Social network modeling and applications

Tutor: Lisette Espín-Noboa

Who are we?

- **Assistant Professor**
  Vienna University of Technology (TU Wien)

- **Team lead**
  Complexity Science Hub Vienna

- **PhD. in Physics**
  Umea University

- **Research**
  Network inequalities, computational social science

  www.networkinequality.com

- **Associate Professor**
  Central European University (CEU)

- **PhD. in Physics**
  University of São Paulo

- **Research**
  Complex networks, network inference, Bayesian modeling

  skewed.de

- **Postdoc**
  Complexity Science Hub Vienna (CSH) & Central European University (CEU)

- **PhD. in Computer Science**
  University of Koblenz-Landau

- **Research**
  Network fairness, social network analysis, algorithmic auditing, computational social science
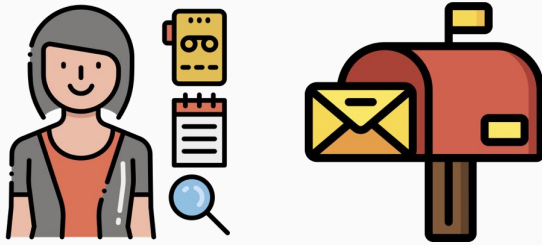
  www.lisetteespin.info

Why do we need this tutorial?
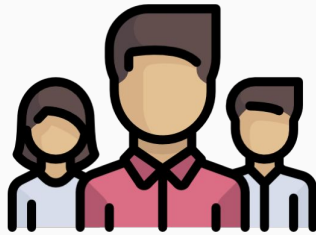
Because
social networks
are everywhere!

friendship

co-authorship

citation

image source: https://insights.dice.com/2019/09/25/networking-building-contacts-effective

Before

Field observations and surveys

"Designed" data covering few people
in small geographical areas

Now

Digital footprints from
social media, phones, online surveys

"Organic" data covering almost
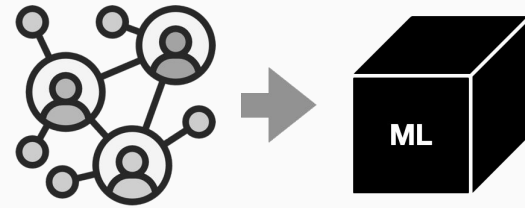the entire world
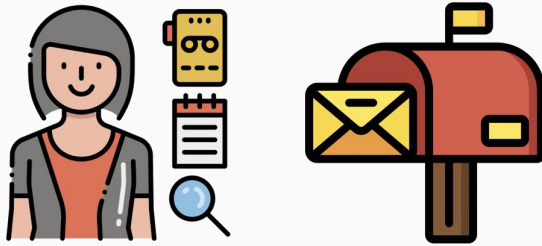
Problem #1

Traditional methods do not scale

We need new tools to characterize edge formation

Problem #2

ML algorithms are not transparent

classification

ranking

ML algorithms need to be interpretable and explainable

PARADIGM 1

From social theories to models
(e.g., homophily, preferential attachment)

PARADIGM 2

From data to models
(e.g., model fitting, inference)

