



Universiteit
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Introduction to Network Analyses for Official Statistics

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Network Science



Network Science

The study of phenomena emerging from relations between entities.

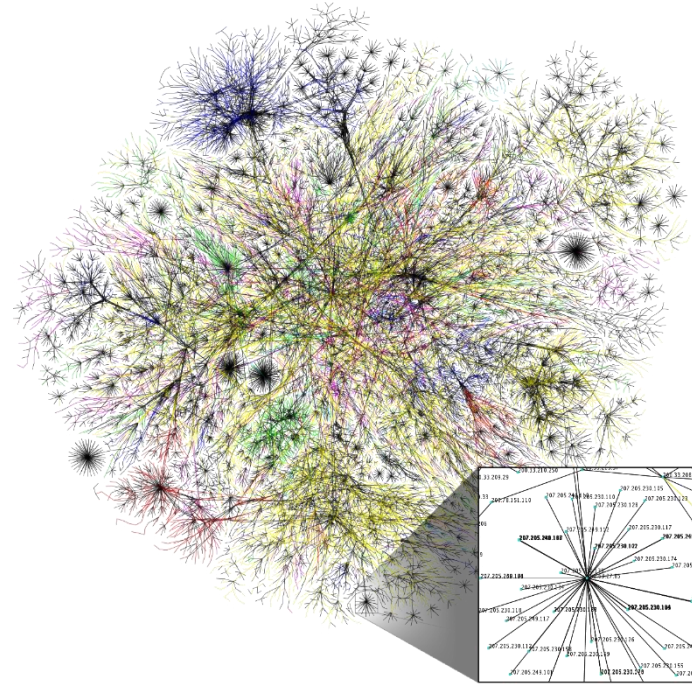
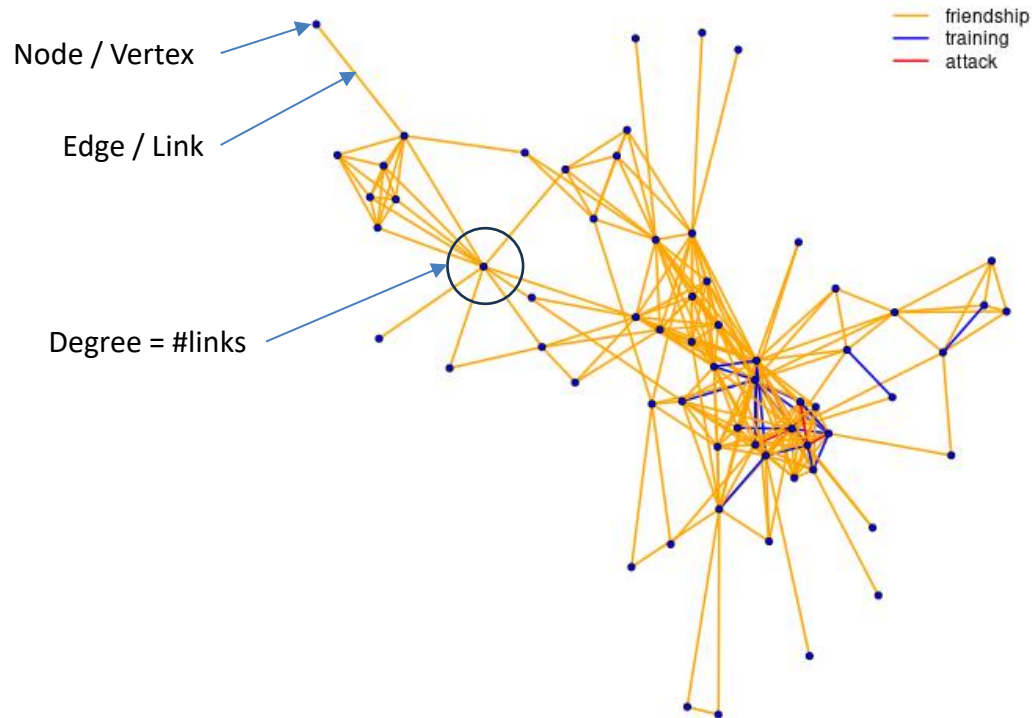


