
PRACTICAL INFORMATIONS

Teachers

Pierre VANDERGHEYNST
Pascal FROSSARD
Andreas LOUKAS
Michaël DEFFERRARD
Volodymyr MIZ

Assistants

Michaël DEFFERRARD
Volodymyr MIZ
Effrosyni SIMOU
Eda BAYRAM

Benjamin RICAUD

Nicolas ASPERT
Clément VIGNAC
Guillermo JIMENEZ
Nikolaos KARALIAS

Team



Pierre
Vandergheynst



Pascal
Frossard



Andreas
Loukas



Michaël
Defferrard



Volodymyr
Miz



Effrosyni
Simou



Eda
Bayram



Benjamin
Ricaud



Nicolas
Aspert



Clément
Vignac

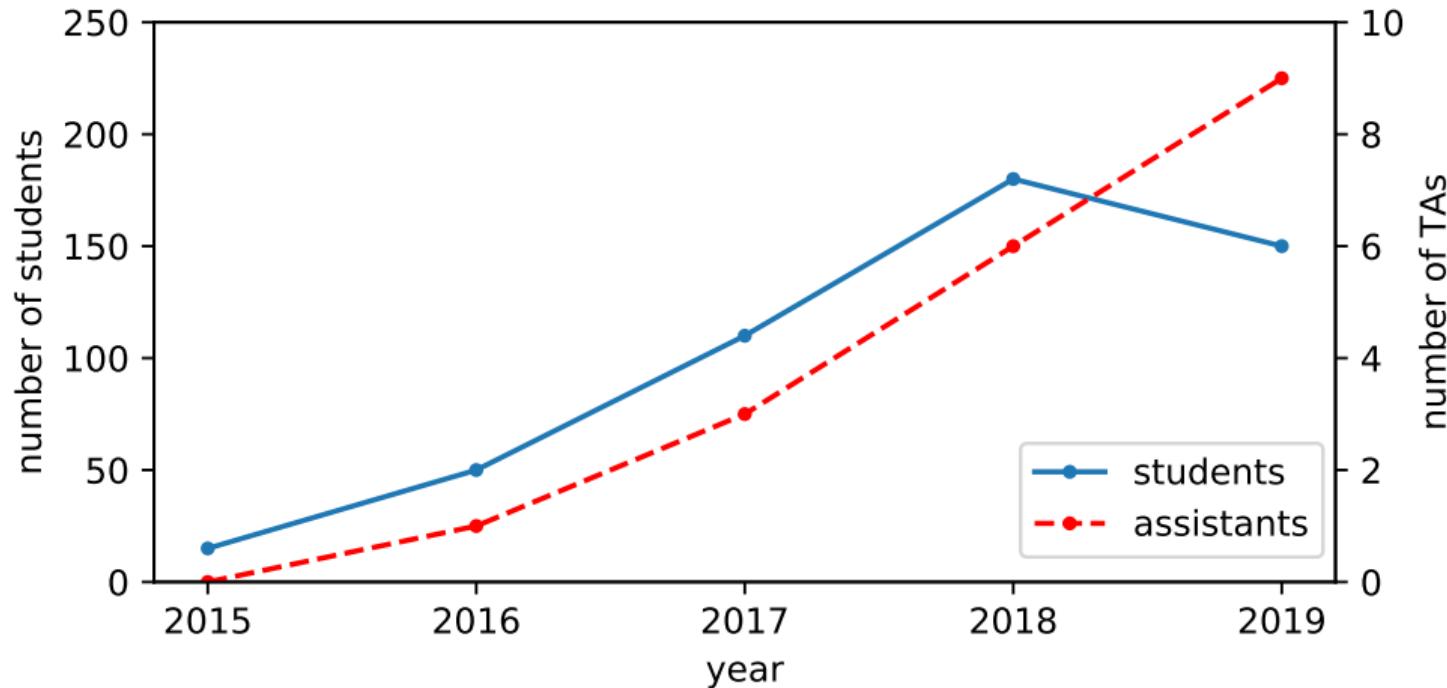


Guillermo
Jimenez



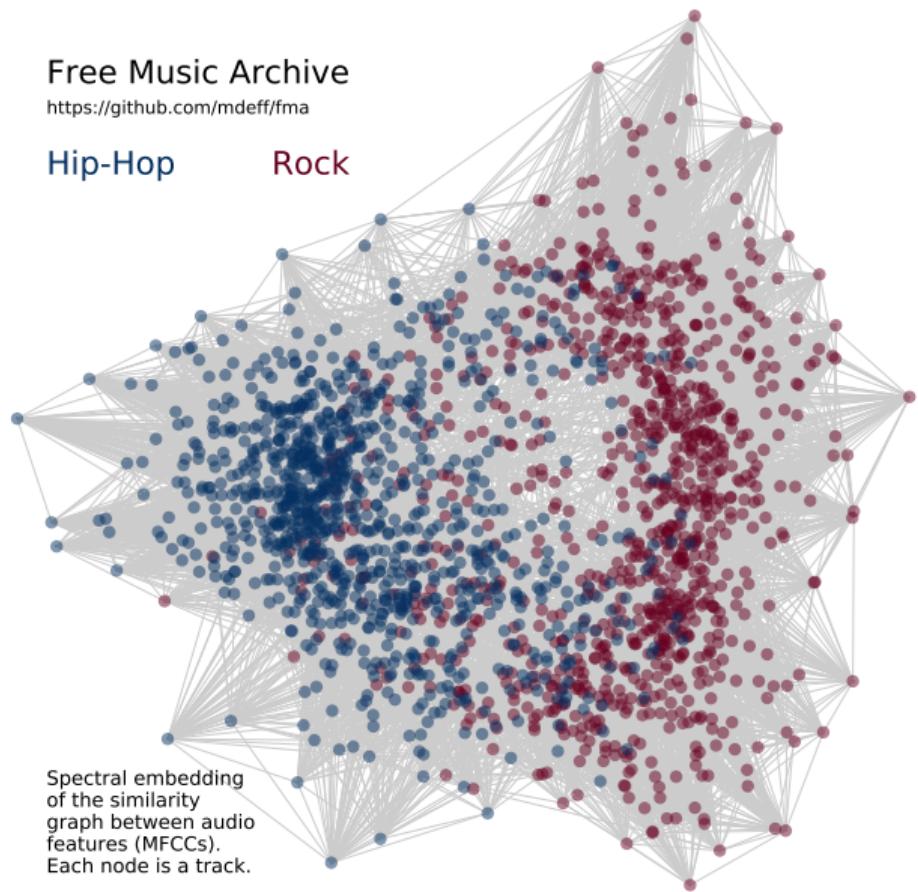
Nikolaos
Karalias

Enrollment

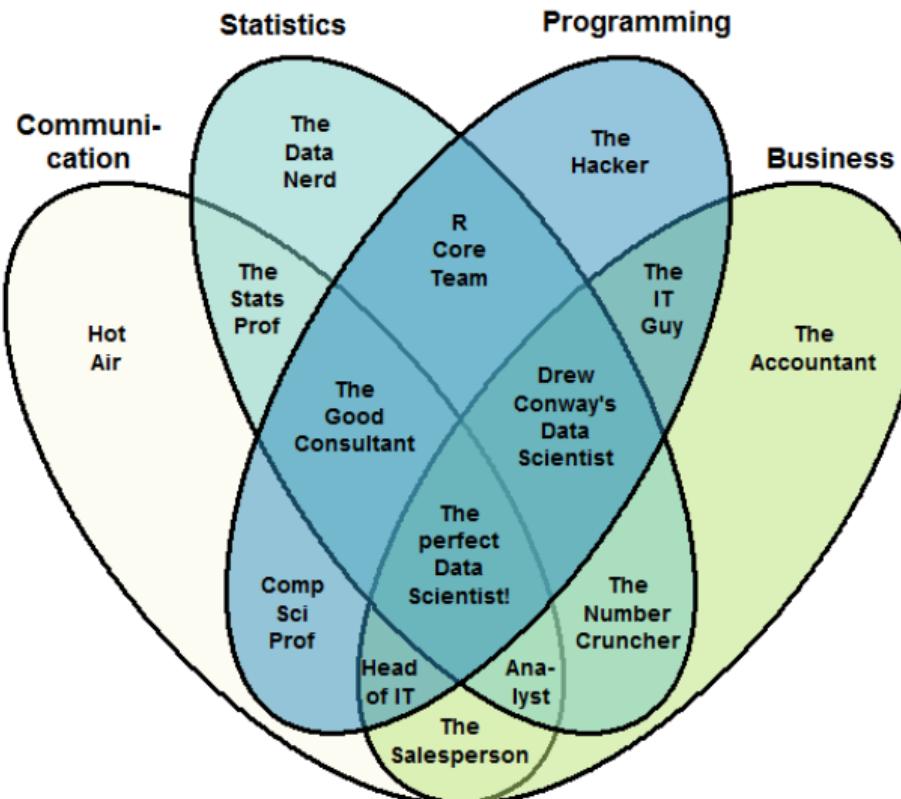


Content: A Network Tour of Data Science

1. Network Science
2. Spectral Graph Theory
3. Graph Signal Processing
4. Machine Learning with Graphs



Content: A Network Tour of Data Science



Organization

Theory & practice

Lectures theory and tools to deal with networks and network data

Lab sessions application of the tools to real-world data

Sessions on Tuesdays (10:15 to 12:00, CE2) and Wednesdays (10:15 to 12:00, CO2)

Course support

- ▶ your notes
- ▶ lecture slides (available on Moodle)
