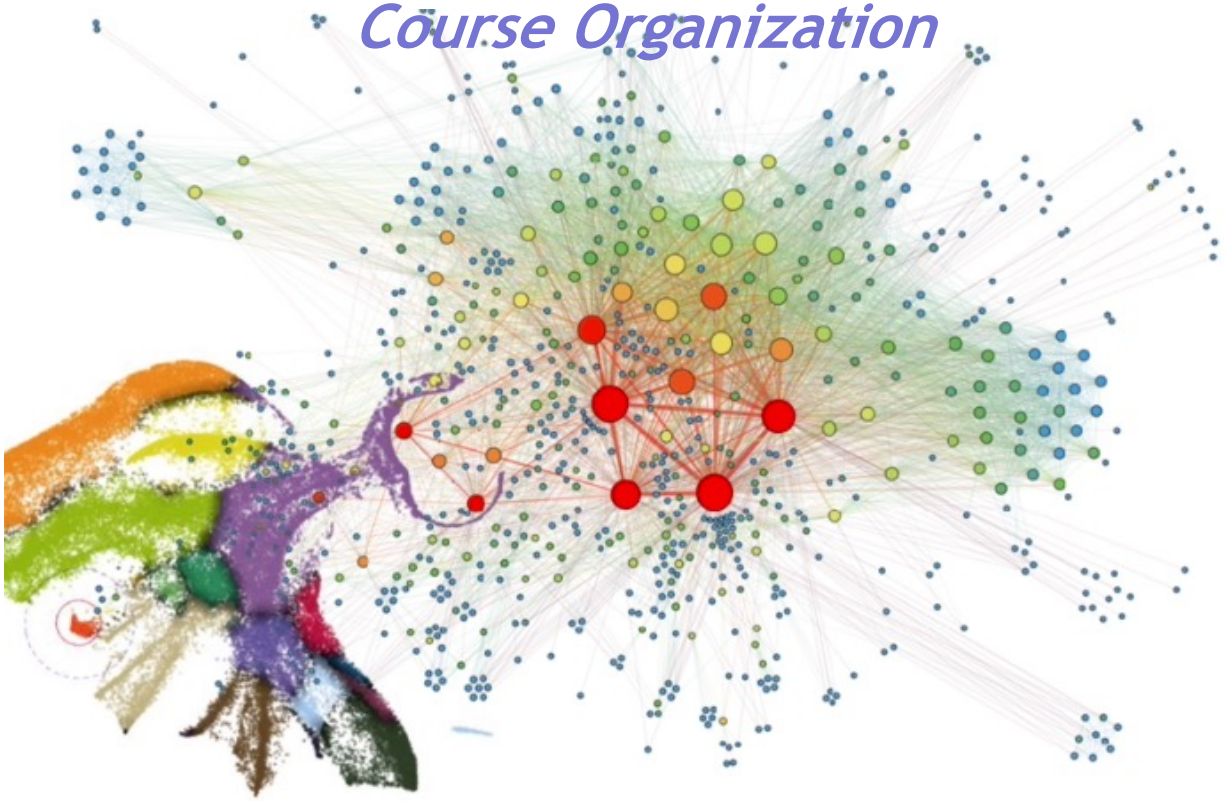
(High-dimensional and Relational) Data Visualization

Course Organization



dr. Tamara Mchedlidze

prof. dr. Alexandru (Alex) Telea

Department of Information and Computing Sciences
Utrecht University, the Netherlands

Course info: https://webspace.science.uu.nl/~telea001/DataVis/

Introduction - Instructors

Tamara Mchedlidze (Mtsentlintze)

https://www.uu.nl/staff/TMtsentlintze1

- PhD in graph drawing (NTUA Athens, 2012)
- PostDoc in network visualization (KIT Karslruhe, 2012-2020)
- assistant professor (UU Utrecht, since 2020)
- research: graph drawing (theory, practice, ML), applications of datavis in humanities
- check: https://evm.science.uu.nl/

Alex Telea

http://www.staff.science.uu.nl/~telea001

- PhD in scientific visualization (TU Eindhoven, 2000)
- assistant professor in visualization (TU Eindhoven, 2000-2007)
- professor in multiscale visual analytics (RUG, 2007-2019)
- professor in visual data analytics (UU, since 2019)
- research: visual analytics, shape analytics, machine learning

Alister Machado dos Reis (tutorials)

https://www.uu.nl/staff/AMachadodosReis

- Bachelor in Computer Science (UFRGS, Brasil, 2017)
- Master's in Data Science (INP, Grenoble, 2017)
- Software Engeneer (Google Brasil, 2018-2021)
- PhD student (UU Utrecht, since 2021)
- research: interactions between Visualization and Reinforcement Learning

Introduction - Students

Tell us about you!

