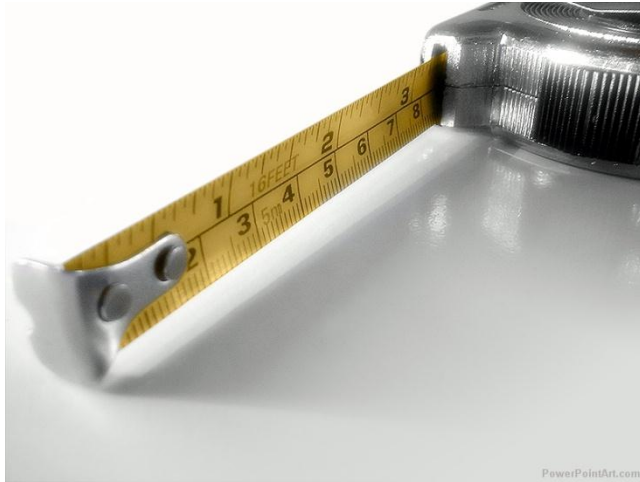


A horizontal strip of three images. The left image shows a person's hand reaching out towards a large, curved, metallic structure. The middle image shows a large, white, parabolic satellite dish antenna. The right image shows three people (two men and one woman) looking at a laptop screen in a meeting or collaborative work environment.

New Approaches of Measuring Scientific Impact

Christoph Lutz
HIIG Kolloquium
October 26 2012

Research Evaluation Business Innovation



- **Managerial Impact**
 - Impact on peer group in companies and public administration
- **Scientific Impact**
 - Impact on scientific community
- **Media Impact**
 - Impact on media and public perception

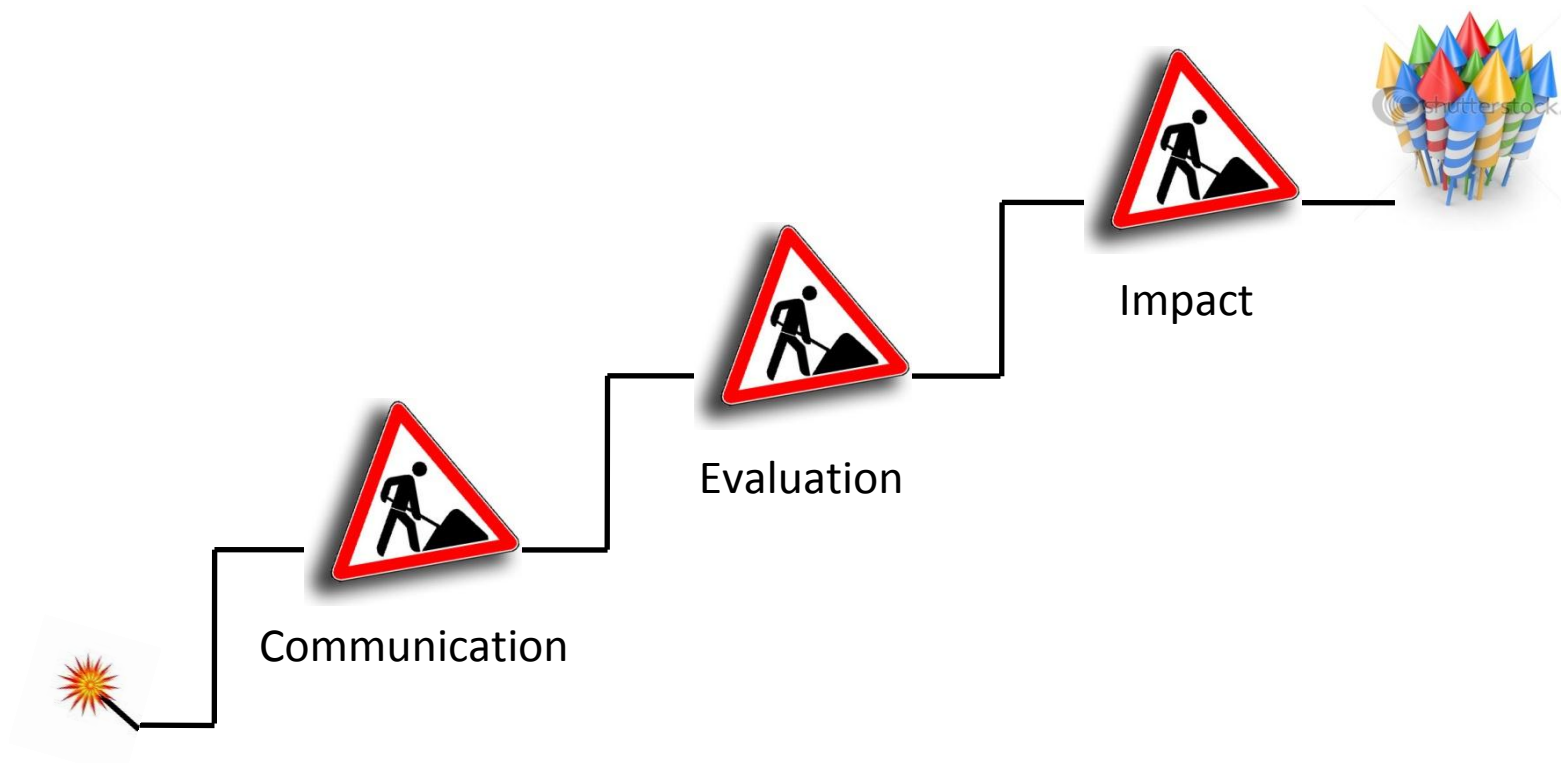
A painting of a man with a beard, wearing a blue robe, working at a desk. He is holding a quill and looking down at a book. The desk is covered with various items, including a blue cloth and a small vase. In the background, there is a large window with a grid pattern and a wooden cabinet.