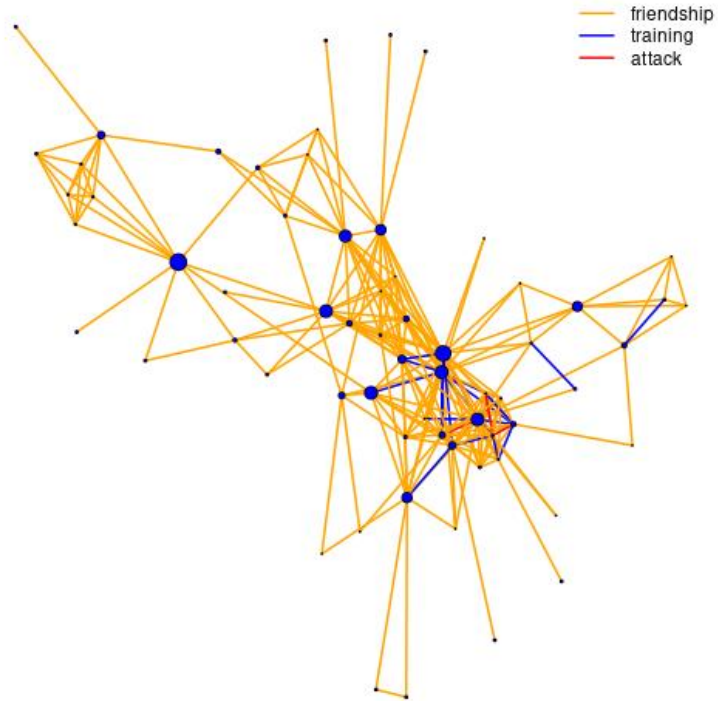
Image: <https://en.wikipedia.org/wiki/Internet>



