



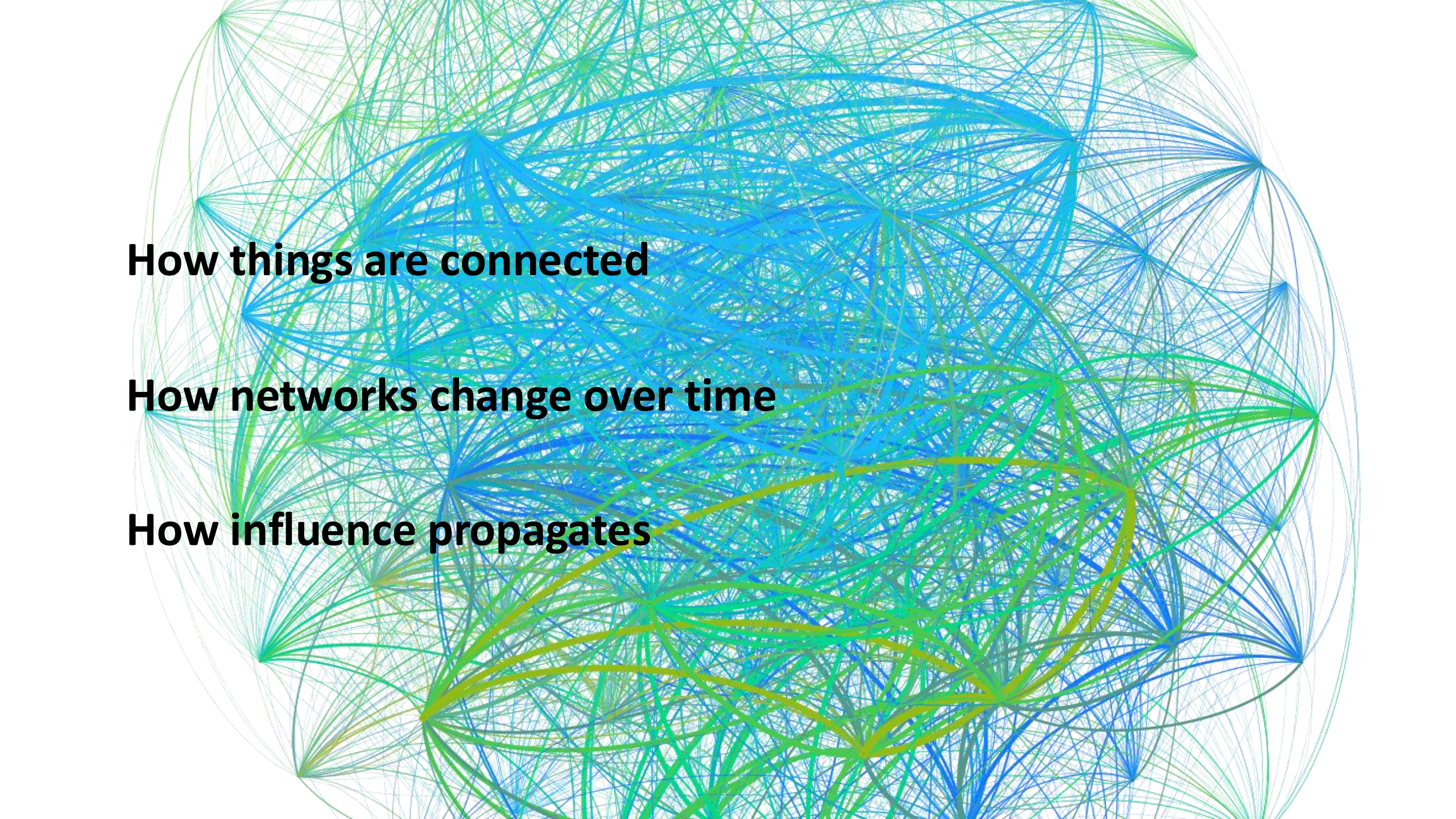
The Importance of Networks Unveiling Gender Disparities in Corporate Board Career Paths using Deep Learning

