

# Network Science

## Homework 1 & Interdisciplinary projects

© 2019  
T. Erseghe

tomaso.erseghe@unipd.it



# Timeline (1/2)

## HW1

Due by 20<sup>th</sup> Dec 2019 (**+1 bonus**)

... or before the oral exam (no bonus in this case)

## HW2

Due by 20<sup>th</sup> Jan 2020 (**+1 bonus**)

... or before the oral exam (no bonus in this case)

## Interdisciplinary project

Due by 20<sup>th</sup> Jan 2020 (**+2 bonus**)

... or before the oral exam (no bonus in this case)

# Timeline (2/2)

## Oral exam

Oral presentation (slides) of HWs or IP  
10 min presentation + 5 min for questions

## Sessions (starting on)

30 Jan 2020, 14:00, classroom Ce

20 Feb 2020, 14:00, classroom Ce

2 July 2020, 14:00, classroom Ce

10 Sep 2020, 14:00, classroom Ce

## Available in [uniweb.unipd.it](http://uniweb.unipd.it) (registration starting 8th Dec)

Network systems 12 cfu – partial exam on Module B

Network science 6 cfu – full exam

Network science 9 cfu – full exam, same days, but including  
written exercises on the spreading part

# Homework 1

# Homework 1 (1/4)

## 1. Choose your own dataset

- It must involve a **complex** (non trivial) **network** with a (sufficiently) high number of nodes, in such a way to enable quantitative evaluations
- Each student must use a **different** dataset
- You can use a dataset available from the Internet  
(e.g., <https://snap.stanford.edu/data> ,  
<https://www.kaggle.com/datasets>)
- You can build **your own dataset**  
(this awards a **bonus!**)



# Homework 1 (2/4)

## 2. Extract relevant analytics

- Degree distribution, average degree, higher moments, power-law exponent
- Distance distribution, diameter
- Clustering coefficient and its distribution
- (for temporal networks) Preferential attachment measures, fitness distribution
- Nearest neighbor degree, assortativity, structural and natural cutoffs, assortativity under randomization
- Robustness to random failures and attacks
- Consistency with the analytical estimates



# Homework 1 (3/4)

## 3. Write a brief report

- 4/5 pages, written in English
- Include only relevant results, preferably graphically illustrated
- The report should be clear, complete, correct, concise and creative
- LaTeX typesetting is suggested (but you can use other)