Example: the Moreno Terrorist Network



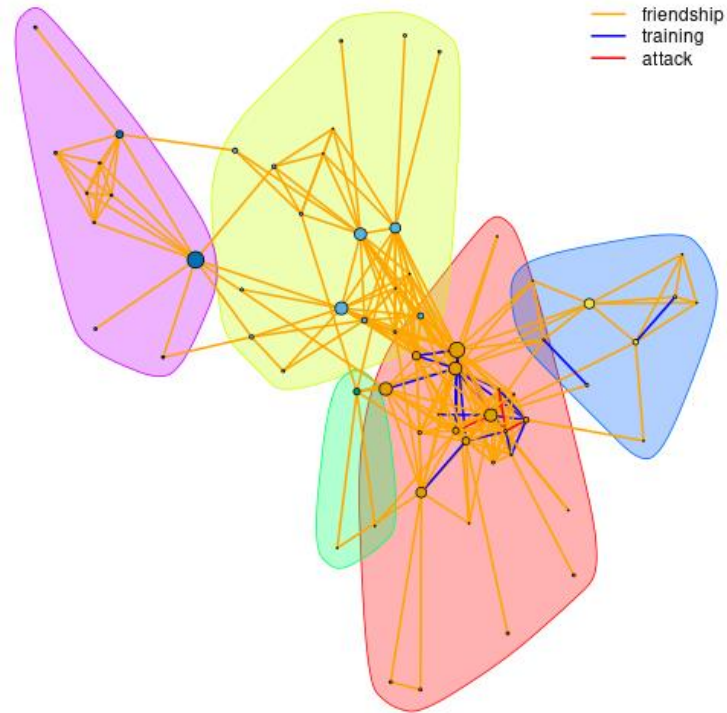
Importance of nodes: centrality



Betweenness centrality



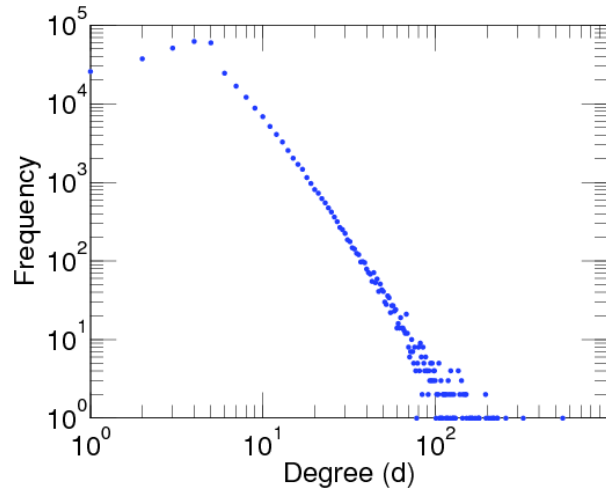
Clustering of nodes



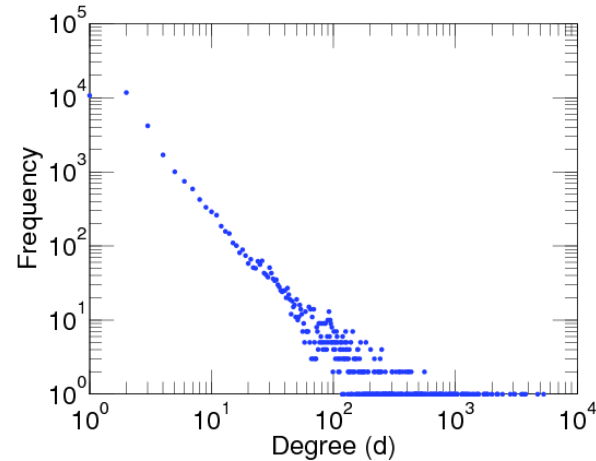
Louvain Clustering



Network models and universal behaviour



Amazon product co-buying



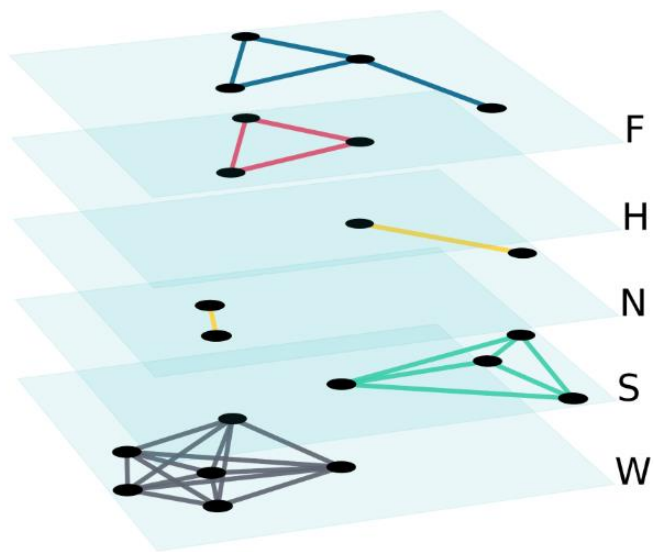
Internet server connections



Population Scale Social Network



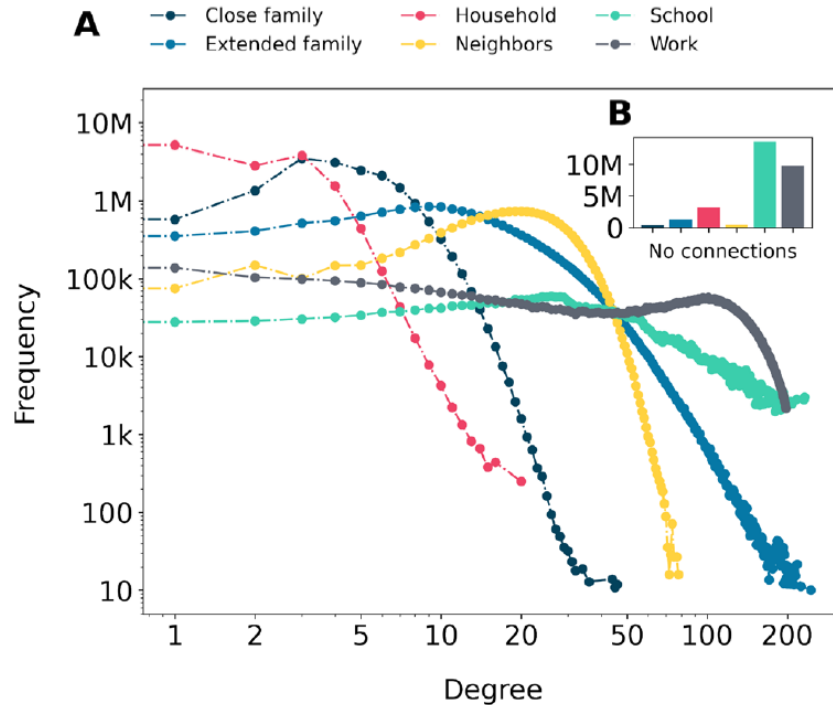
A Population-Scale Social Network Based on Administrative Data