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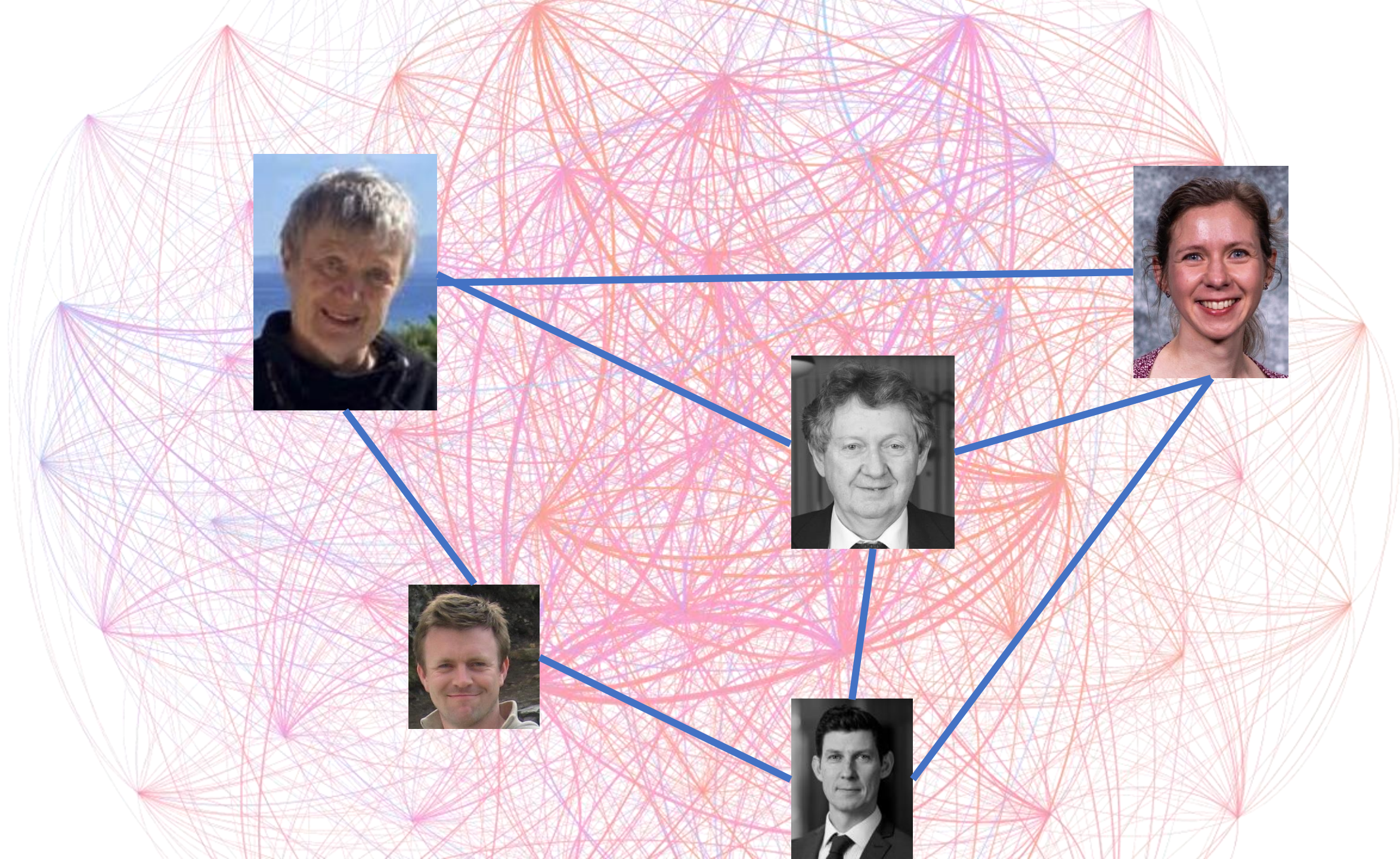
Workshop for Anna - November 14, 2025



How things are connected

How networks change over time

How influence propagates





Breaking Barriers Unveiling Gender Disparities in Corporate Board Career Paths using Deep Learning

Co-authors: Yuhao (Jet) Zhou, Wenhao Chen, Cristián Bravo, Matthew Davison

Manuscript accepted in Patterns

Presented at the AAAI Workshop on AI in Finance for Social Good – Best poster award

Motivation & Gap

Research on career paths and gender

- Science of science: Increase of participation of women in science over the past 60 years was accompanied by an increase of gender differences in both productivity and impact (Huang et al., 2020)
- Glass ceiling effect: “the unseen, yet unbreakable barrier that keeps minorities and women from rising to the upper rungs of the corporate ladder, regardless of their qualifications or achievement” (Avin et al., 2015)
 - i. “rich get richer” mechanism
 - ii. a minority-majority partition
 - iii. homophily

Motivation & Gap

What is a board in a corporation? Why is the board important?

The benefits of having a **diverse board** has been widely studied in the past decade

Knowing that a diverse board offers benefits is good

Few studies on **who board members are** and **why have they** been promoted to this position

- Director appointments: It is who you know (Cai et al., 2022)
- *Gap*:
 - The specific **influence of professional, educational, and social engagement networks** on these pathways, especially when **analyzed through a gender-focused perspective**, has **not** been thoroughly explored

