Peer Review
from WoS

V. Batagelj,
A. Ferligoj

Citations

Collaboration

References

Analysis of Peer Review data from WoS

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Data Science and Social Research
Naples, February 17-19, 2016
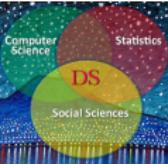
Outline

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1. Citations
2. Collaboration
3. References

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"I know you've had over 100 articles published, but my question was 'Have you ever made a contribution to the literature?'"

Journal of Irreproducible Results, 32(1988)2, 24

Current version of slides (February 18, 2016 / 12 : 27):
http://vlado.fmf.uni-lj.si/pub/slides/peereDSSR.pdf

WoS networks

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From the Web of Science (WoS), using the queries `"peer review*"` and `refereeing`, we downloaded in June 2015 the corresponding data set. We manually improved it.

Using the program WoS2Pajek we transformed it into a collection of networks: `cite`, *two-mode networks*: `WA`, `WJ`, `WK`; partitions `DC` (DC= a work w has (1) / has not (0) a WoS description), `year` (publication year); and CSV file `titles` with basic data about works with DC=1.

```
>>> End of processing of WoS file
number of works    =  580263
number of authors  =  248725
number of journals =  33210
number of keywords =  30627
number of records  =  17219
number of duplicates =  15
works + titles  : titles.csv
works index file: vtxIndex.txt
```

We removed multiple links and loops from networks. The cleaned citation network has $n = 580263$ nodes and $m = 690881$ arcs.

Citation networks

A citation network is based on the citing relation Ci

$$X \, Ci \, Y \equiv X \, cites \, Y$$

A citation network is usually (almost) acyclic. Using the 'preprint' transformation it can be transformed into a corresponding acyclic network in which we can determine the importance of arcs (citations) and nodes (works) using SPC (Search Path Count) weights.

We first restricted the original citation network to its 'boundary' (21513 nodes). This network has one large weak component (8927 nodes), 66 small components, and 11783 isolated nodes. It contains also 7 small (4,4,3,3,2,2,2) strong components. We transform it into an acyclic network, CiteAcy, using the Preprint transformation. It has $n = 21533$ nodes and $m = 24031$ arcs.

SPC – Search path count method

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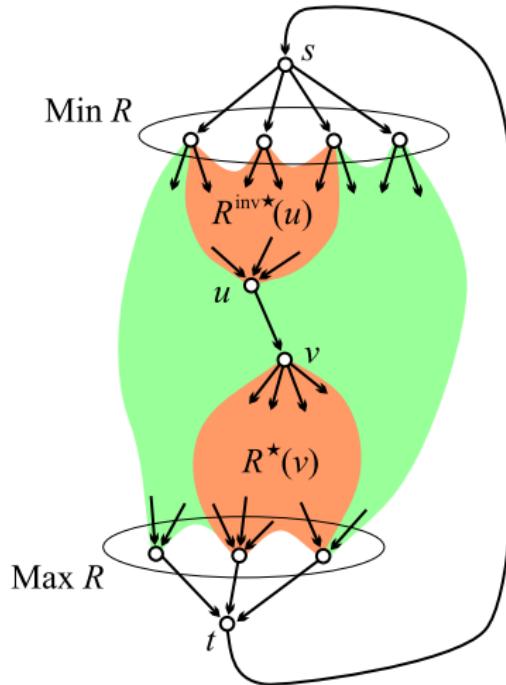
The *search path count* (SPC) method is based on counters $n(u, v)$ that count the number of different paths from s to t through the arc (u, v).

arXiv, Wiley book

The *Main path* starts in a link with the largest SPC weight and expands in both directions following the adjacent link with the largest SPC weight.

The *CPM path* is determined using the Critical Path Method from Operations Research.

In the network we compute the SPC weights and on their basis determine the main path and link islands [20 200].