Family
Household
Neighbours
School
Work



Some properties



17 Mn nodes

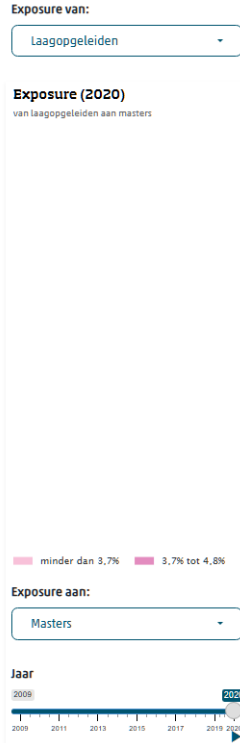
1.4 Bn links

Network as *contact opportunity structure* (social capital)



Educational Segregation

Exposure of educational level A to B:
Percentage of B in the network
surroundings of A

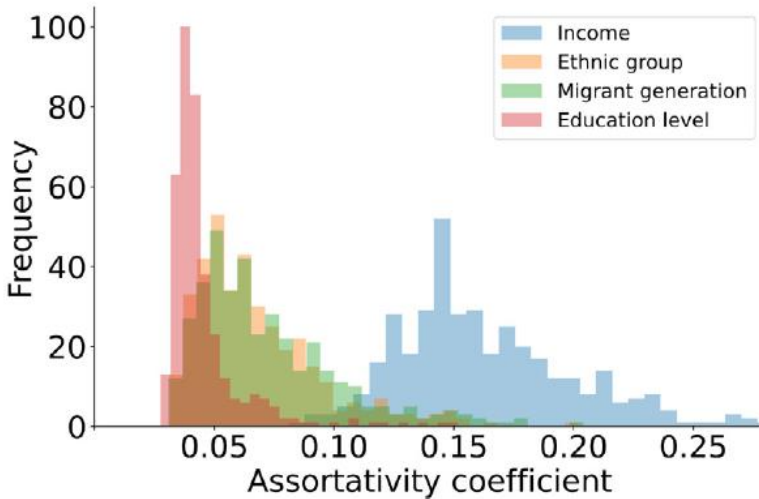


https://dashboards.cbs.nl/v4/opl_segregatie/

Van der Laan *et al* (2023) European Sociological Review **39** 147-160 <https://doi.org/10.1093/esr/jcac026>