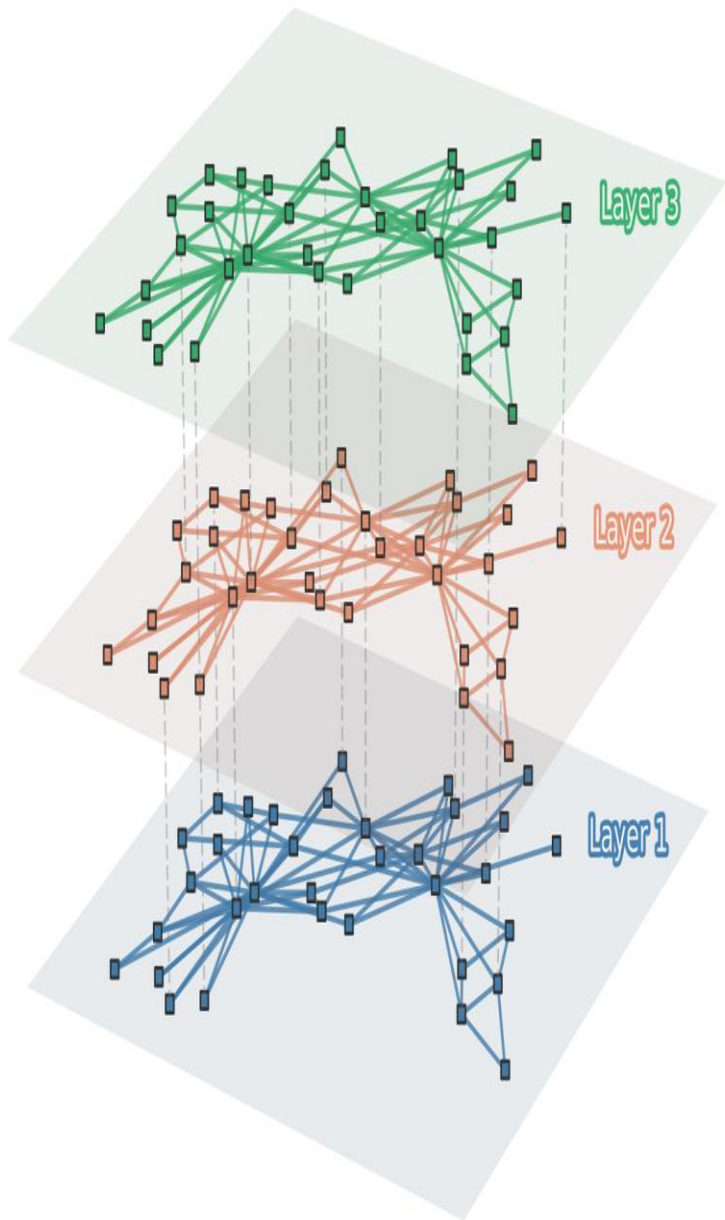
Objectives

- Examine the **varied influence of five distinct networks and roles** on board director appointments, highlighting the differential effects across genders
- Identify **unique strategies utilized by male and female senior managers** with analogous backgrounds and career trajectories in leveraging professional networks for board positions
- Uncover **barriers impeding women's advancement into board** roles and propose **actionable insights to enhance gender diversity** within the highest level of corporate governance

Key Takeaways

- There is always a qualified woman
- Networking is crucial for director appointments
- Despite similar career trajectories and backgrounds, women face higher expectations in networking

Encounter a glass-ceiling effect!



- Data from BoardEx
 - Corporate & Individual
- Create networks
 - 5 sources



Education

Education
(EDU)



Working

Current Employment
(CE)
Prior Employment
(PE)



Social Engagement

Current Social
Engagement
(CSE)
Prior Social Engagement
(PSE)

Network – 5 Centralities

Degree

Number of direct connections

Betweenness

Number of times an individual lies on the shortest path

Closeness

How close an individual was to all other individuals in the network

PageRank

Assessed an individual's importance within the network based on the number and quality of connections

Personalized PageRank

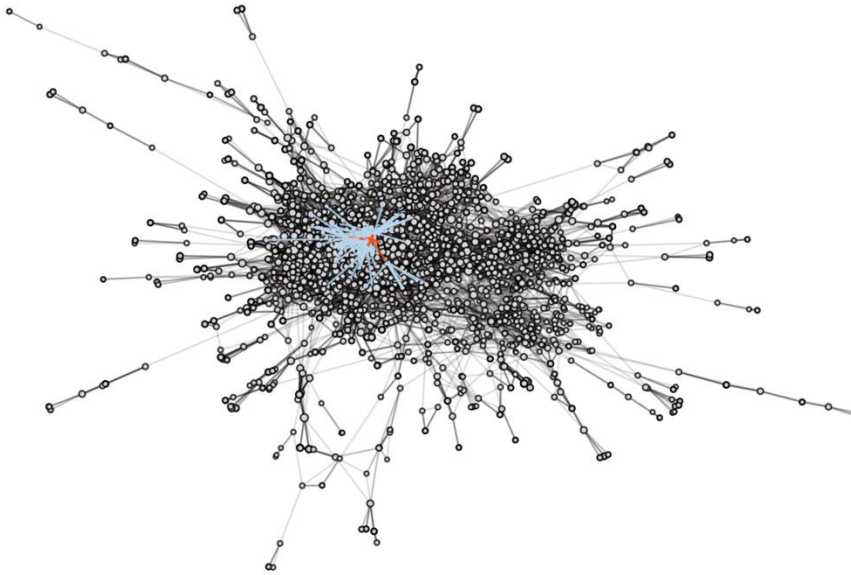
A variation of PageRank, specifically tailored in our study to emphasize connections with current board members

Size of Networks

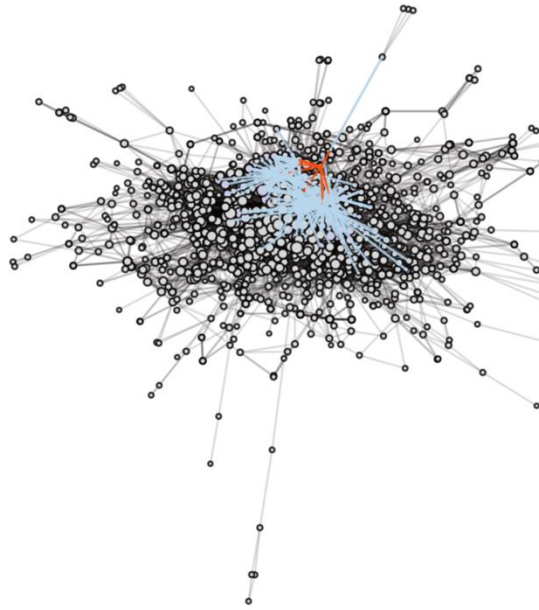
Canadian Market (After 2000)