1

Point of departure

Current Challenges in the Communication
and Measurement of Science and Research

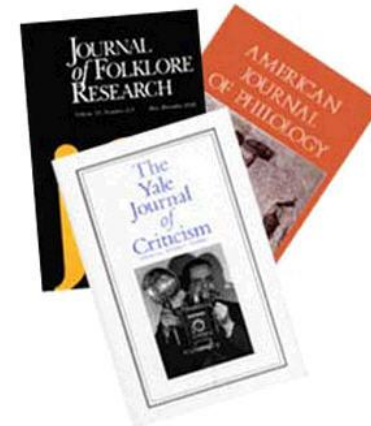
Three construction zones of scientific work



1. Communication



Public Sphere



Peer-reviewed Journals

New Ways of Communication

- Not all research results can find their way into the mass media, but how can the "splendid isolation" of peer-reviewed journals be broken?
- Specialist journals and magazines act as intermediary actors between science and professional practice
- Social media offer new opportunities of addressing, commenting and capitalizing research processes and results



2. Evaluation



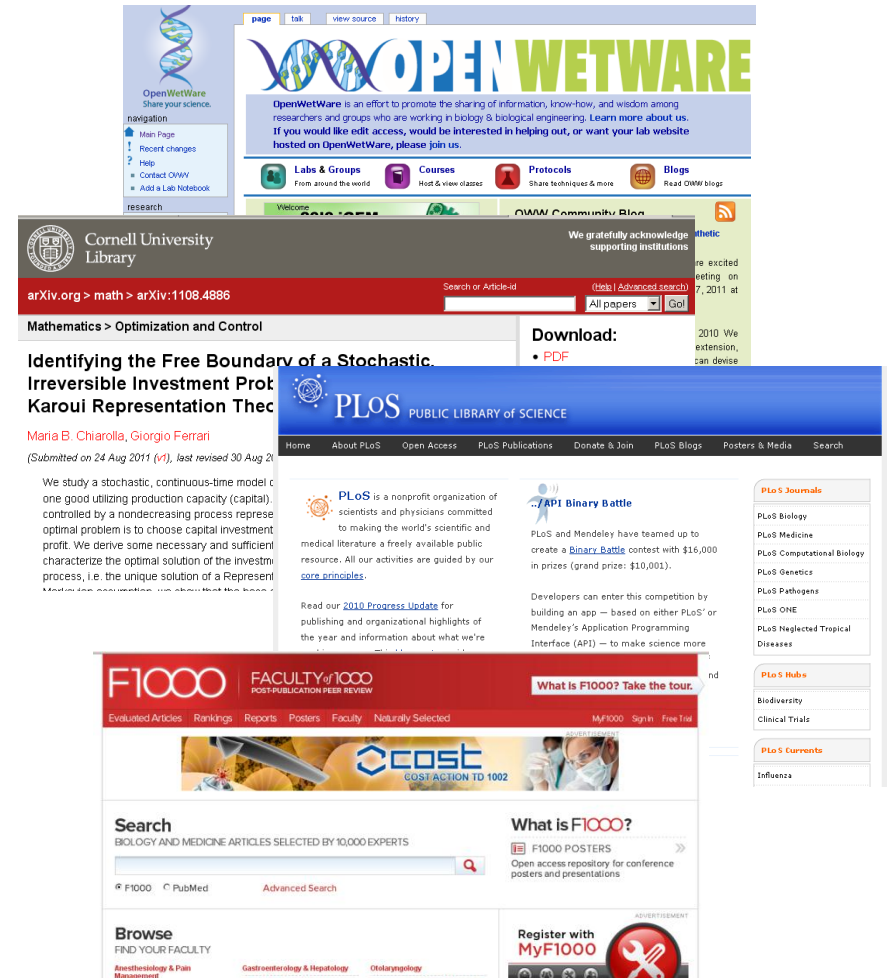
Co-Creation



Peer-review

New Ways of Evaluation

- New media support the research evaluation through peers during various phases of the process:
- Crowdsourcing: Making the research process transparent and collecting new ideas (literature, methods...).
- Pre-Publication: Feedback during production of an article
- Open Access: free access to publications, feedback from readers (PLOS, Open Aire)
- Peer-Review
- Post-Publication: Crowd-Selection (Mendeley)



3. Impact



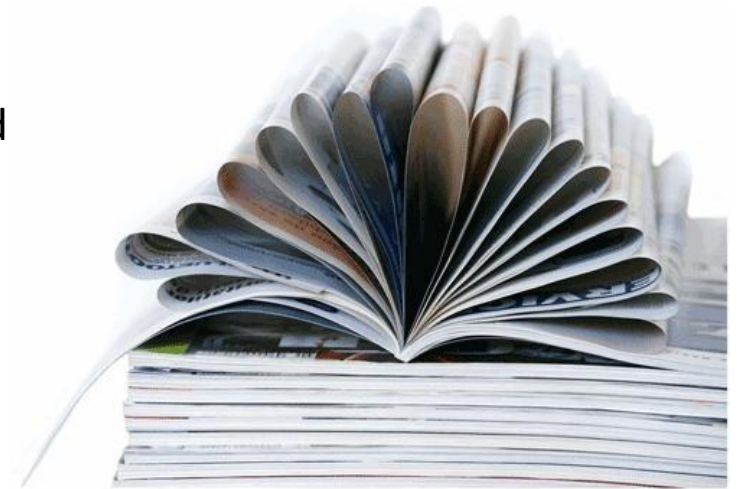
Referencing



Peer-reviewed Journals

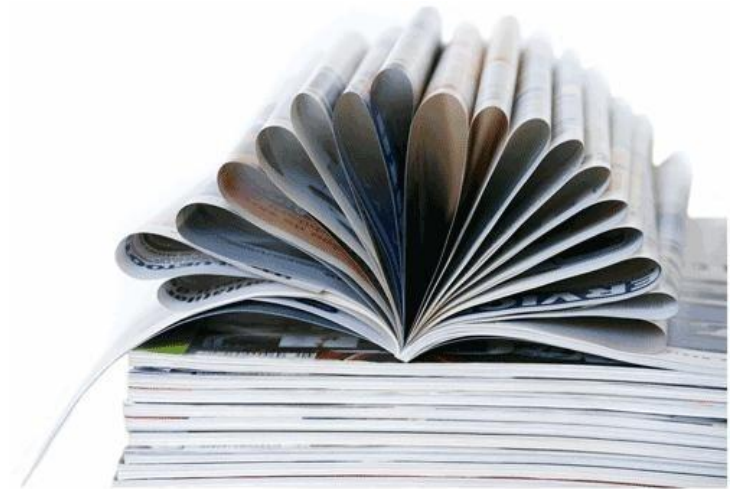
Scientific Impact: Publish or perish

- Most widely used measure of scientific impact:
Articles in peer-reviewed journals are scored according to the "Impact Factor" of the journal
- The overall output of a researcher is indicated by the number of citations s/he has (h-Index)
- Advantages of bibliometrics:
 - Relatively easy to compute
 - Data is accessible
 - Consensus and wide use



Scientific Impact: Publish or perish

- Disadvantages of bibliometrics:
 - Little validity of actual use
 - Reasons and context of citation unknown
 - Susceptibility to gaming-strategies
 - Metrics are not up-to-date
 - Wrong incentives
 - Overweighting of journal articles
 - Lack of transparency
 - Impact outside academia is neglected



The background is a vibrant, abstract composition. On the left, several glowing light bulbs in shades of orange, yellow, and pink are visible, some with light rays emanating from them. In the center and right, a laptop is partially visible, its keyboard and screen area shown. Overlaid on the entire scene are large, translucent, 3D-style numbers in various colors (blue, green, yellow) that appear to be floating or falling. The overall color palette is dominated by blues, greens, and yellows, creating a high-tech, digital atmosphere.

