Network Science and the Digital Humanities

Applications, opportunities and challenges for interdisciplinary research in a South African context

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What is network science?

- Emerged around 2000
- Long and complex history dating back to 1736 [1].
- Approach within complex systems and General Systems Theory (GST)
- Network science is a mathematical approach to systems
- Social Network Analysis (SNA)
- Applicable to virtually any relational data

Edward M Reingold
Mark Granovetter
Ithiel de Sola Pool
Stanley Milgram
Duncan Watts
Jacob Moreno
Linton Freeman
Manfred Kochen
Leonard Euler
Alfréd Rényi
Réka Albert
Albert-László Barabási
Francois Quesnay
Kurt Lewin
Siegfried Nadel
Thomas Fruchterman
Steven Strogatz
Leo Katz
Alex Bavelas
Pál Erdős

# Macrolevel studies focus on network structure

1. Small-worldedness [2]–[4].
2. Link distributions [5].
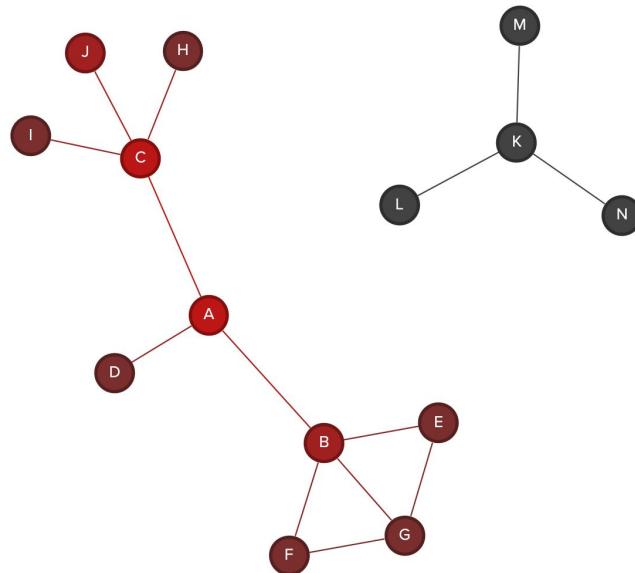
# Mesolevel studies provide insight into how groups of nodes are connected

1. The formation of communities (e.g. modularity) [6]–[10].
2. The core/periphery structure of networks [11], [12].
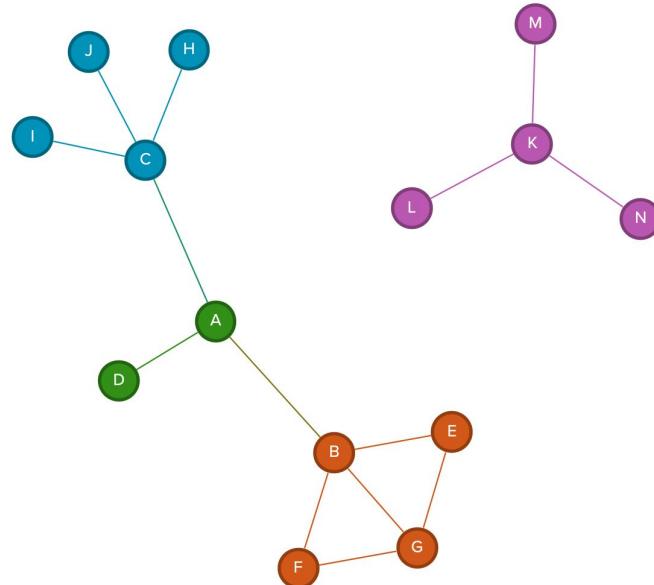
# Microlevel studies focus on the importance of individual nodes

- degree
- betweenness
- closeness
- PageRank
- Eigenvector [12]–[19].
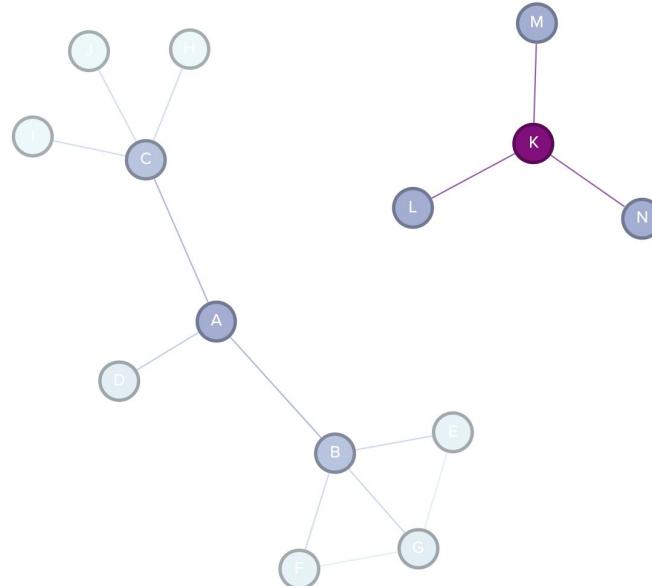
Literary studies