Or go to https://www.menti.com/alxuiaip3in1
use code: **6984 2695**

For *whom* is this course

- (under)graduate students in the MSc phase
- interested to learn in depth algorithms and methods for data visualization

What you need to know *before*

- a programming language (C, C++, Python, Java, C#)
- data/software management (platforms, tools, scripting, etc)
- background in math (linear algebra, calculus, optimization, statistics)
- knowledge of algorithms and computational complexity
- fundamentals of visualization and/or graphics

Course Structure

Lectures

• 7 lecture weeks
• communicate and illustrate theory, techniques, methodology
• present examples
• interactive setting: slides, questions to**from audience** (!)

Tutorials

• develop a tool for relational, high-dimensional data visualization
• work in groups (1..3 students); **groups of 2** are encouraged
• assignment is online (assignment -> Overview)
• work on the assignment as the course progresses (25% of the grade, more later)
• implement algorithms given at the lectures. If you want to implement smth else, provide a good reason why to do so.

Feedback

• global, during lectures
• per-group, from lecturers, upon submission of progress reports

Course Structure

Grading (more later)

- 25% Process
- 25% Final project presentation
- 50% Final project deliverable

Course Outline

Module 1: **Introduction**

Module 2: **Tree visualizations**

Module 3: **Visualization of general graphs**

Module 4: **Visualization of directed graphs**

Module 5: **Visualization of clustered/multilayer networks**

Module 6: **Low dimensional data visualization**

Module 7: **High dimensional data visualization**

Note: A module is not 1-to-1 to one lecture

Course Schedule

Week	Date	Time	Content	Lecturer
6	February 7	9:00-10:45	Introduction to Network Visualization	Tamara
7	February 12	-	Tutorial	Alister
	February 14	-	Tree Visualizations	Tamara
8	February 19	-	Tutorial	Alister
	February 21	-	Visualization of general graphs	Alister for Tamara
9	February 26	-	Tutorial	Alister
	February 28	-	Visualization of hierarchical graphs	Tamara
10	March 4	-	Tutorial	Alister
	March 6	-	Visualization of multilevel networks	Tamara
11	March 11	-	Tutorial	Alister
	March 13	-	High-dimensional data visualization	Alex
12	March 18	-	Tutorial	Alister
	March 20	-	High-dimensional data visualization: advanced	Alex
13	March 25	-	Tutorial	Alister
	March 27	-	—	
14	April 2	17:15-19:00	Final Presentations	Students
	April 3	9:00-12:45	Final Presentations	Students

Note: MSTeams -> General -> Files

Assessment

Practical assignment

Design and implement a system for the visualization for relational and high-dimensional data

1.Progress report updates (25% of the grade)

- describes implementation choices, parameters of the algorithms, presents output visualizations, qualitative and quantitative evaluation of the visualizations
- submit progress of the report every week - same updated document
- use github for collaborative work both for code and progress report
- submit progress report every week (on Monday) to MSTeams (Tutorials -> Files)
- we grade: consistency, quality, and completeness
- check: tips&tricks documents released every week

2. Final project deliverable (50% of the grade)

•PDF of the final report (completeness of the assignments and explanations, quality of writing)
•GitHub repository with code (not graded separately, but must work to pass course)
•Readme + built instruction