2

Scientometrics 2.0

New Metrics of Impact in the Scientific Community

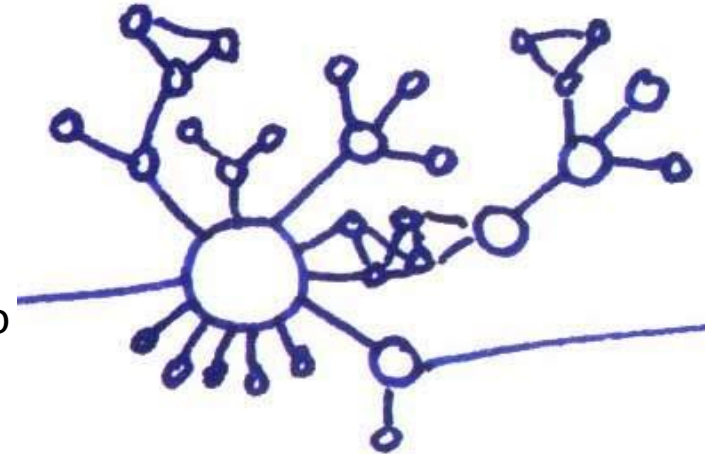
Usage-based metrics



- The migration of scientific publications into the web allows the application of new metrics:
 - "Webometrics" analyze the navigation and reading behavior on the internet
 - "Scientometrics 2.0" also analyze the connections between researchers, their publications and projects, and take mutual references as well as reviews into account.
- The goal is to achieve a more current and differentiated picture of the impact of scientific publications

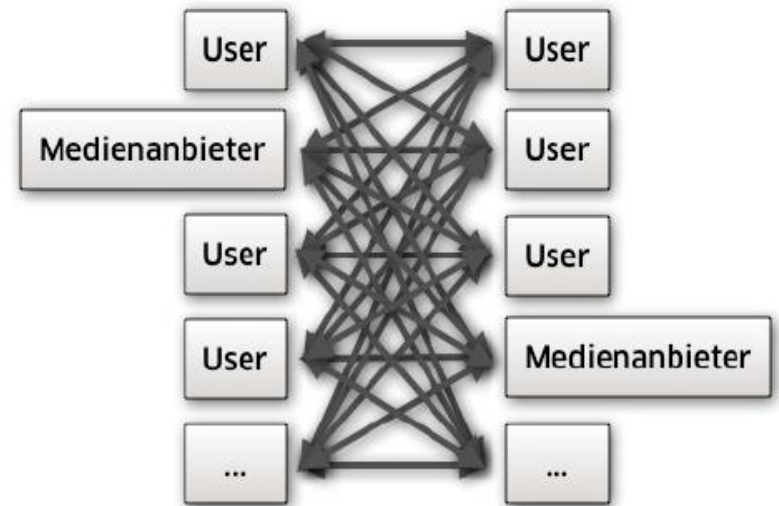
Webometrics

- Measures taken into account:
 - Number of Web/URL Links (Mentioning of article title or URL),
 - Usage data (Number of downloads and views – studies show a high correlation between download data und citations later on),
- Require the cooperation of the publisher or access through search engines.
- Attribution of citations, views and downloads to specific users can be very difficult



The opportunities of social media

- In social networks communication takes place in quasi-public form (Theatralität)
- This allows the observation and analysis of the communication and its underlying structure of relations: the network of researchers and their publications



Scientometrics 2.0

- **Bookmarking:** Analysis of tags to publications (Indexation)
- **Reference managers:** Analysis of citations and literature collections of users, requires sharing-functionalities
- **Recommendation systems:** User ratings and recommendations, possibly restricted to experts/peers
- **Comments:** Comments on publications permit analysis of feedback and attention
- **Microblogging:** Analysis of links and citations of publications in tweets and posts
- **Wikipedia:** Citation of publications in articles
- **Blogging:** Links and citation of publications in blogposts.
- **Social Networks:** Network of users and their publications

Possible Criteria of Scientometrics 2.0



Publications:

#Views, #Likes, #Shares,
#Bookmarks, #Mentions,
#Comments, #Downloads,
#Up-/Downgrades