Social network modeling & applications

APPLICATIONS

Network inequalities & algorithmic bias
(i.e., node ranking and classification)
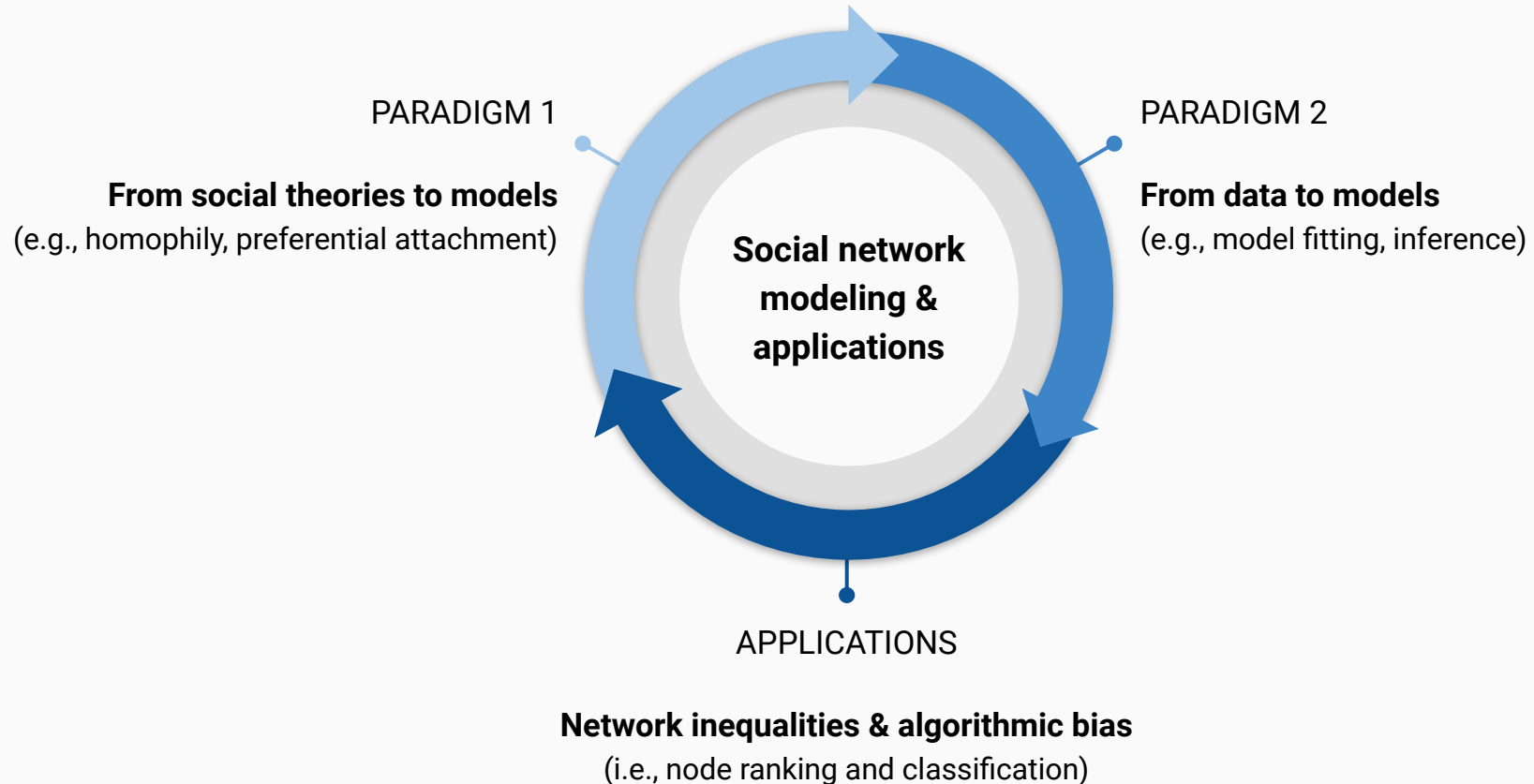
What you will learn today

1 How to generate realistic synthetic graphs

- Useful when real networks are too big, and for data protection
- How? Using `netin` and `graph-tool`

2 How to study social phenomena when no real network is available

- How do networks (edges) form?
- What-if scenarios via simulations

3 To audit network-based algorithms

- To audit network-based algorithms
  - When does my model fail?

What this tutorial is NOT about

- Extensive review of all existing random network models
  - Here we focus on models that help replicating the most important properties and mechanisms found in real-world social networks such as preferential attachment, homophily, and triadic closure.

Agenda

Sunday, April 30

10:00 - 17:00 (CDT)

AT&T Hotel and Conference Center
Classroom #103

10:30 - 12:30	Paradigm 1: From social theories to models Tutor: Fariba Karimi ● Social theories ● Network properties and structure ● Network models
12:30 - 13:30	Lunch break
13:30 - 15:30	Paradigm 2: From data to models Tutor: Tiago Peixoto ● Model fitting ● Model inference ● Model selection
15:30 - 16:40	Applications Tutor: Lisette Espín-Noboa ● Biases in sampling and classification ● Ranking inequalities
16:40 - 17:00	Challenges & open questions Tutor: Lisette Espín-Noboa

Material

All required information is on the tutorial's website:
https://bit.ly/snma2023