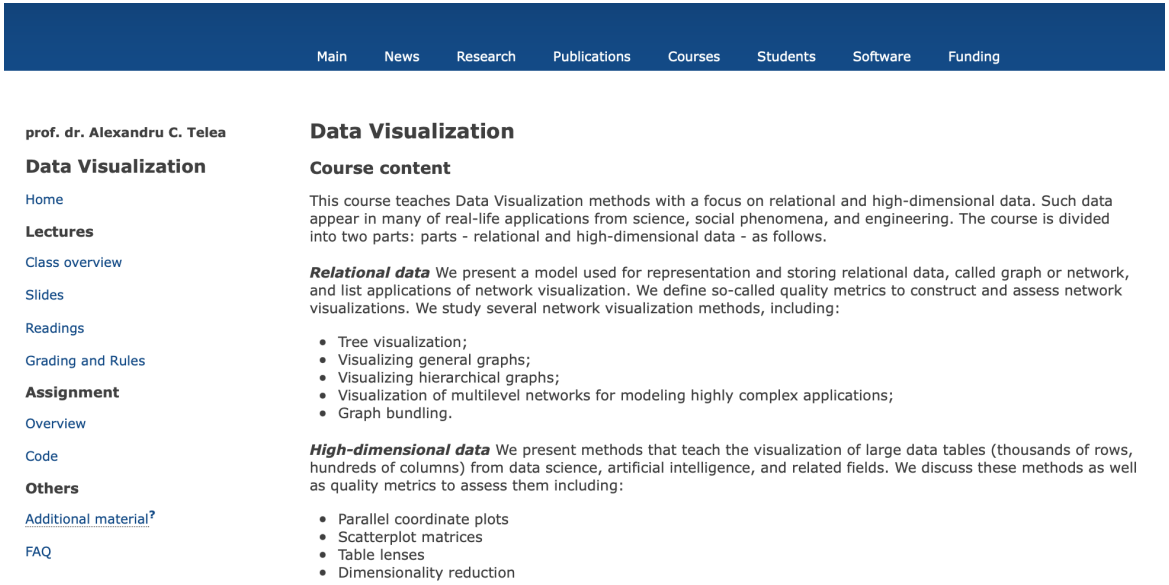
3. Final presentation (25% of the grade)

- present orally your system
- clarity and structure of the presentation, quality of the slides, engagement with the audience, addressing questions

Communication Channels

Course webpage

- slides (webpage->slides, updates as the course progresses)
- recommended books/articles
- datasets
- sample code fragments
- assignment description
- tips & tricks (added as the the course progresses)
- grading rules
- FAQ