In July 2015 a new option was added to program Pajek: `Network/Acyclic Network/Create (Sub)Network/Main Paths` with several suboptions for computing local and global main paths and for searching for Key-Route main path in acyclic networks [3].
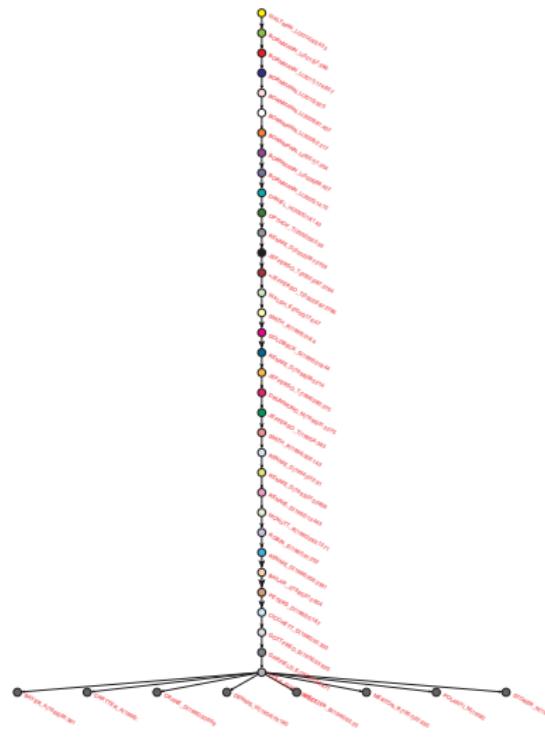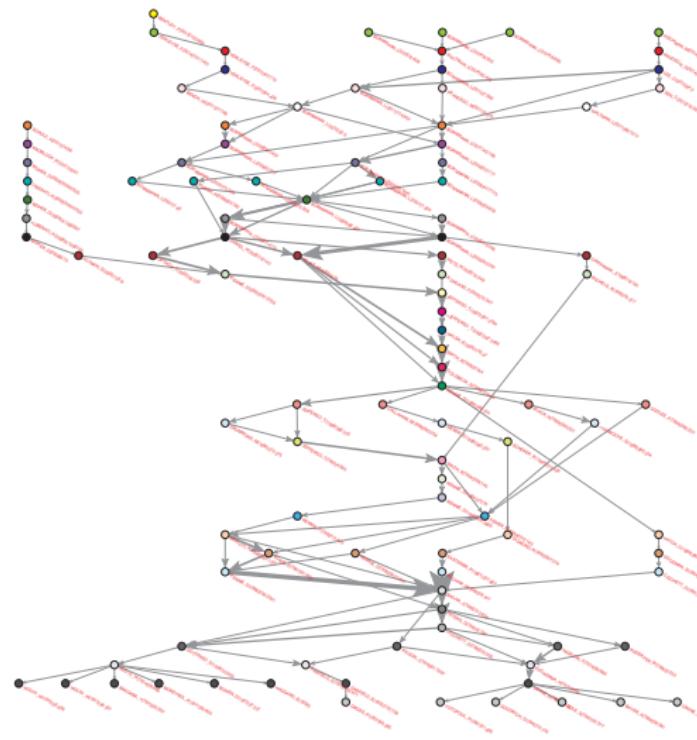
Main path list of titles