1. Literary system [5], [11], [12], [14]–[17], [19], [21]–[23].
2. Literary system - road network [20].
3. Character relationships [24].
4. Character interactions [25].
5. Social media [10], [26], [27].
6. Close readings of individual poems [28].
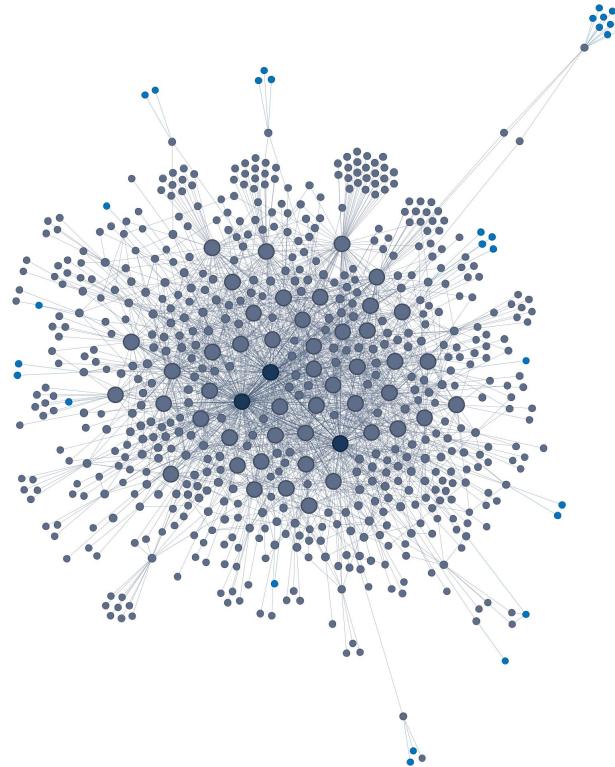
Linguistics

Language structure through word
co-occurrence networks [29], [30].
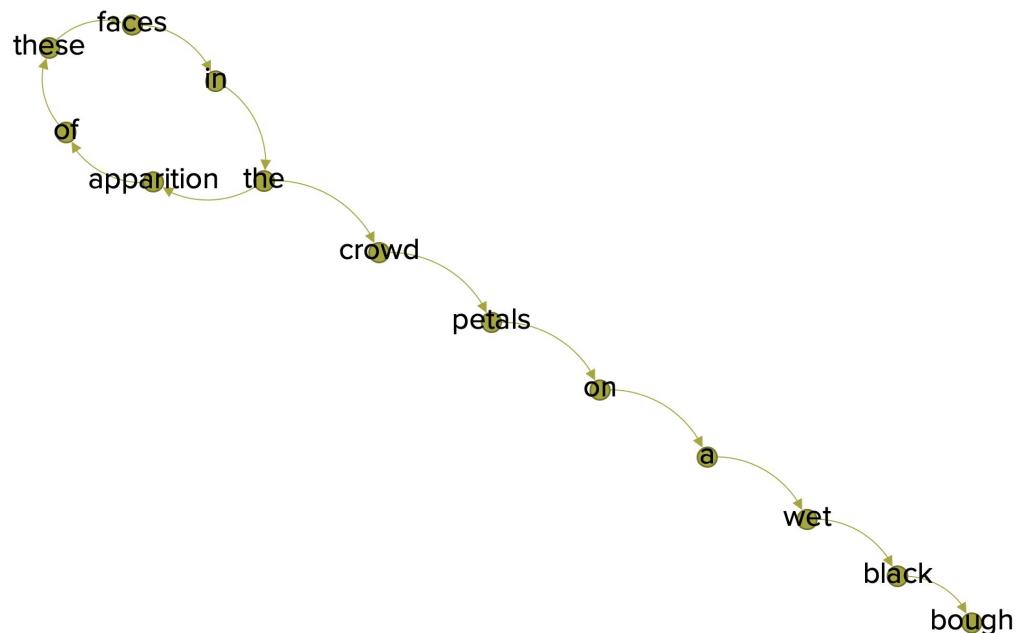
Film and theatre