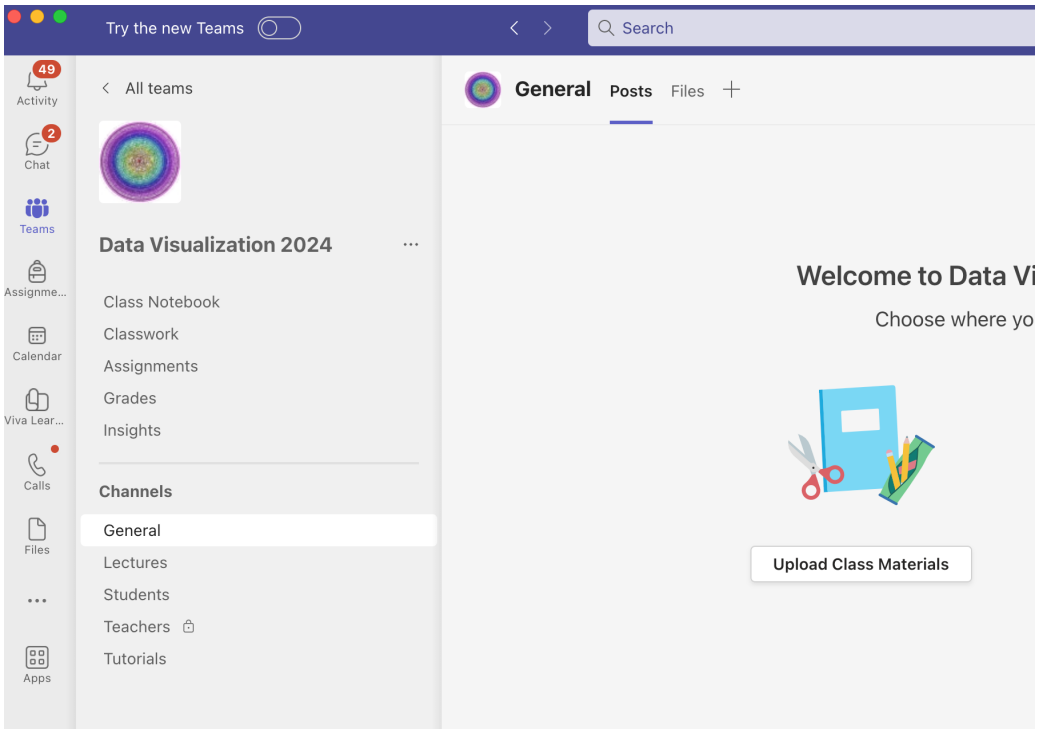


Course info: https://webspace.science.uu.nl/~telea001/DataVis/

Communication Channels

MSTeams

- link in blackboard – please request access
- **General** : announcements and questions about organizational matters
- **Lectures**: questions about the lecture content
- **Tutorials** : questions about assignments
- **Students** : communication among the students, can help you to find project partner



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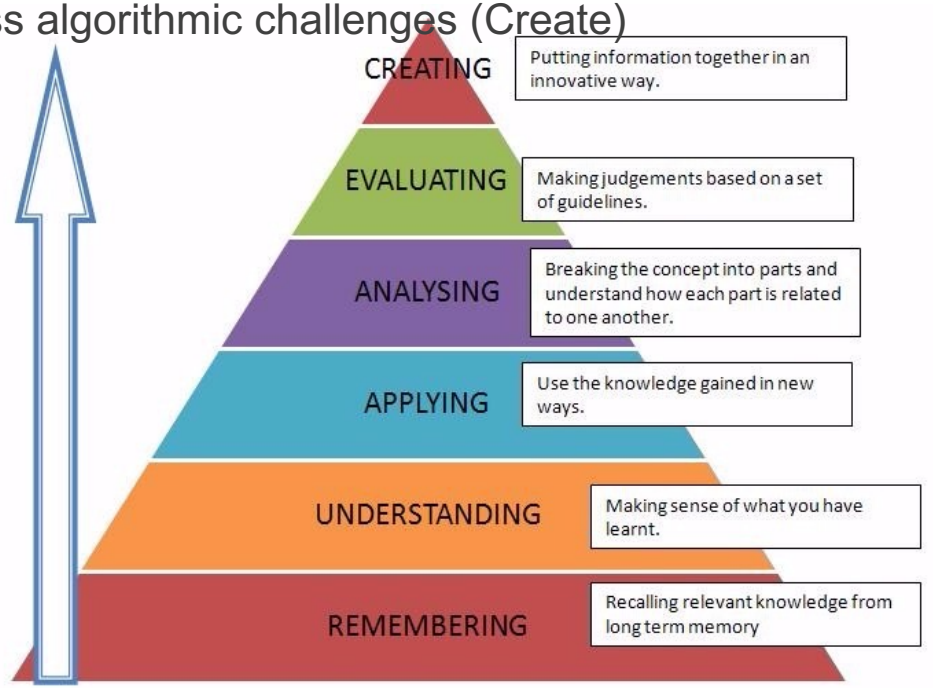
Learning Goals

- Have an overview of the state-of-the art visualization methods for relational and high-dimensional data (Remember)
- Be able to explain the functionality of these methods (Understand)
- Implement the methods in your programming language of choice (Apply)
- Parametrise the methods for a range of data sets (Apply)
- Assess the results of the constructed visualizations (Analyse, Evaluate)
- Present and motivate all taken choices (Analyse)
- Come up with novel ideas to address algorithmic challenges (Create)



Bloom's Taxonomy for Learning Outcomes

Additional Remarks

Competences assumed you have (and develop further)

Coding

- you need to be able to **program** (well)!!!
- lecturer is **not assumed** to debug your source code

Communication

- describe a problem/question **correctly**, **compactly**, and **technically** (“it does not work, what to do?” is not a good example ☺)

Reporting

- your final report should be at the level of an **industry white paper / tech report / scientific publication**
- well structured, complete, coherent, with clear math notations, references
- **illustrate** all you do by graphs, charts, snapshots
- use tips&tricks!

Additional Remarks

Be present!

- lectures give **detailed explanation** of the methods you need to implement
- tutorial sessions give opportunity to **ask questions** and **anticipate challenges**

Be proactive!

- ask **questions** during lectures!
- provide assignment progress **reports**
- do read all information on course **website**

Watch the time!

- make sure you progress **continuously** with the assignment
- report blockers ASAP!

Last but not least: Have fun!

Enjoy this online visualization of political blogosphere:
https://vimeo.com/108948127