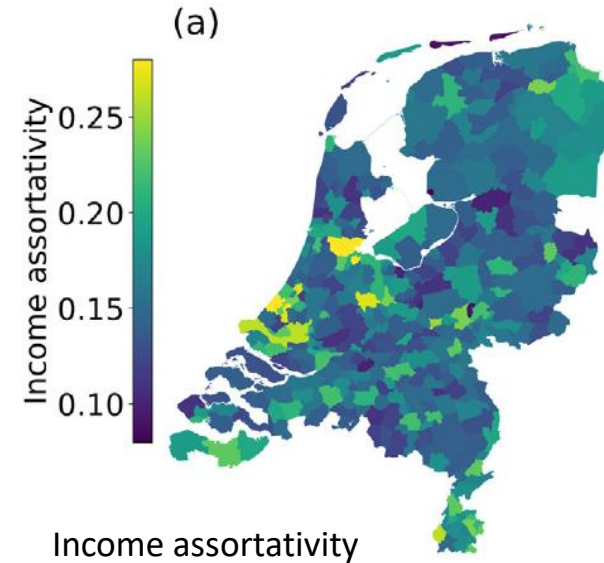


Socio-economic segregation

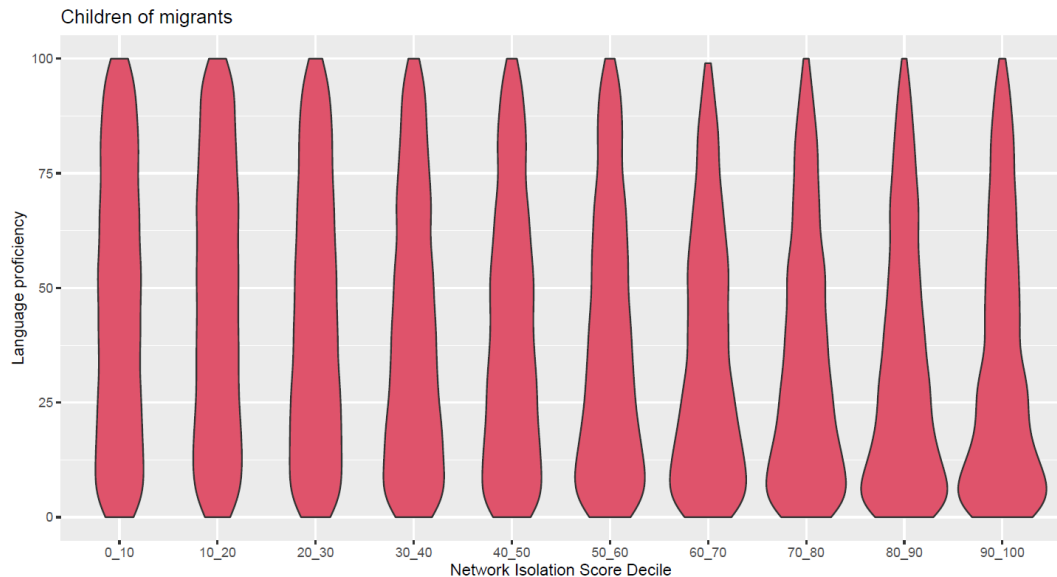


Assortativity:

The tendency of similar nodes to be interlinked.



Dutch Language Skills of Migrant's Children



Network Isolation: weighted fraction of persons with same migration background in network surroundings of child.