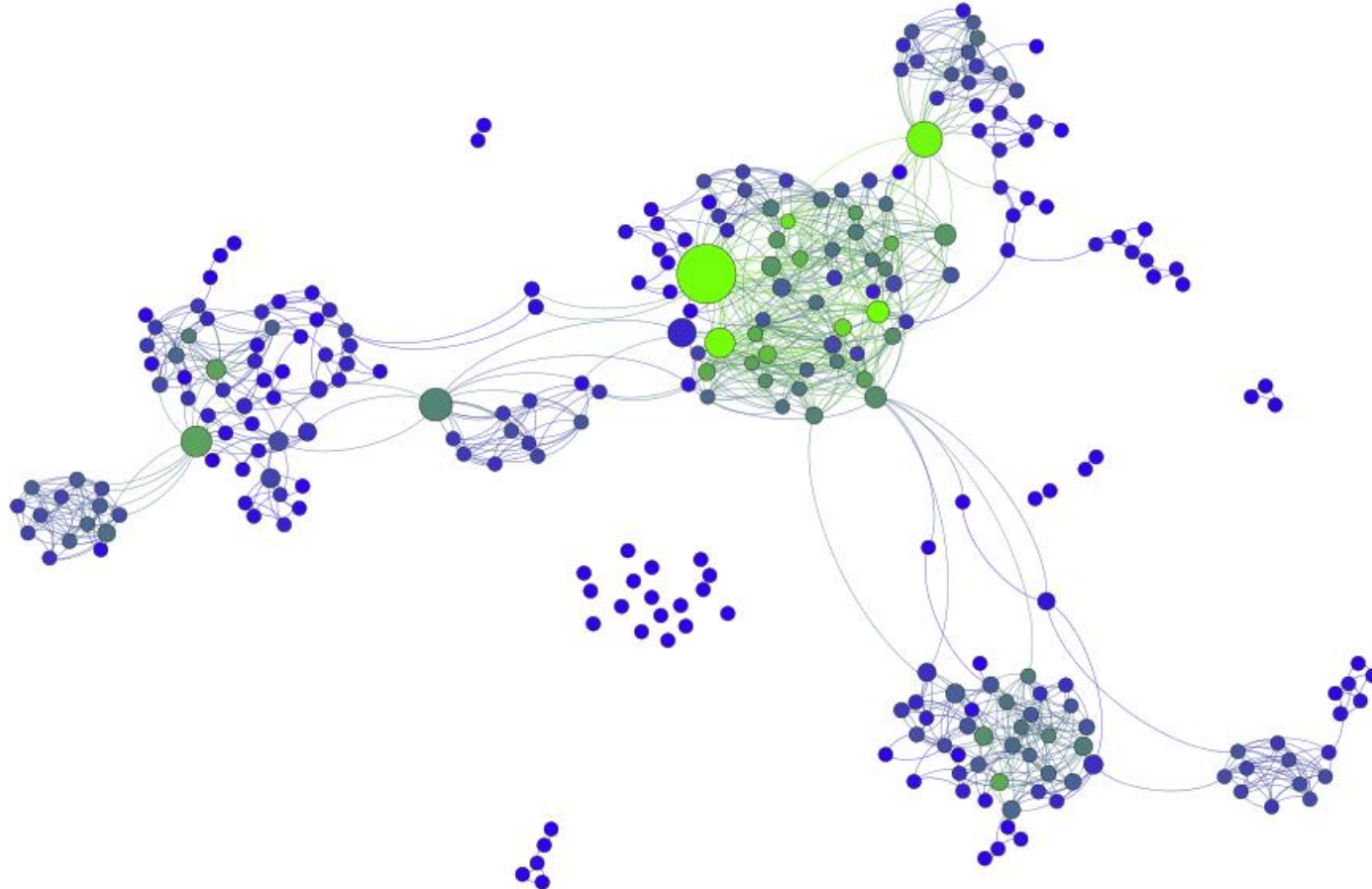


Persons:

#Papers, #Uploads, #Follower,
#Profile Views, #Impact Points,
Co-Authors

Network of researchers, popularity measures, metrics of social network analysis (Centrality, Betweenness, etc.). Feedback about individual publications.

Example: Analysis of an ego-centered network



The bigger and lighter the nodes, the more central the actor
(Centrality this case = Degree Centrality = Number of Connections or Neighbors)

A hand is shown on the left, holding a thin, light-colored string. To the right of the hand is a large, inflated green balloon. The background is a warm, golden-brown color. A semi-transparent green rectangular box is overlaid on the right side of the image, containing the text.

3

Altmetrics

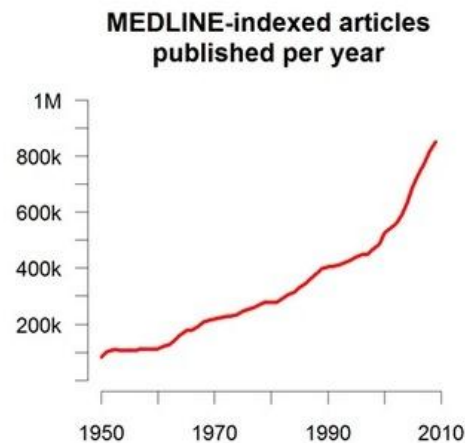
A New Paradigm?

altmetrics: a manifesto

NO ONE CAN READ EVERYTHING. We rely on filters to make sense of the scholarly literature, but the narrow, traditional filters are being swamped. However, the growth of new, online scholarly tools allows us to make new filters; these altmetrics reflect the broad, rapid impact of scholarship in this burgeoning ecosystem. We call for more tools and research based on altmetrics.

As the volume of academic literature explodes, scholars rely on filters to select the most relevant and significant sources from the rest. Unfortunately, scholarship's three main filters for importance are failing:

- Peer-review has served scholarship well, but is beginning to show its age. It is slow, encourages conventionality, and fails to hold reviewers accountable. Moreover, given that most papers are eventually published somewhere, peer-review fails to limit the volume of research.
- Citation counting measures are useful, but not sufficient. Metrics like the h-index are even slower than peer-review: a work's first citation **can take years**. Citation measures are narrow; influential work may remain uncited. These metrics are narrow; they neglect



- Tackle the disadvantages of bibliometric measurement of scientific impact
- Online reference managers like Zotero and Mendeley store the data of more than 40 million articles and as much as one third of scholars are already on Twitter. Why not make use of the data?
- Non-traditional forms of publication (raw science, nanopublications, blogs...) are increasingly important and should be considered

Example: ImpactStory

The screenshot shows the ImpactStory website homepage. At the top left is the "ImpactStory." logo in orange. To its right are navigation links: "create", "about", "follow", "register", and "log in". In the top right corner, there is a blue "BETA" badge with the text "Send us your feedback!". The main content area has a large heading "Tell the full story of your research impact." followed by a paragraph: "ImpactStory aggregates **altmetrics**: diverse impacts from your articles, datasets, blog posts, and more." Below this is a blue button that says "Make my impact report". To the right of the button is the text "or, show me a sample report". On the right side of the main area, there is a white box with the heading "New!" and the text "Have you registered for an ORCID ID yet? Create an ImpactStory report using" followed by the "ORCID" logo. At the bottom, there is a section titled "We track impact across the Web:" followed by a row of logos for various sources: citeulike, crossref, delicious, DRYAD, F1000 FACULTY1000, facebook, github, MENDELEY, ORCID, PLOS, PubMed Central, PubMed, ScienceSeeker, Scopus, slideshare, and Wikipedia. In the bottom left corner, there is a logo for the "Institute for Media and Communications Management" at the "University of St. Gallen".

ImpactStory.

create about follow register log in

BETA
Send us your feedback!