1. Collaborations in films [6], [31]–[34].
2. Theatre [4].
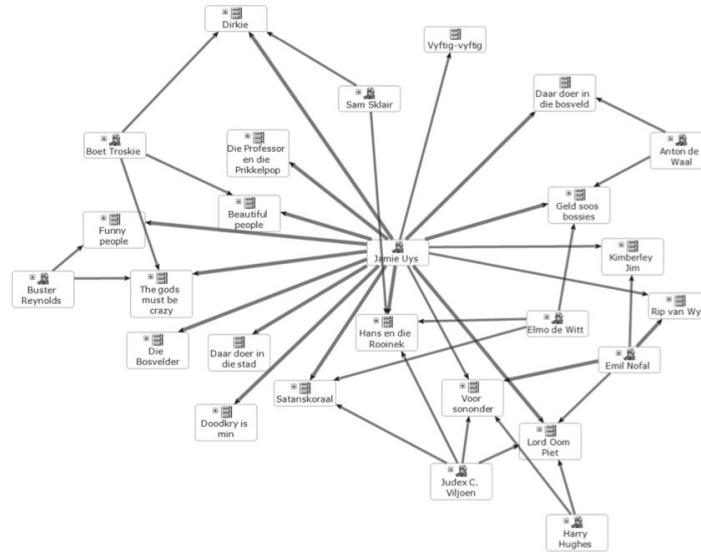
History

1. Global power relations, sanctions and arms embargoes [8], [13], [35], [36].
2. The history of the University of the Free State [37].
3. Terrorist networks [18].
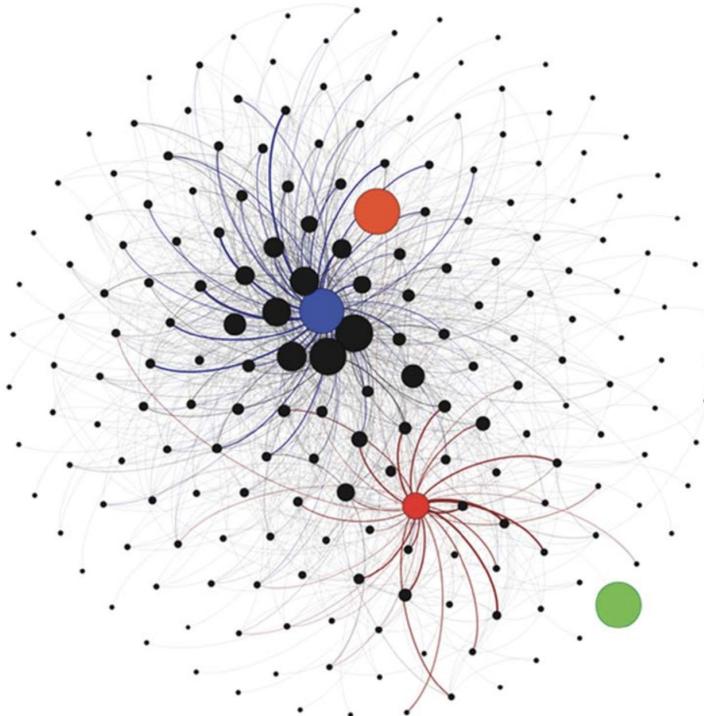
Other applications

1. Diet, history and culture [7], [42].
2. Overlapping directorships [43]–[45].
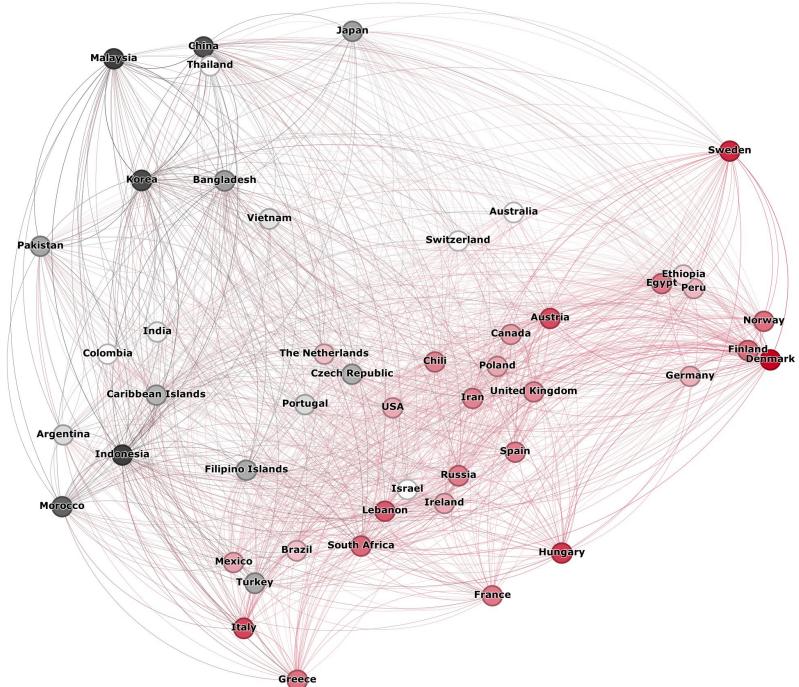
Science of science applications