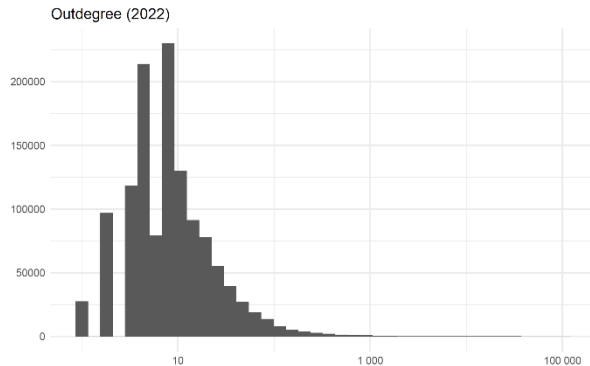
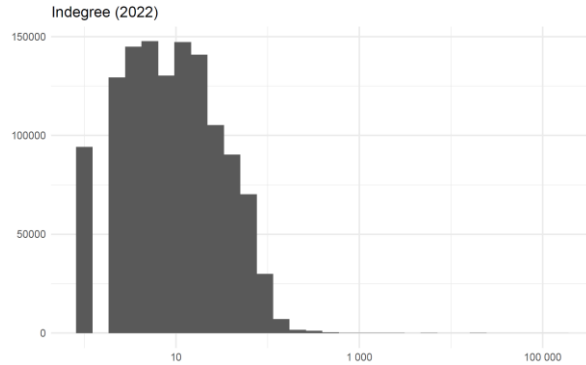
Language proficiency distribution vs Network Isolation



Population Scale Business Network



The Dutch Production Network



Estimation of trading network

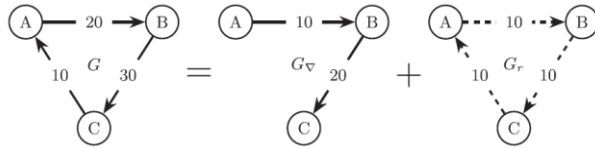
10^6 Businesses

$1.6 \cdot 10^7$ Transactions

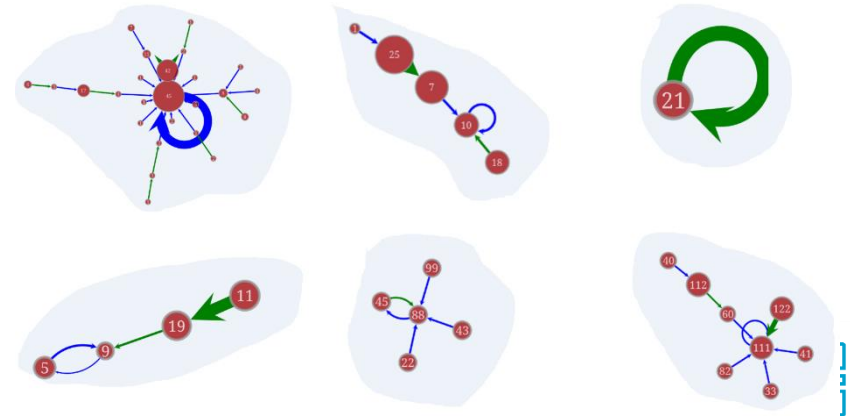
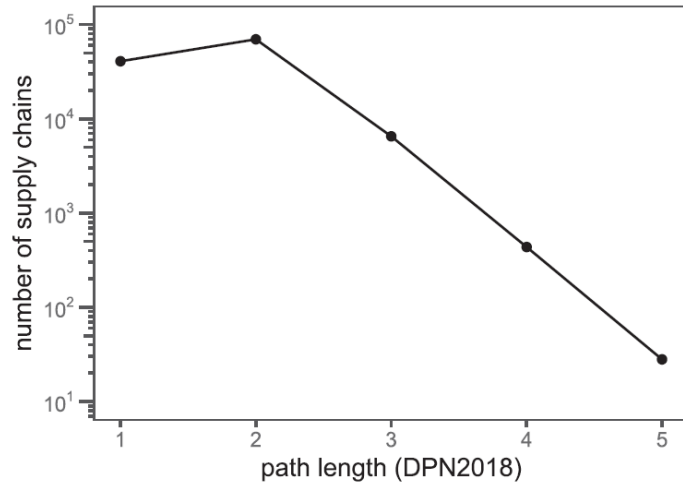
523 Commodity groups

Links are estimated

Detection of Production Chains



Restricted Gradient Graph Algorithm
Splits a graph into cycles and paths.



Analysing Networks with R