Tell the full story of your research impact.

ImpactStory aggregates **altmetrics**: diverse impacts from your articles, datasets, blog posts, and more.

Make my impact report

or, show me a sample report

New!

Have you registered for an ORCID ID yet?
Create an ImpactStory report using

ORCID

We track impact across the Web:

citeulike crossref delicious DRYAD F1000 FACULTY1000 facebook github MENDELEY ORCID PLOS PubMed Central PubMed ScienceSeeker Scopus slideshare Wikipedia

Institute for Media and Communications Management
University of St. Gallen

Example: ReaderMeter

ReaderALPHAMeter

Forename(s)

Surname

Search

...research impact, crowdsourced

[Example of author readership analysis](#)

[Read the blog post of the official launch](#)

[Read the altmetrics manifesto](#)

[About](#)

[FAQ](#)

[News](#)

[Contact](#)

altmetrics

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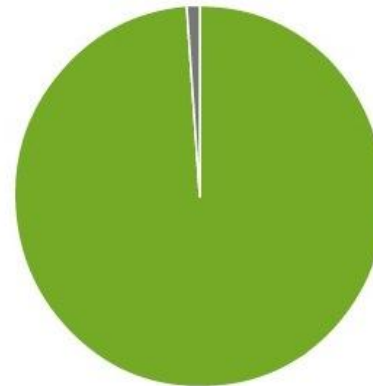


Example: ResearchGate Score

7.41
RG Score

A new way to measure
scientific reputation.

The RG Score takes *all* your
research and turns it into a
source of reputation.

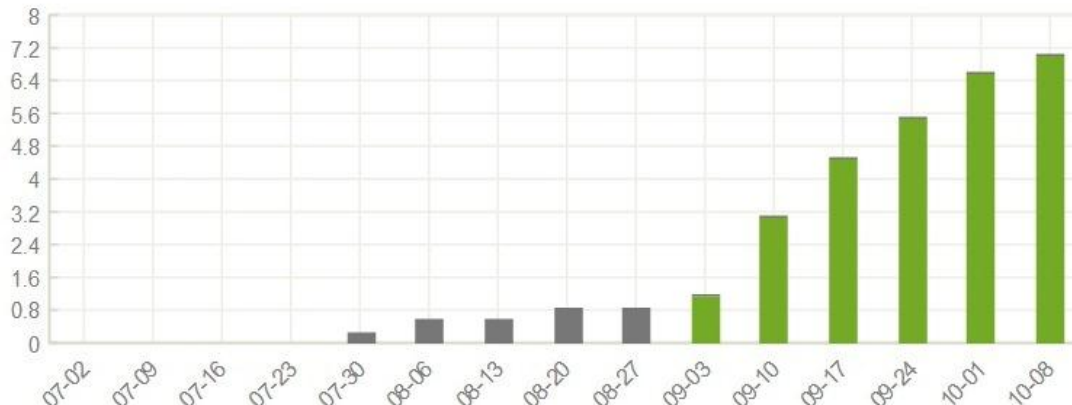


PERCENTILE

Your score is higher than 85% of
ResearchGate members'.



RG SCORE OVER TIME



How does the RG Score work?

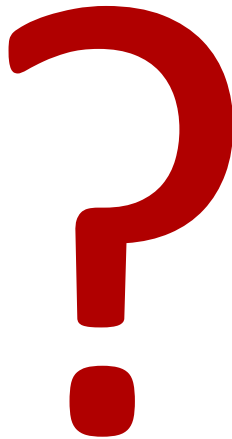
Your RG Score is calculated based on how other
researchers interact with your content, how often,
and who they are. The higher their score, the more
yours will increase.

The background is a detailed architectural drawing on a blue background, showing a cross-section of a building's connection to an existing structure. The drawing includes various structural elements like beams, columns, and walls, with numerous technical annotations and dimensions. A large white number '4' is overlaid on the left side of the drawing. A semi-transparent dark blue rectangle is positioned on the right side, containing the title text.

4

The ResearchGate Pilot Project

What is ResearchGate?



- ResearchGate is the biggest social network site for scientists with roughly 2 million users
- Based in Berlin and founded in 2008 by virologist Iljad Madisch, Sören Hofmayer, Horst Fickenscher
- Database of more than 30 million publication entries
- Vivid community, especially popular with young researchers and developing and emerging countries

Voluntary Pilot Project «ResearchGate»



- Voluntary participation in a pilot project in cooperation with scientific social network site ResearchGate at the Profilbereich Business Innovation
- Participants' usage data (especially publications) are migrated from Unisg platform Alexandria to ResearchGate
- Aggregation and analysis of user data: networks, intensity of interaction, impact

Summary: The Road ahead!



Scientific Impact:

- Freiwilliges Pilotprojekt "Scientometrics 2.0"
 - Beginn Oktober '11, Datentransfer läuft
- Präsentation an BI Day '13