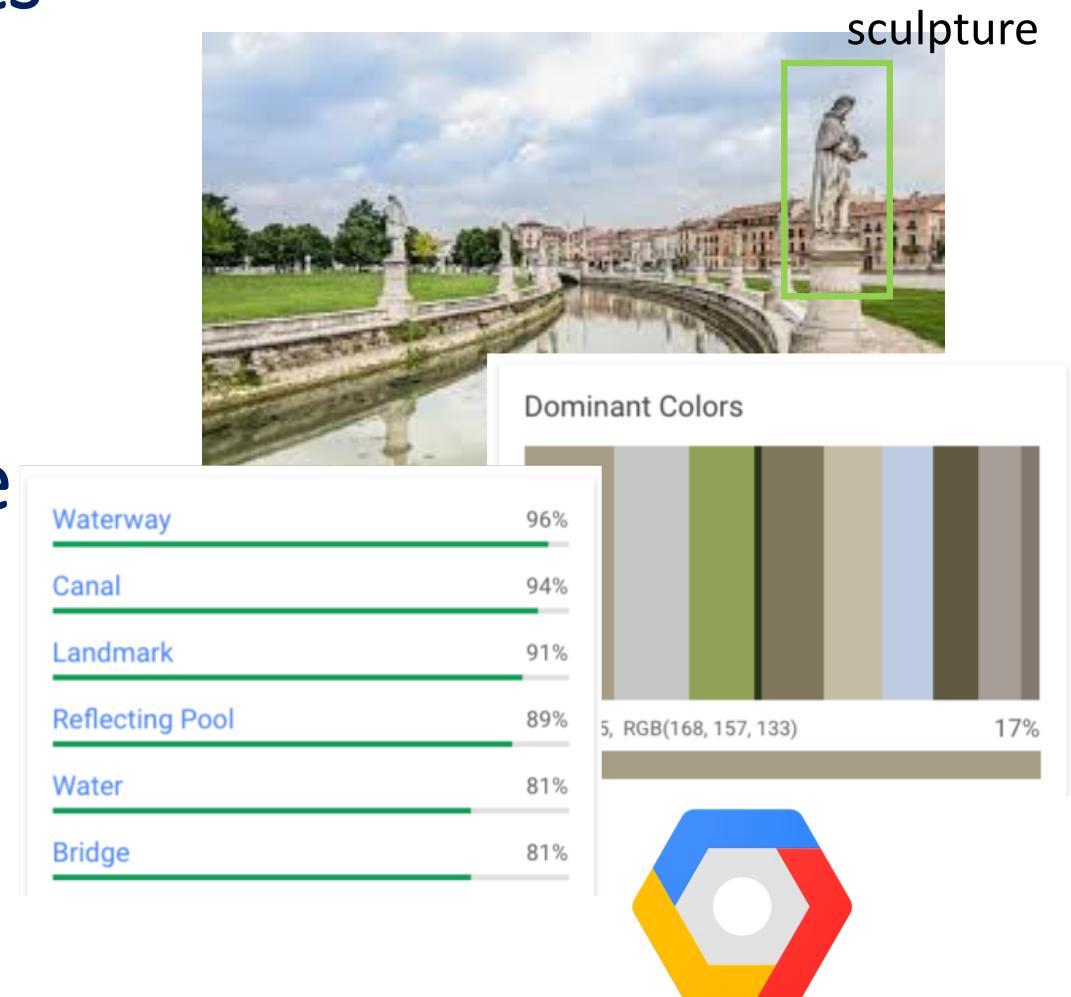
# Homework 1 (4/4)

## 4. Upload your work

- A text document (in pdf format)
- Supporting code files (use MatLab or any other programming language at your choice, e.g., Phyton) properly polished and commented
- Make sure that the code works in a completely autonomous way (no whatsoever manual intervention)
- Companion data in accessible format (e.g., the network data in a .mat or .txt file form)
- Upload the files in the elearning web site  
**(Homework 1: upload box)**

# Google cloud platform (1/2)

- Vision API detects
  - objects
  - labels
  - colors
  - etc.
- Natural language API detects
  - relevant words
  - etc.



... but many other exist

# Google cloud platform (2/2)



Want to play with Google Cloud Platform **online**?

- ❑ Vision API

<https://cloud.google.com/vision/>

- ❑ Natural language API

<https://cloud.google.com/natural-language/>

Want to play on your PC?

See sample files on **elearning**

# Interdisciplinary projects

# Interdisciplinary projects (1/3)

- In collaboration with Social Network Analysis

(prof. Caterina Sutner, prof. Leonardo Badia)

- By students of the master degree  
in Strategies in Communications

- Work in groups (4/5 people)

- Each student should find her/his specific role in  
the group (e.g., study a different aspect)



# Interdisciplinary projects (2/3)

- Empowering vs. victimizing collective action: a cross-linguistic comparison of **semantic networks** in Freeda  
by Elena Calamai & Rachele Faccio
- Network of answers of **tweets** by Meloni, Renzi, and Salvini. A focus on immigration  
by Martina Eleno, Riccardo Pinton, Giovanni Boato
- Semantic network of **tweets** related to abortion  
by Lara Schwartz
- Right- and left-wing **fake news** spreading in Spanish election  
by Ula Abrati & Neos Frau

# Interdisciplinary projects (3/3)

- Greta effect on public opinion about climate change:  
a network analysis on **Twitter**  
by Francesca Civolani, Riccardo Bergamasco, Chiara Vareto
- On the relevance of swear words in the speeches of  
politician's **followers**  
by Salvatore Romano
- Spaghetti or Noodles? A cross-cultural comparison of  
**ingredients networks**  
by Dana Ching Fang Tai
- Network structure and social identification among  
people speaking **veneto dialect**  
by Ainhoa Sotomayor Aranburu & Ane Arzallus Alonso

# Questions ?