- ▶ research papers and textbooks referenced in the slides

Schedule

(tentative, updated on Moodle)

Date	Topic	Instructor	Room	Deadline
17.09	Introduction	Vanderghenst, Defferrard	CE2	
18.09	Graph theory basics	Frossard	CO2	
24.09	Installation & basics		CE2	
25.09	Random networks	Frossard	CO2	
01.10	Scale-free networks	Frossard	CE2	group registration
02.10	Assignment 1: network properties & models		CO2	
08.10	Assignment 1: network properties & models		CE2	
09.10	Network formation models	Frossard	CO2	
15.10	Assignment 1: network properties & models		CE2	assignment 1
16.10	Elements of spectral graph theory	Loukas	CO2	
22.10	Unsupervised learning with graphs: spectral clustering	Loukas	CE2	
23.10	Assignment 2: spectral, GSP, GNN		CO2	
29.10	Assignment 2: spectral, GSP, GNN		CE2	
30.10	Unsupervised learning with graphs: dimensionality reduction	Loukas	CO2	
05.11	Regularization on graphs with graph signal processing	Loukas	CE2	

Schedule

(tentative, updated on Moodle)

06.11	Assignment 2: spectral, GSP, GNN		CO2
12.11	Supervised learning on graphs with deep learning: part I	Defferrard	CE2
13.11	Supervised learning on graphs with deep learning: part II	Defferrard	CO2
19.11	Assignment 2: spectral, GSP, GNN		CE2 assignment 2
20.11	Project		CO2
26.11	Project		CE2
27.11	Network epidemics	Frossard	CO2
03.12	Visualization	Miz	CE2
04.12	Project		CO2 project summary
10.12	Project		CE2 peer review
11.12	Project		CO2
17.12	Project		CE2
18.12	Project		CO2
10.01	Handle project report and github repository		report and repository
21.01	Project presentation		
22.01	Project presentation		slides

Deadlines

(tentative, announced on Moodle)

Oct 1 form groups of four

Oct 15 handle assignment 1 (network properties & models)

Nov 19 handle assignment 2 (spectral, GSP, GNN)

Dec 4 handle project summary for peer-review

Dec 10 handle peer-review report

Jan 10 handle project report and github repository

Jan 21 project presentations

Practical sessions

Apply the material learned in class in a Data Science context.

During the labs, we will:

- ▶ Demo tools, e.g., how to manipulate a graph in Python.
- ▶ Explain the assignments and give directions.
- ▶ Answer questions about the assignments and project.

We expect you to:

- ▶ Bring your laptop.
- ▶ Work outside the hours on the assignments and project.