Thank You For Your Attention



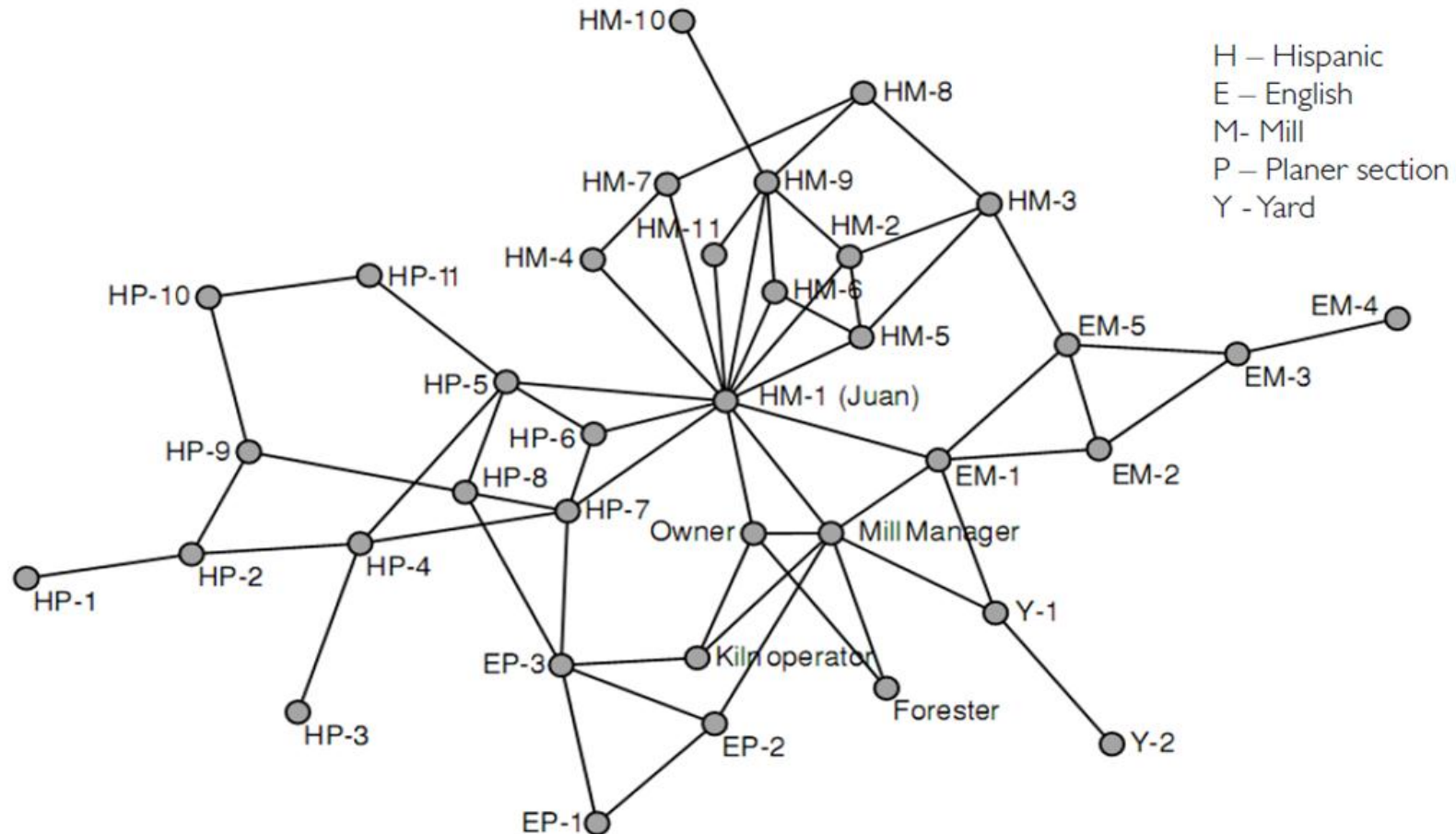
5

Discussion

Questions for Discussion

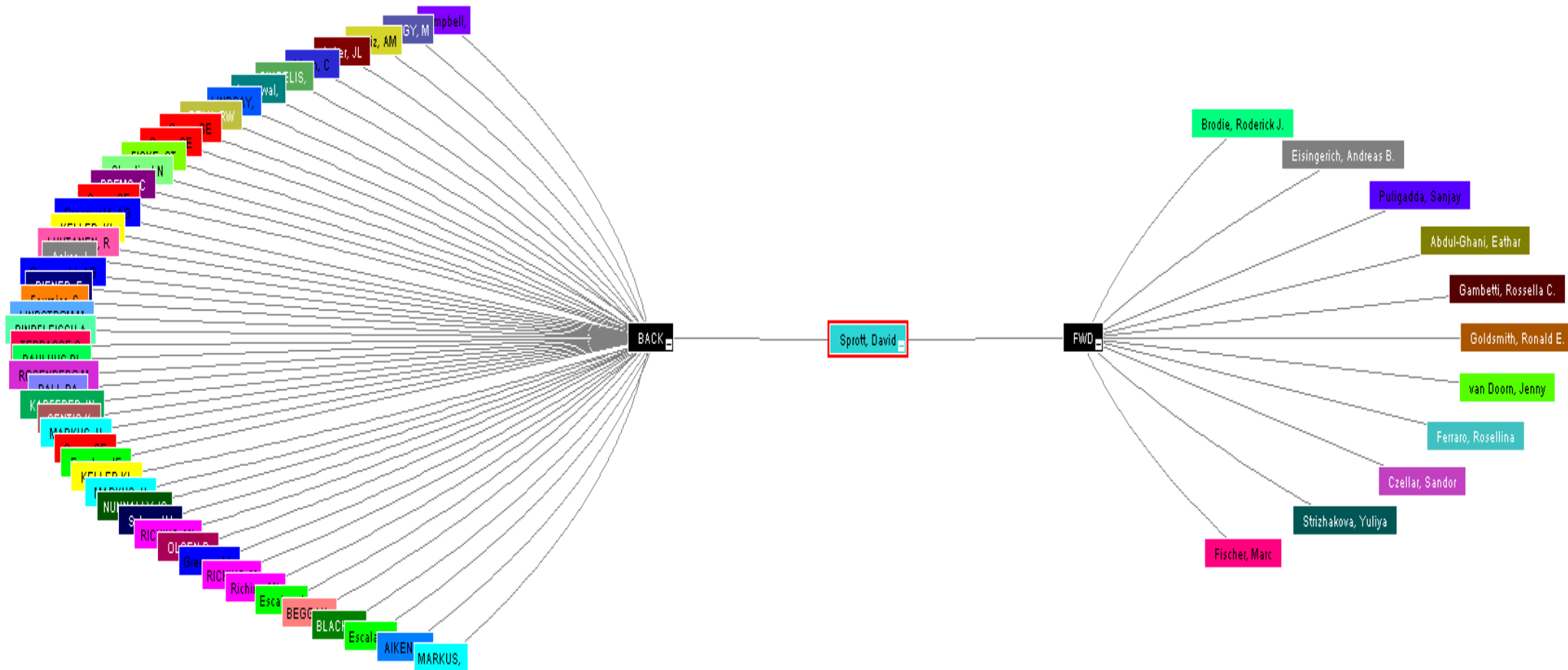
- Do Altmetrics have the chance to challenge traditional bibliometrics?
- What are the advantages and disadvantages of Altmetrics?
- Questions and inputs about the ResearchGate project?