name	author	title	journal	year
MELTZER_B[1949]55:25	Meltzer, BN	The productivity of social scientists	AM J SOCIOL	1949
DENNIS_W[1954]79:180	Dennis, W	Bibliographies of eminent scientists	Scient. Monthly	1954
MERTON_R[1957]22:635	MERTON, RK	PRIORITIES IN SCIENTIFIC DISCOVERY - A CHAPTER IN THE SOCIOLOGY OF SCIENCE	AM SOCIOL REV	1957
POLANYI_M[1958]:	Polanyi, M	Personal Knowledge: Towards a Post-Critical Philosophy	book	1958
CRANE_D[1965]30:699	Crane, D	Scientists at major and minor universities	AM SOCIOL REV	1965
BAYER_A[1966]39:381	Bayer, AE	Some Correlates of a Citation Measure of Productivity in Science	Sociology of Education	1966
STORER_N[1966]:	Storer, N	The Social System of Science	book	1966
CARTTER_A[1966]:	Cartter, AM	An assessment of quality in graduate education	AM Council on Education	1966
COLE_S[1967]32:377	COLE, S	SCIENTIFIC OUTPUT AND RECOGNITION - STUDY IN OPERATION OF REWARD SYSTEM IN SCIENCE	AM SOCIOL REV	1967
GARFIELD_E[1972]178:471	GARFIELD, E	CITATION ANALYSIS AS A TOOL IN JOURNAL EVALUATION - JOURNALS CAN BE RANKED BY FREQUENCY AND IMPACT OF CITATION	SCIENCE	1972
GOTTFRED_S[1978]33:920	GOTTFREDSON, SD	EVALUATING PSYCHOLOGICAL-RESEARCH REPORTS - DIMENSIONS, RELIABILITY, AND CORRELATES OF QUALITY JUDGMENTS	AM PSYCHOL	1978
CICCHETT_D[1980]35:300	CICCHETTI, DV	RELIABILITY OF REVIEWS FOR THE AMERICAN-PSYCHOLOGIST - A BIOSTATISTICAL ASSESSMENT OF THE DATA	AM PSYCHOL	1980
PETERS_D[1982]5:187	PETERS, DP	PEER-REVIEW PRACTICES OF PSYCHOLOGICAL JOURNALS - THE FATE OF ACCEPTED, PUBLISHED ARTICLES, SUBMITTED AGAIN	BEHAV BRAIN SCI	1982
BAILAR_J[1985]312:654	BAILAR, JC	JOURNAL PEER-REVIEW - THE NEED FOR A RESEARCH AGENDA	NEW ENGL J MED	1985
RENNIE_D[1986]256:2391	RENNIE, D	GUARDING THE GUARDIANS - A CONFERENCE ON EDITORIAL PEER-REVIEW	JAMA-J AM MED ASSOC	1986
ROBIN_E[1987]91:252	ROBIN, ED	PEER-REVIEW IN MEDICAL JOURNALS	CHEST	1987
MCNUTT_R[1990]263:1371	MCNUTT, RA	THE EFFECTS OF BLINDING ON THE QUALITY OF PEER-REVIEW - A RANDOMIZED TRIAL	JAMA-J AM MED ASSOC	1990
RENNIE_D[1992]13:443	RENNIE, D	SUSPENDED JUDGMENT - EDITORIAL PEER-REVIEW - LET US PUT IT ON THE LINE	CONTROL CLIN TRIALS	1992
RENNIE_D[1993]270:2856	RENNIE, D	MORE PEERING INTO EDITORIAL PEER-REVIEW	JAMA-J AM MED ASSOC	1993
RENNIE_D[1994]272:91	RENNIE, D	THE 2ND INTERNATIONAL-CONGRESS ON PEER-REVIEW IN BIOMEDICAL PUBLICATION	JAMA-J AM MED ASSOC	1994
SMITH_R[1994]309:143	SMITH, R	PROMOTING RESEARCH INTO PEER-REVIEW	BRIT MED J	1994
JEFFERSO_T[1995]4:383	JEFFERSO, T	ARE GUIDELINES FOR PEER-REVIEWING ECONOMIC EVALUATIONS NECESSARY - A SURVEY OF CURRENT EDITORIAL PRACTICE	HEALTH ECON	1995
DRUMMOND_M[1996]313:275	Drummond, MF	Guidelines for authors and peer reviewers of economic submissions to the BMJ	BRIT MED J	1996
JEFFERSO_T[1998]280:275	Jefferson, T	Evaluating the BMJ guidelines for economic submissions - Prospective audit of economic submissions to BMJ and The Lancet	JAMA-J AM MED ASSOC	1998
RENNIE_D[1998]280:214	Rennie, D	Peer review in Prague	JAMA-J AM MED ASSOC	1998
SMITH_R[1999]318:4	Smith, R	Opening up BMJ peer review - A beginning that should lead to complete transparency	BRIT MED J	1999
GOLDBECK_S[1999]318:44	Goldbeck-Wood, S	Evidence on peer review - scientific quality control or smokescreen?	BRIT MED J	1999
WALSH_E[2000]176:47	Walsh, E	Open peer review: a randomised controlled trial	BRIT J PSYCHIAT	2000
JEFFERSO_T[2002]287:2784	Jefferson, T	Effects of editorial peer review - A systematic review	JAMA-J AM MED ASSOC	2002
RENNIE_D[2002]287:2759	Rennie, D	Fourth International Congress on Peer Review in Biomedical Publication	JAMA-J AM MED ASSOC	2002
OPTHOF_T[2002]56:339	Opthof, T	The significance of the peer review process against the background of bias: priority ratings of reviewers and editors and the prediction	CARDIOVASC RES	2002
JEFFERSO_T[2002]287:2786	Jefferson, T	Measuring the quality of editorial peer review	JAMA-J AM MED ASSOC	2002
BORNMANN_L[2005]14:15	Bornmann, L	Committee peer review at an international research foundation: predictive validity and fairness of selection decisions on post-gra	RES EVALUAT	2005
DANIEL_H[2005]18:143	Daniel, HD	Publications as a measure of scientific advancement and of scientists' productivity	LEARN PUBL	2005
BORNMANN_L[2006]68:427	Bornmann, L	Selecting scientific excellence through committee peer review - A citation analysis of publications previously published to approve	SCIENTOMETRICS	2006
BORNMANN_L[2007]1:204	Bornmann, L	Convergent validation of peer review decisions using the h index - Extent of and reasons for type I and type II errors	J INFORMETR	2007
BORNMANN_L[2008]2:217	Bornmann, L	Latent Markov modeling applied to grant peer review	J INFORMETR	2008
BORNMANN_L[2009]81:407	Bornmann, L	The influence of the applicants' gender on the modeling of a peer review process by using latent Markov models	SCIENTOMETRICS	2009
BORNMANN_L[2010]32:5	Bornmann, L	The manuscript reviewing process: Empirical research on review requests, review sequences, and decision rules in peer review	LIBR INFORM SCI RES	2010
BORNMANN_L[2011]174:857	Bornmann, L	A multilevel modeling approach to investigating the predictive validity of editorial decisions: do the editors of a high profile journ	J R STAT SOC A STAT	2011
BORNMANN_L[2013]7:286	Bornmann, L	The validation of (advanced) bibliometric indicators through peer assessments: A comparative study using data from InCites and I	J INFORMETR	2013
WALTMAN_L[2014]65:433	Waltman, L	F1000 Recommendations as a Potential New Data Source for Research Evaluation: A Comparison With Citations	J ASSOC INF SCI TECH	2014