1. Citation analysis [38]–[40].
2. Co-authorships [41].
3. Topic modelling.
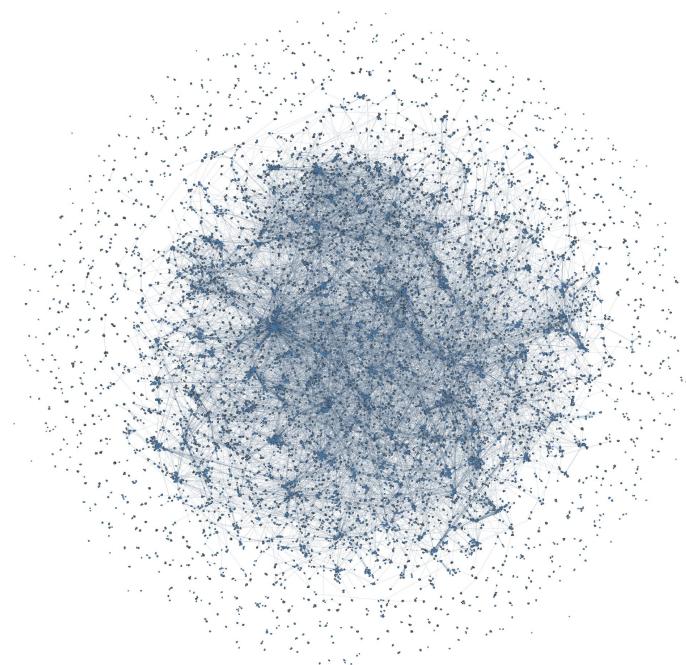
Challenges

1. Unstructured to structured data
    1.1.   Time consuming, especially given the size
    1.2.   Requires additional computer skills (e.g. regular expressions)
2. Obtaining data
3. Learning to use software (Ucinet, Pajek, Gephi, Cytoscape, NodeXL, R, python)

Datasets

1. Afrikaans film industry 1916-2016 [46].
2. Afrikaans poetry system 2000-2022 [47].
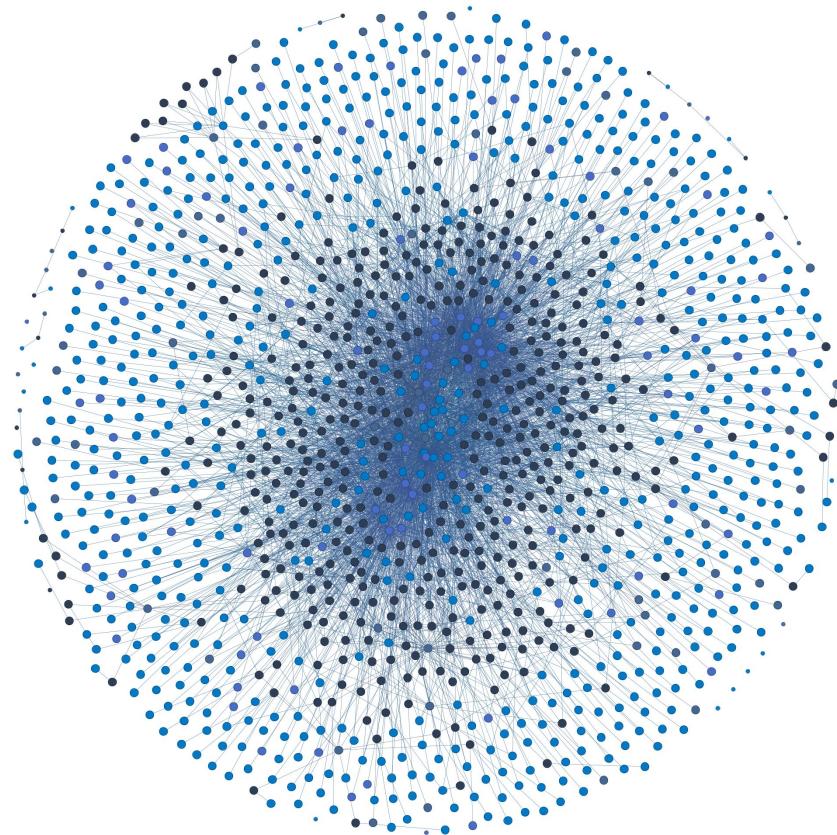
Conclusion

- Wide variety of applications
- Requires creativity
- Large datasets are a challenge

Thank you

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