Social Networks Beispiel: Communication Ties within a Sawmill



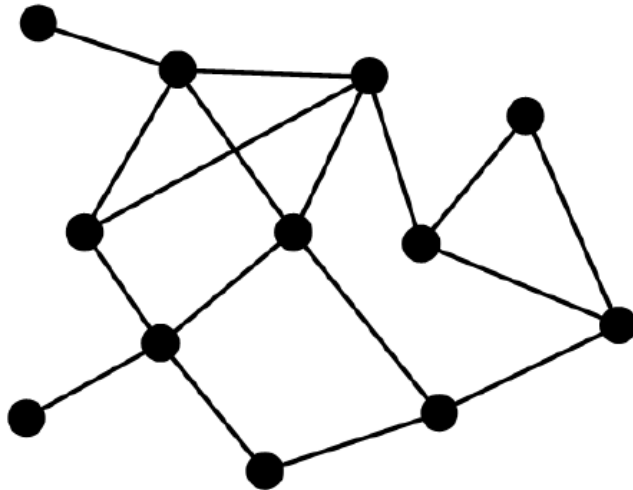
Vertex labels indicate the ethnicity and the type of work of each employee, for example HP-10 is an Hispanic (H) working in the planer section (P)

Social Networks Beispiel: Citation Maps

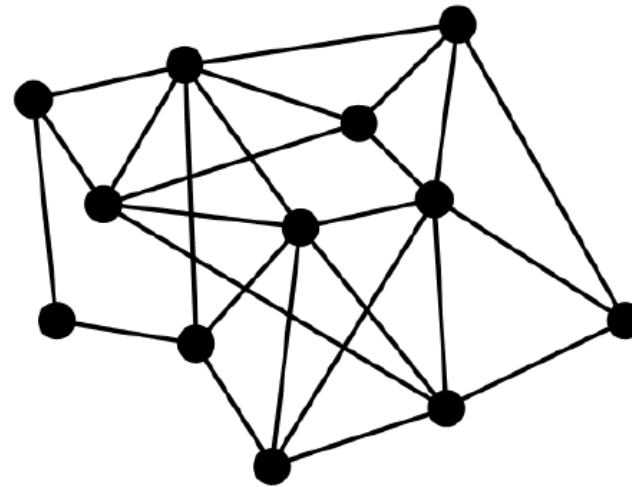


Social Networks Beispiel: Network Measures, Density

$$D = \frac{2|E|}{|V|(|V| - 1)}$$



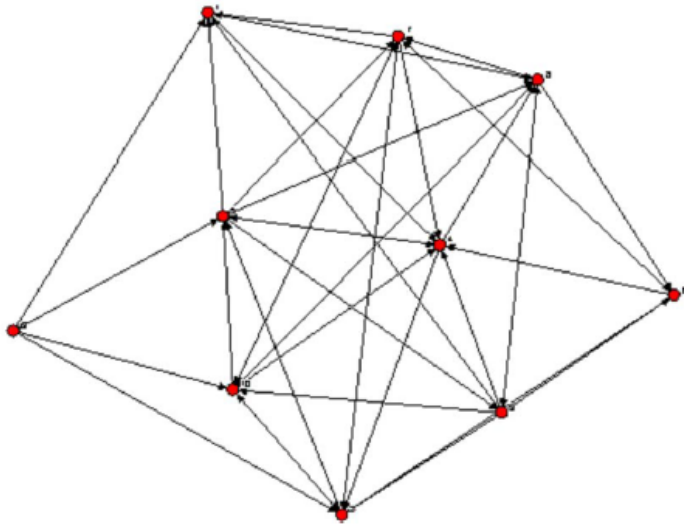
low density: 25%



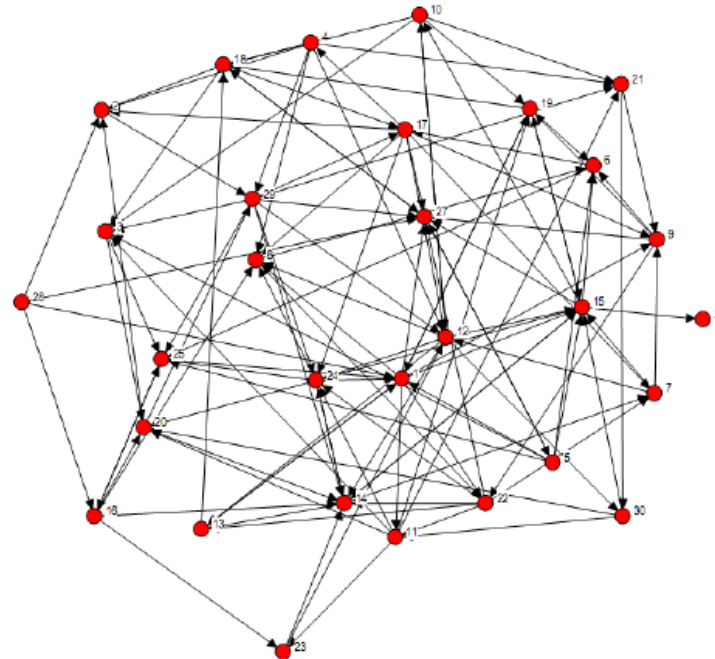
high density: 39%

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Social Networks Beispiel: Network Measures, Degree



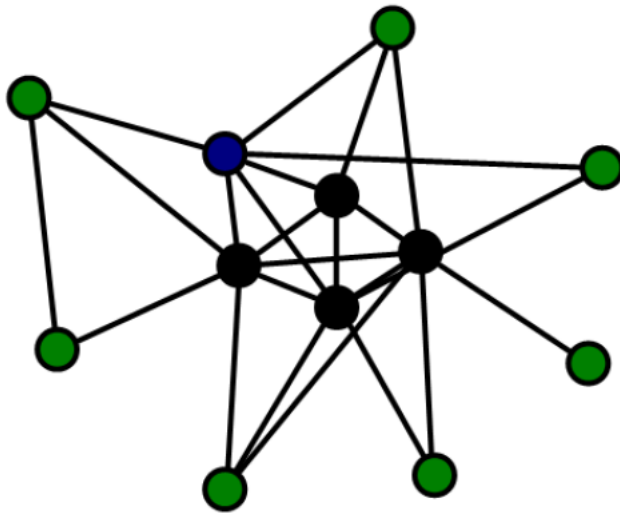
Density: 0,47
Average Degree: 4



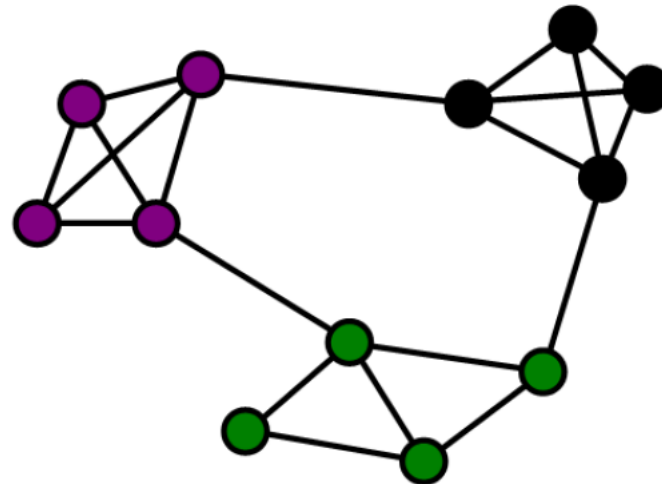
Density: 0,14
Average Degree: 4

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Social Networks Beispiel: Network Measures, Distance