- 700+ Canadian Public Firms
- 19,000+ Senior Managers & Board Members
- Over 2 Million Connections
- Less Than 25% are Females

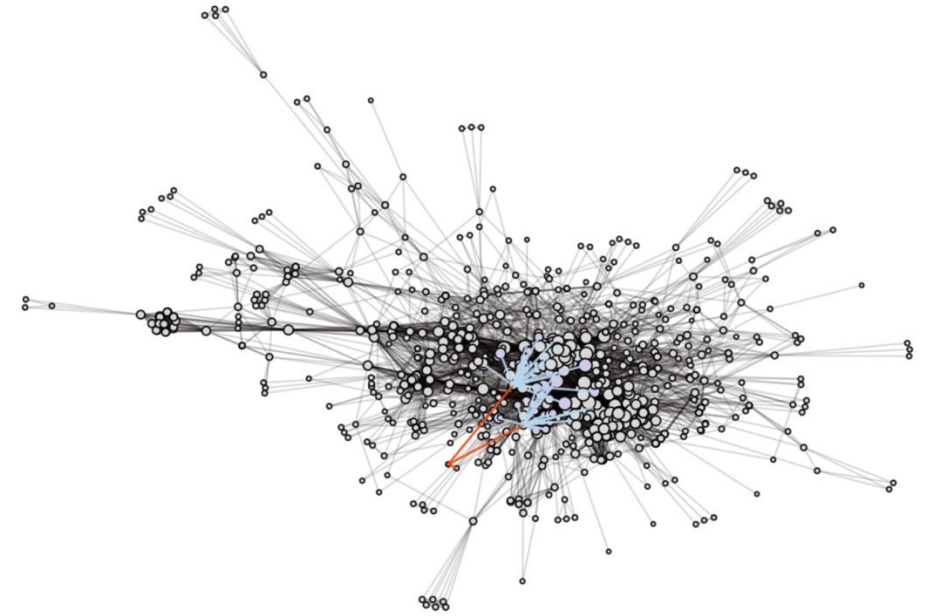
Current Employment



Education

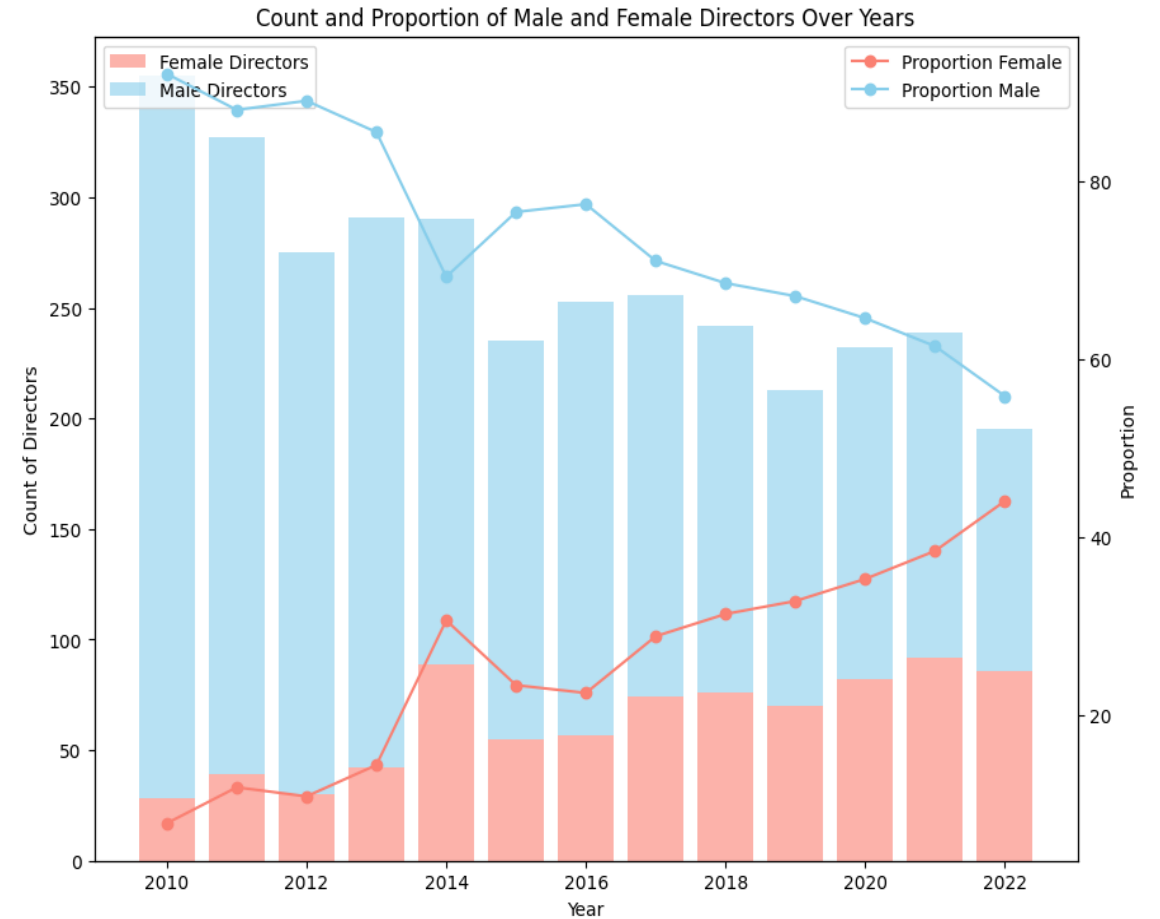
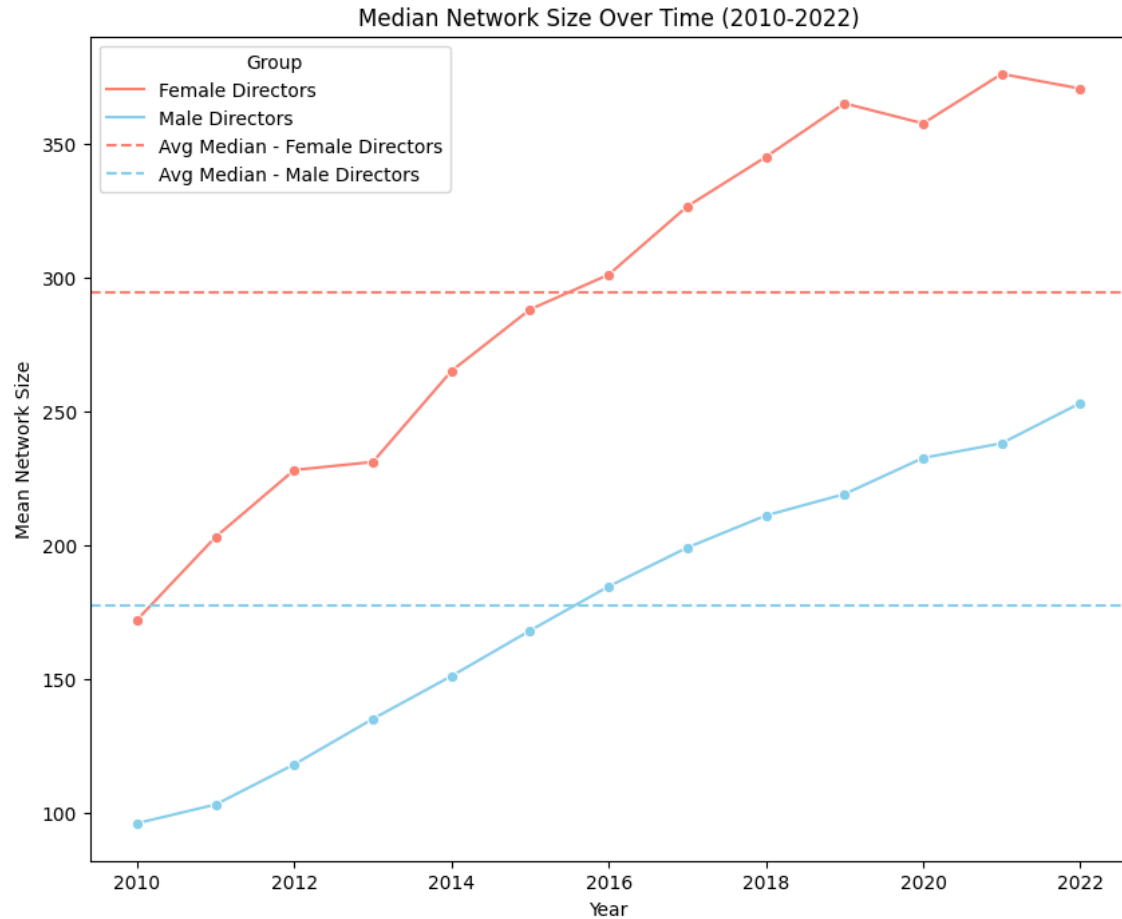


Current Social Engagement



Focal director's connections in 2020 across current employment (left), education (middle), and social engagement (right) networks. First-degree ties (red) and second-degree ties (blue) are shown in distinct colors, with all other nodes muted.

Network Size Differences by Gender



Matching Methodology

In our causal analysis, we paired female and male candidates on a one-to-one basis, aligning them according to their **career trajectories** and **demographic** characteristics

➤ **97%** of women in the dataset are matched

➤ **Career Trajectory**

- a) Positions held
- b) Sector employed
- c) Company indices
- d) Types of companies

