Engineering and Operations Research(main subject Manufacturing and Supply Chain Engineering)	3	A
Master of Science in Industrial Engineering and Operations Research(main subject Transport and Mobility Engineering)	3	A
Master of Science in Computer Science Engineering	3	A
Master of Science in Industrial Engineering and Operations Research	3	A

Teaching languages

English

Keywords

Data, data visualisation, data exploration, dashboards, interactive data visualisation, machine learning, AI, data quality, streaming data, time series, maps, graphs

Position of the course

Datavisualisation is used to communicate statistics and information in a visual manner. This is used frequently in research, in evidence-based methods (decision- and policy-making) and in the development of data- and AI-driven systems. In this course you will learn about the different aspects of data visualization, current best practices, and gain experience in hands-on use of (programming) tools to create data visualizations and dashboards. Specific attention will be paid to the use of data visualization in development of AI systems (including interactive exploration and improvement of data quality) and to AI methods to automate the data-visualization process itself.

Contents

- Why data visualization: in general & use cases
- Theory and principles of data visualisation
- Theory of perception and design mantras
- Visualization of various data types, including structured data: time series, maps, and (knowledge) graphs
- Dashboards, interactive graphs, and tools to develop web apps
- Visualisation to explore data and AI models, including data quality and bias/fairness
- AI to automate data visualization
- Evaluation of (interactive) visualisation
- Guest lecture from a company

Initial competences

Students are expected to
- Have fluent programming skills in Python
- Have knowledge of and the ability to apply basic machine learning techniques

Final competences

1 Be able to explain what data visualization is and motivate its use
2 Have knowledge of human perception in the context of data visualization
3 Have knowledge of and be able to apply the theory of data visualization and design principles
4 Appropriately apply existing (semi-automatic) tools for make graphs for different data types and structured data: time series, maps, (knowledge) graphs
5 Be able to design and implement interactive graphs and dashboards (as a web app)
6 Be familiar with the application of visualization in data exploration and the development of AI models, including exploration and improvement of data quality and bias/fairness
7 Critically reflect on (interactive) data visualizations and dashboards and have knowledge on how to evaluate these

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, Seminar, Lecture, Practical

Extra information on the teaching methods

The course consists of lectures and a few assignments in small groups. These assignments consist of the implementation of (interactive) graphs and dashboards using techniques presented in the lectures, and writing a brief written report with critical reflection. Each assignment is introduced in a tutorial seminar, where the required tools are introduced. The assignments partially build on each other. Both the implementation and reflection reports are graded and students will receive feedback on them.

Study material

Type: Slides

Name: DVAI Lecture slides
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Slides : 350
Oldest Usable Edition : -
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No
Additional information: The lecture slides are subject to (minor) change every year, so they will be made available during the course.

References

Books from which material is used (all study material will be provided during the course, it is not necessary to have access to these books):
- Information Visualization: Perception for Design (Colin Ware)
- Visualization Analysis and Design: Principles, Techniques, and Practice (Tamara Munzner)
- Interactive Visual Data Analysis (Christian Tominski, Heidrun Schumann)

Course content-related study coaching

Interactive support through the electronic learning environment; per appointment, requested per e-mail, for personal matters

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

- End-of-term evaluation: oral assessment, with written preparation during which the internet and course material is available
- Continuous evaluation: graded assignments (small projects) in small groups, graded written reports

Calculation of the examination mark

De final score is the average score for the two parts (50% oral assessment and 50% assignments).
If the score for one part is above 7/20 and less than 10/20, the final score is at most 9/20.
If the score for one part is 7/20 or less, the final score is at most 7/20.