Tools: Python scientific stack

To be installed with conda.

- ▶ git: version control system
- ▶ Python: programming language
- ▶ Jupyter: interactive computing
- ▶ NumPy: n -dimensional arrays
- ▶ SciPy: scientific computing
- ▶ matplotlib: visualization
- ▶ pandas: data analysis
- ▶ NetworkX: network science
- ▶ graph-tool: network science
- ▶ gephi: graph visualization
- ▶ PyGSP: graph signal processing
- ▶ PyTorch: deep learning

Evaluation

Joint evaluation of theoretical and practical skills through assignments and a project.

Two parts:

1. Guided with two assignments that follow the lectures.
2. Open ended project.

Grading

assignments 50% for acquiring the course material in a structured way

peer-review 10% for giving critical feedback

project 40% for being creative and able to understand data, i.e., Data Science

Assignments

1. Template notebook with instructions given on GitHub.
2. Multiple weeks to complete.
3. Lab sessions to ask questions.
4. Completed notebook to be handled on Moodle.
5. Solutions posted on GitHub.
6. Grades given on Moodle.

Topics that follow the lectures, with a Data Science taint:

1. Network properties & models
2. Spectral Graph Theory, Graph Signal Processing, Graph Neural Networks

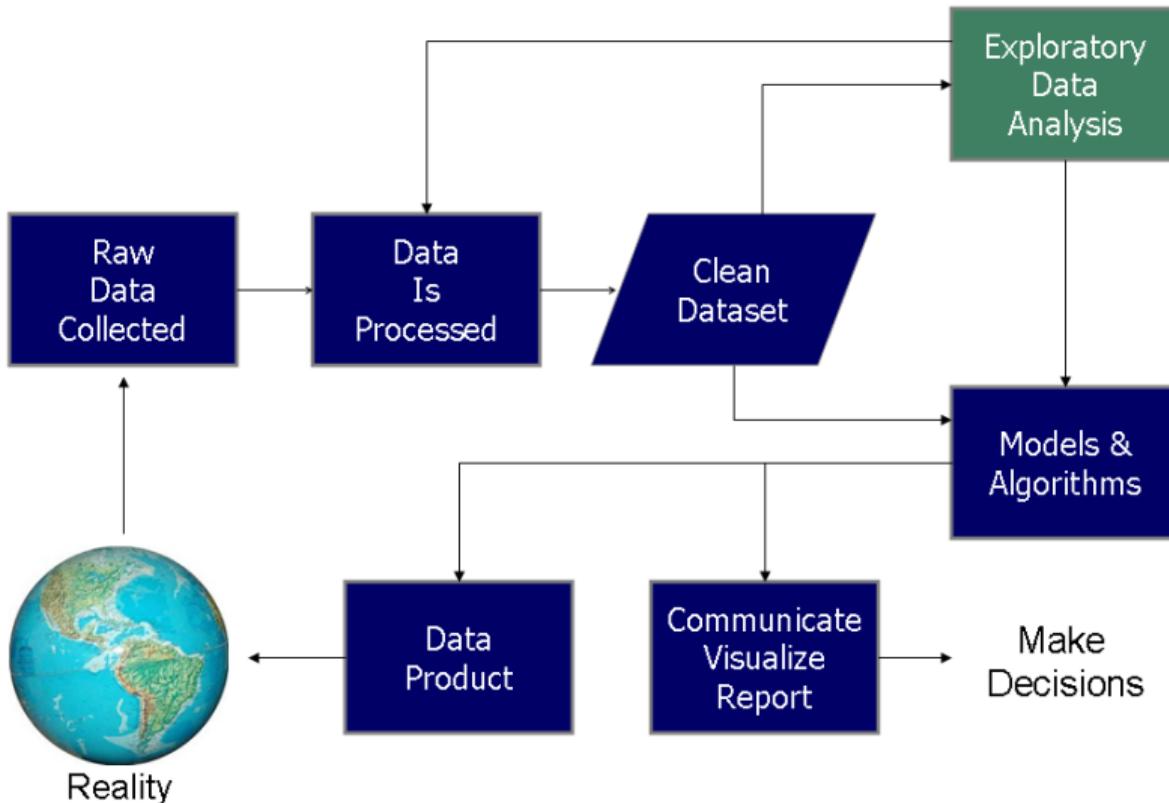
Project

More information later in the semester.