➤ **Demographics**

- a) Education level
- b) Professional tenure
- c) Nationality

Steps on Matching

Transforming career trajectories into sequences

- Employing Transition Rate Matrix to calculate transition cost between states

Calculating a dissimilarity matrix among sequences

- Employing Optimal Matching based on transition costs

Integrating static demographic features

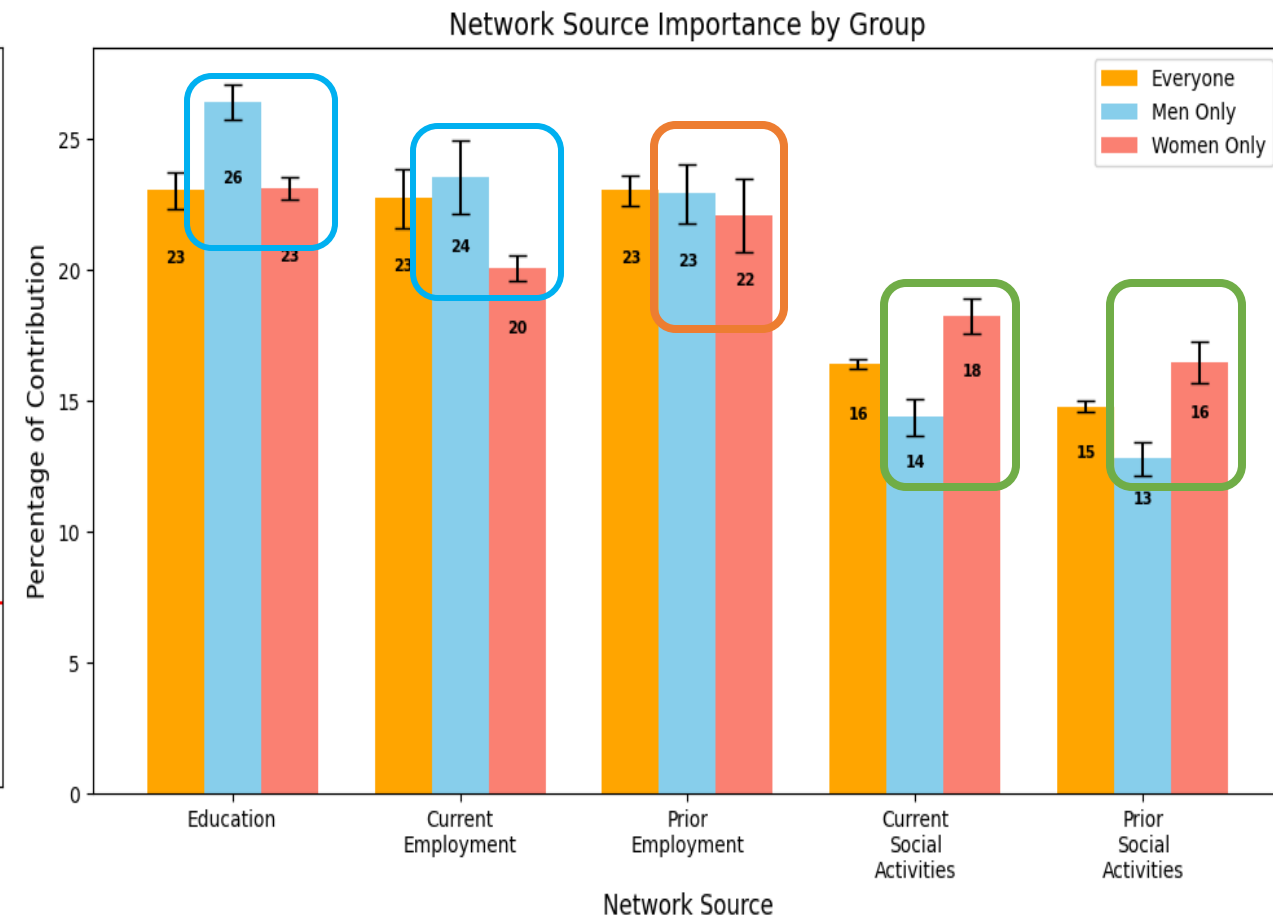
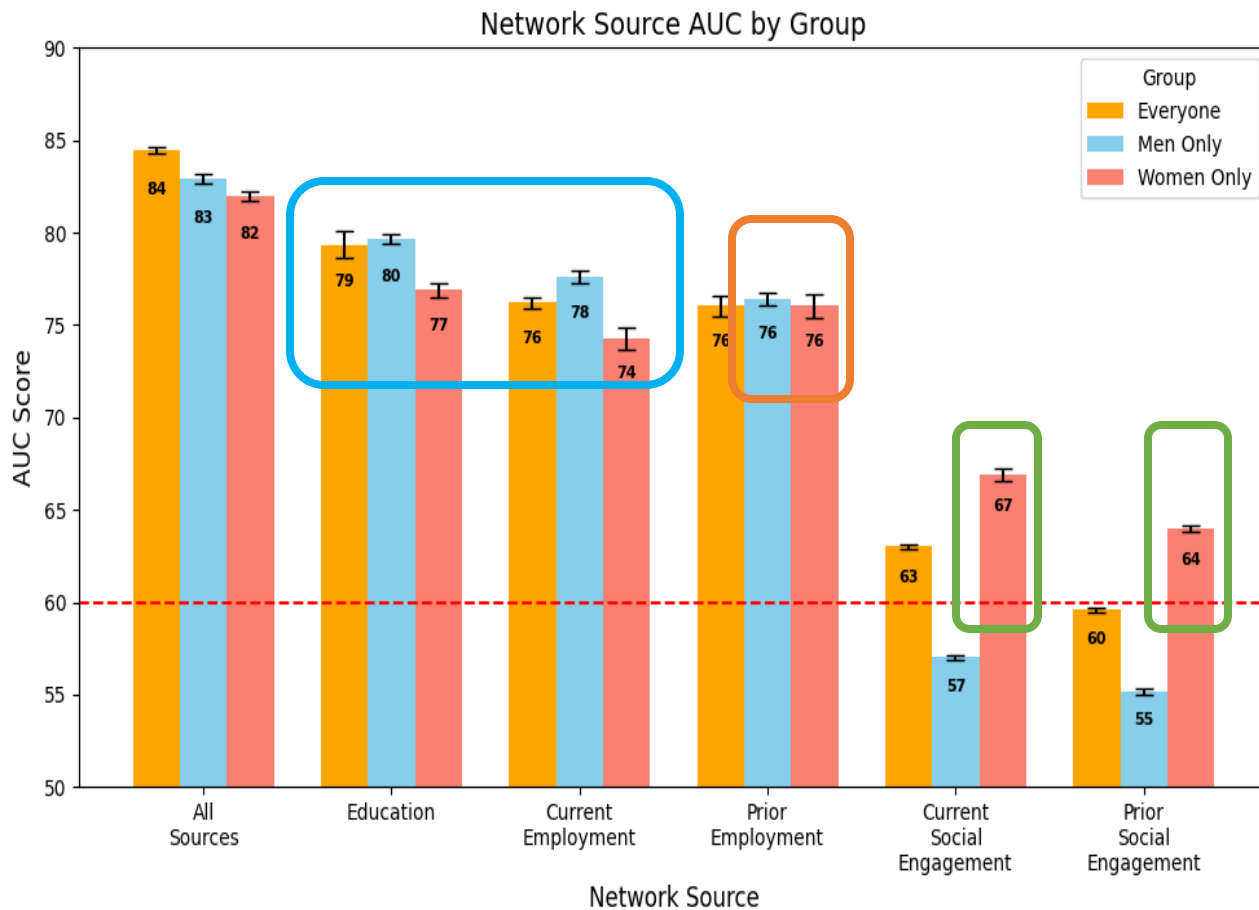
- Generating another dissimilarity matrix to integrate with the previous one using sequential data