- before 1982: social science journals;
- from 1928 to 2002: biomedical journals;
- after 2002: specialized journals on science studies.

Journals: social science journals (sociological, psychological, educational,...).

The most **influential authors:** Cole and Cole (1967), Zuckerman and Merton (1971), Garfield (1972), Gottfredson (1978), and Peters and Ceci (1982).

Topics: scientific productivity, citation measures as measures of scientific accomplishement, scientific output and recognition, evaluation in science, referee system, journal evaluation, peer-evaluation system, review process, peer review practices.

The main path publications

from 1983 to 2002

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Journals: biomedical journals, mainly in JAMA. From 1986 the International Congress on Peer Review and Biomedical Publication is organized every four years.

The most **influential authors:** Rennie (1986, 1992, 1993, 1994, 2002), Smith (1994, 1999), Jefferson (1995, 1998, 2002), and their collaborators.

Topics: the effects of blinding on review quality, research into peer review, guidelines for peer reviewing, monitoring the peer review performance, open peer review, bias in peer review system, measuring the quality of editorial peer review. Development of meta-analysis and systematic reviews approaches.

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Journals: specialized journals on science studies: Scientometrics, Research Evaluation, Journal of Informetrics, JASIST.

The most **influential authors:** Bornmann and Daniel (2005, 2006, 2007, 2008, 2009, 2010, 2011). The last paper on the main path is Waltman and Costas (2014).

Topics: Bornmann and Daniel studied the validity of commitee peer review process for awarding long-term fellowship to post-graduate researchers, the use of h-index and pre-screening of applications at Boehringer Ingelheim Fonds. They also analysed citations of accepted and rejected papers at a prime chemistry journal (Angewandte Chemie Internationa Edition - AC-IE), the effect of exchanging reviews, the peer review process in this journal, the validity of its editorial decisions. The last two papers (Bormann and Leydesdorff, 2013; Waltman and Costas, 2014) use F1000 (a post-publication peer review system) recommendations as a source of research evaluation.

Cuts, islands, cores

The *node-cut* of a network $\mathcal{N} = (\mathcal{V}, \mathcal{L}, p)$, $p : \mathcal{V} \to \mathbb{R}$, at level t is a subnetwork $\mathcal{N}(t) = (\mathcal{V}', \mathcal{L}(\mathcal{V}'), p)$, determined by the set $\mathcal{V}' = \{v \in \mathcal{V} : p(v) \geq t\}$ and $\mathcal{L}(\mathcal{V}')$ is the set of links from $\mathcal{L}$ that have both endnodes in $\mathcal{V}'$.