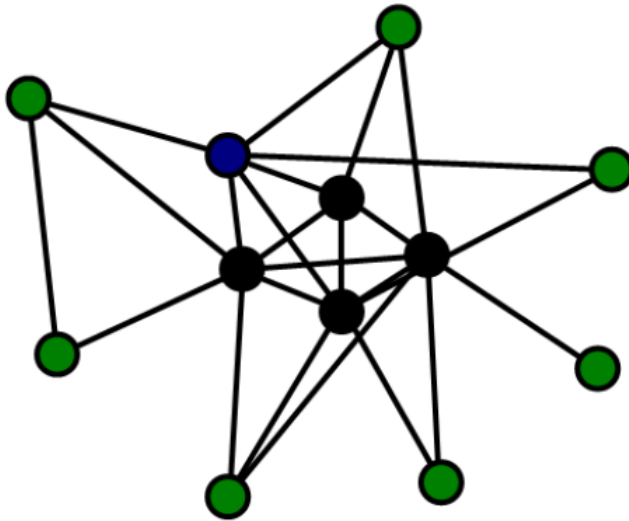
avg. distance 1.9



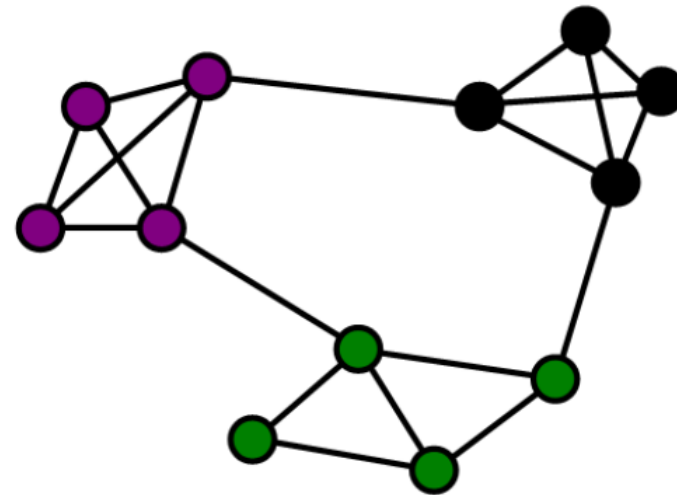
avg. distance 2.4

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Social Networks Beispiel: Network Measures, Diameter



diameter 3

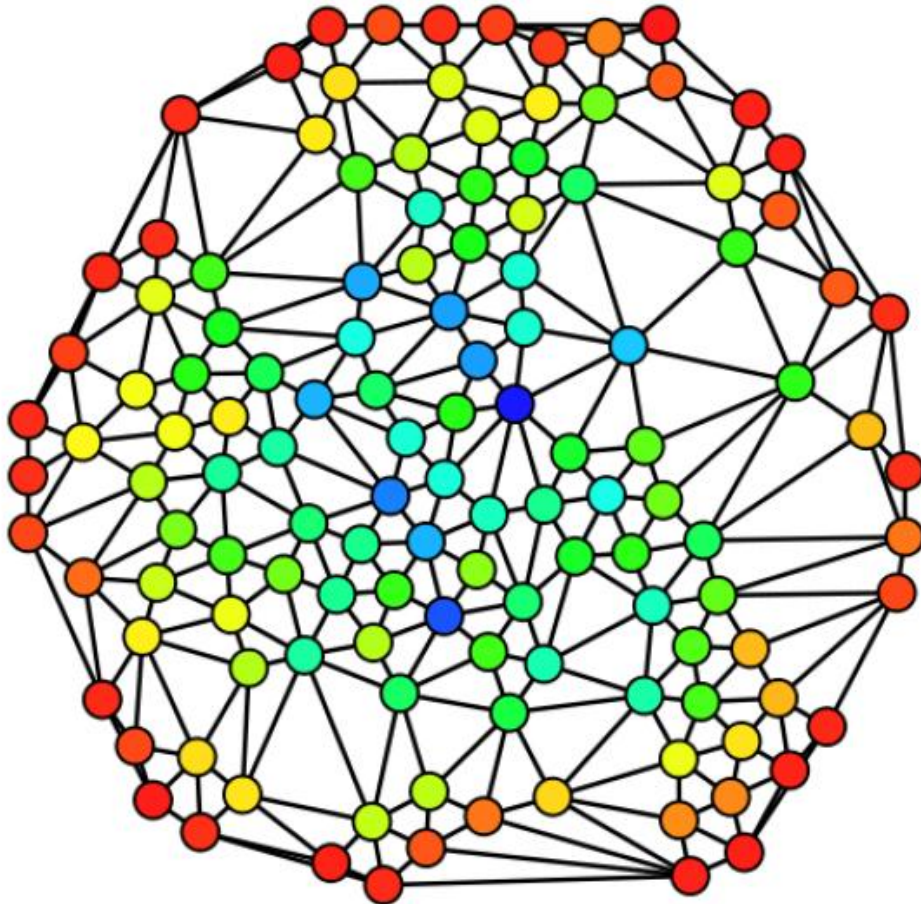


diameter 3

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Diameter = Länge des kürzesten maximalen Pfades

Social Networks Beispiel: Ego-Network Measures, Betweenness Centrality



Hue (from red=0 to blue=max) shows the node betweenness.

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$$C_b(n_i) = \frac{\sum_{\substack{j \neq k \\ i \neq j, k}} \frac{g_{jk}(n_i)}{g_{jk}}}{(g-1)(g-2)}$$