Implementing this gender-based matching using an integrated dissimilarity matrix

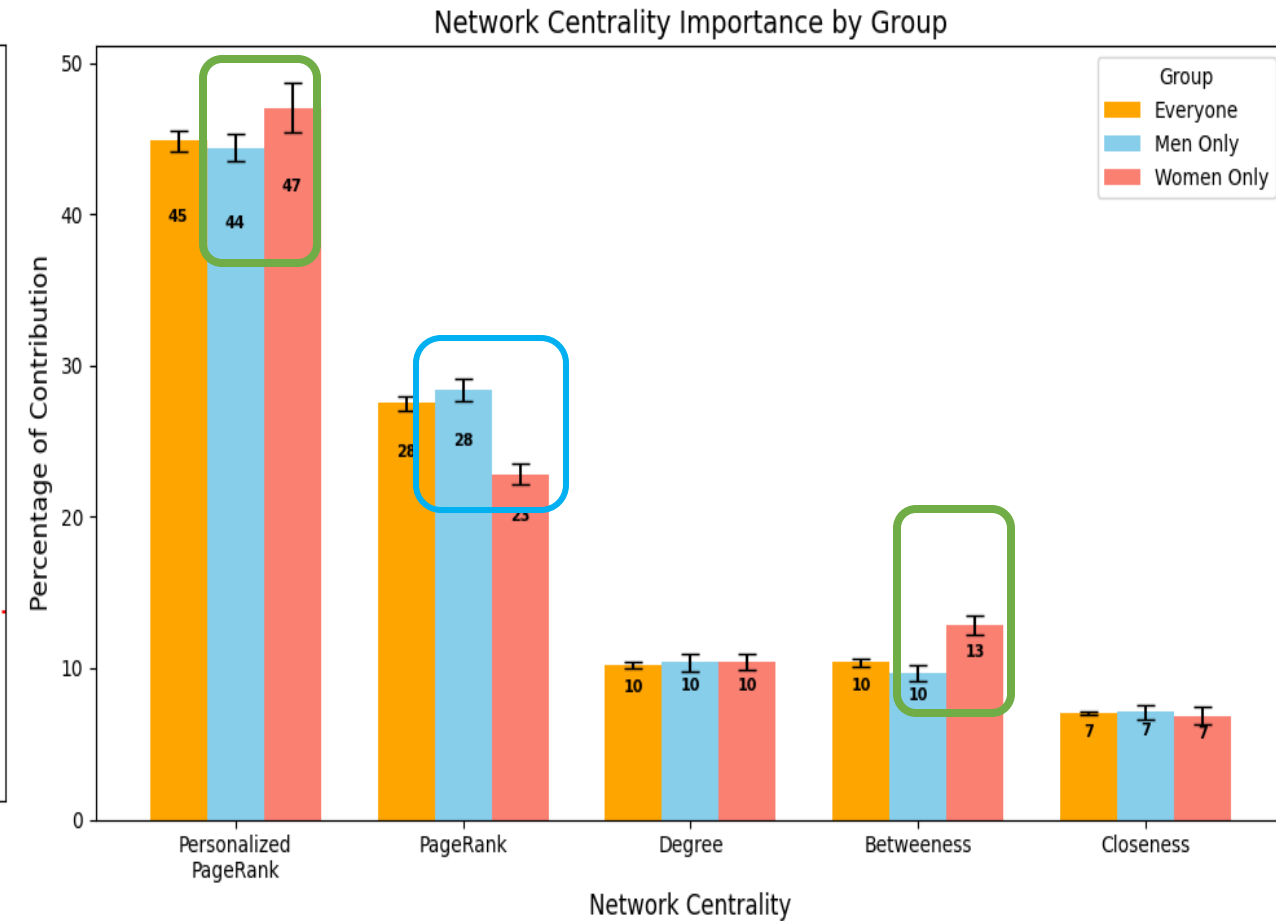
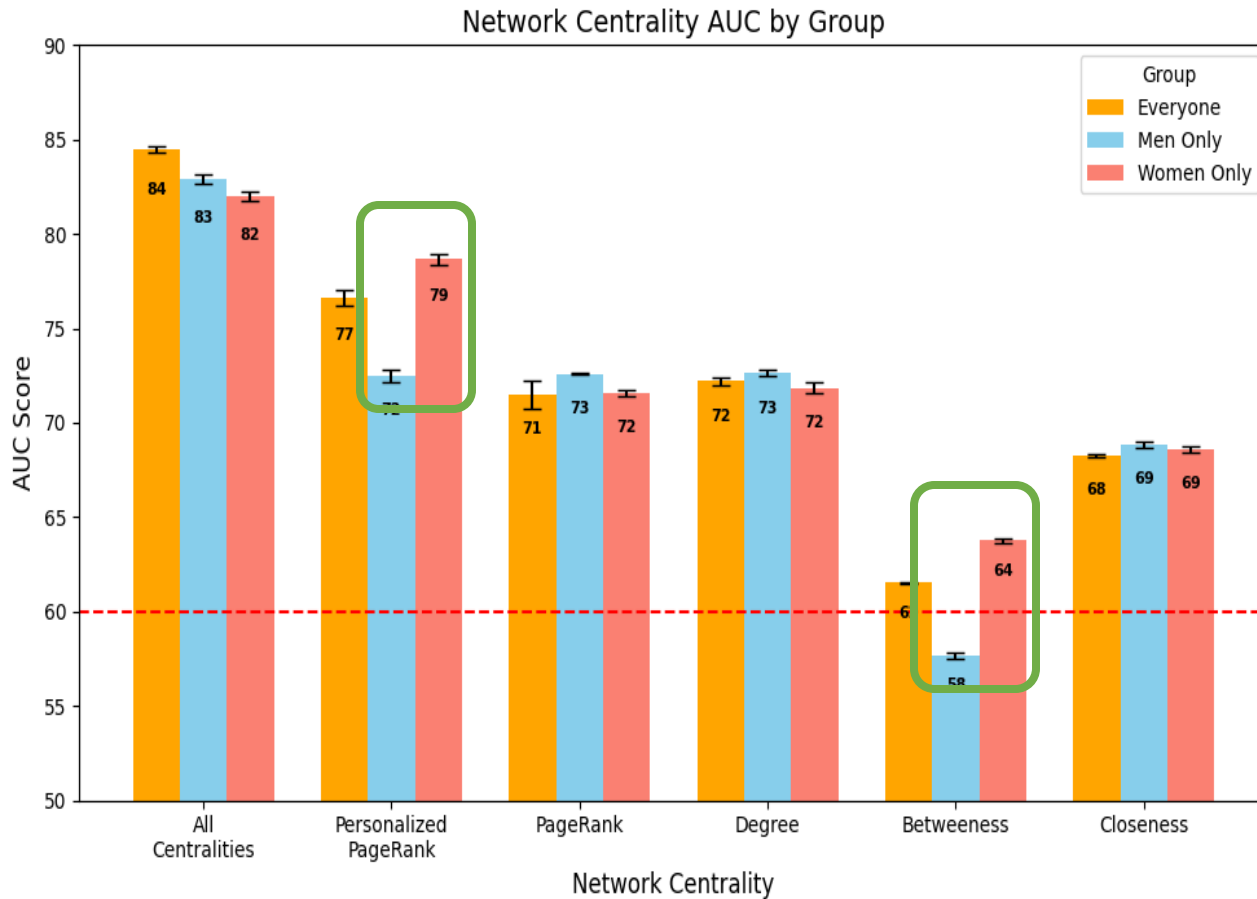
Models & Evaluations

- With **matched** individuals
- Extract career trajectories from the 5 networks
- **Long Short-Term Memory** (LSTM) networks to navigate the complexities of sequential professional networking data, accommodating the variability in sequence lengths
 - These LSTM models are specifically employed **to trace and analyze the evolution of individuals' networking activities over time**
- Predict if the individual was promoted to director level or not
- Use **exponentially weighted AUC** for evaluation
 - Places greater emphasis in more recent years

Results (Network Sources)



Results (Network Centrality)



Key Takeaways

- **Networking is crucial for director appointments**, highlighting its importance in career advancement to board positions across genders
- Despite similar career trajectories and backgrounds, **women face higher expectations in networking**, highlighting the need for broader engagement to overcome professional barriers
- **Education ties and professional networks are key for all**, demonstrating their influential roles in reaching board-level positions
- **Women's board success is also amplified by active social engagement**, highlighting the necessity to balance extensive social activities with other networking efforts to address gender-specific barriers

Contact

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Thank you!



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