Tell us a data story based on the course material!

1. Form teams of four and choose a project.
2. Write a summary and get critical feedbacks from peers.
3. Handle a report and a git repository with code.
4. Impress us in a presentation!

Data science process



Some projects from 2018

more at https://github.com/mdeff/ntds_2018

The image displays a 3x3 grid of project posters, each representing a different data science application. The projects are:

- Spammer... Catch me if you can**: A network graph visualization titled "TEAM 20". It features a complex web of nodes and connections. Below the graph, the text reads: "Spammer... Catch me if you can", "TEAM 20", "Hedi Fendri - Paul Jahn", "Christina Hartmann - Nguyen Minh Nguyen".
- A Netflix Tour of Data Science**: A poster featuring a collage of movie posters. The main title is "A Netflix Tour of Data Science" and the subtitle is "Film Suggestion by Diffusion on Graphs". Below the collage, it says "Avignon Edwige - Fourcade Pierre - Nguyen Kenneth".
- Wiki**: A poster for "Wikipedia Analysis Using a Keyword Based Graph". It features the word "Wiki" in large, stylized red letters. Below it, the text reads: "Wikipedia Analysis Using a Keyword Based Graph", "Project – A Network Tour of Data Science", "Marc GLETTIG", "Mathias MINOIR", "Yves RYCHNER", "Charles TROTIN", "Ecole Polytechnique Fédérale de Lausanne", "23/01/2019", "NTDS 2018".
- Voting patterns in the Swiss National Council**: A poster showing a photograph of the Swiss National Council chamber. The text reads: "Voting patterns in the Swiss National Council", "Through a network analysis", "Steve Webster", "Domenec Vinyals", "Diego Beltramini", "EPFL ECOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE".
- Finding Continents from a Flight Routes Network**: A poster featuring a world map with flight routes overlaid. The text reads: "Finding Continents from a Flight Routes Network", "EPFL - Network Tour of Data Science", "D. Bouaziz, P. Desiraju, A. Duvosset, A. Vandenbroucke".
- How to Beat Terrorism Efficiently**: A poster with a background of network graphs. The text reads: "How to Beat Terrorism Efficiently", "Identification of Set of Key Players in Terrorist Networks", "Marco Pietro Abrate", "Natalie Bolan", "Shahow Kakavandy", "Jangwon Park".
- An exploratory study on the brain dysconnectome**: A poster featuring brain network visualizations. The text reads: "An exploratory study on the brain dysconnectome", "Claudia Bigoni", "Giorgia Giulia Evangelista", "Emeline Müller", "Joan Rue", "Professors: Prof. Pascal Frossard", "Prof. Pierre Vandergheynst", "EPFL ECOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE", "Unil UNIL | Université de Lausanne".
- PROJECT 2018: A Network Tour of Data Science**: A poster for the 2018 competition. It features a stadium scene with the text: "PROJECT 2018: A Network Tour of Data Science", "A Network Analysis", "The 2018 FIFA World Cup", "TEAM 5", "Maxence DRAGUET", "Robert INJAC", "Yannick KLOSE", "Manana LORTKIPANIDZE".
- NTDS TEAM 52: Mood Changing Playlist Generator**: A poster featuring a woman smiling. The text reads: "NTDS TEAM 52: Mood Changing Playlist Generator", "Jawad Imtiaz Ahmed", "Reza Hosseini", "Emmanouil Jacobides", "Miguel Gomez Quintanilla".

Online

Moodle, <https://moodle.epfl.ch/course/view.php?id=15299>

- ▶ slides
- ▶ official announcements
- ▶ grades
- ▶ discussion forum

GitHub, https://github.com/mdeff/ntds_2019

- ▶ assignments
- ▶ installation instructions
- ▶ projects
- ▶ tutorials

Questions?