The *link-cut* of a network $\mathcal{N} = (\mathcal{V}, \mathcal{L}, w)$, $w : \mathcal{L} \to \mathbb{R}$, at level t is a subnetwork $\mathcal{N}(t) = (\mathcal{V}(\mathcal{L}'), \mathcal{L}', w)$, determined by the set $\mathcal{L}' = \{e \in \mathcal{L} : w(e) \geq t\}$ and $\mathcal{V}(\mathcal{L}')$ is the set of all endnodes of the links from $\mathcal{L}'$.

If we represent a given or computed value of nodes / links as a height of nodes / links and we immerse the network into a water up to selected level we get *islands*. Varying the level we get different islands.
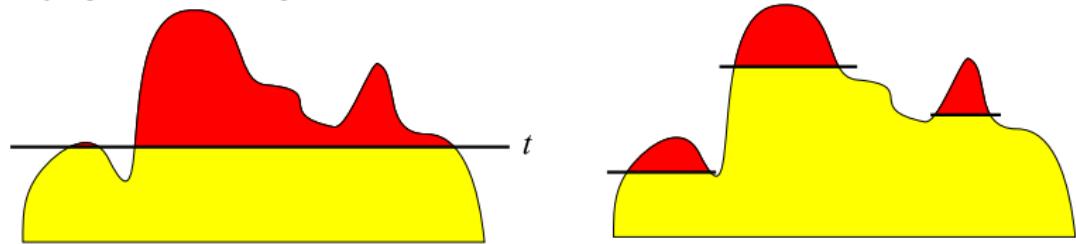
The subgraph $\mathcal{H} = (C, \mathcal{E}|C)$ induced by the set $C \subseteq \mathcal{V}$ is a *p-core at level $t \in \mathbb{R}$* iff $\forall v \in C : t \leq p(v, C)$ and C is a maximal such set.
Ordinary *core*: $p(v, C) = deg_H(v)$
p_S-core: $p(v, C) = \sum_{u \in C} w(v, u)$, $w(v, u)$ is the weight of link (v, u)
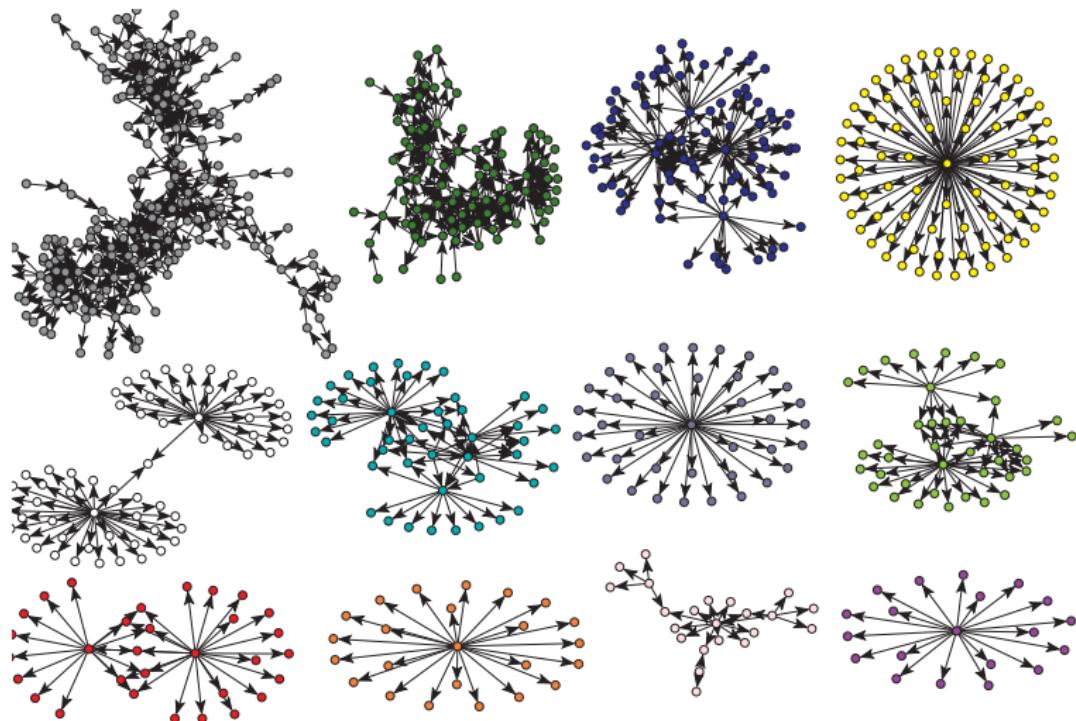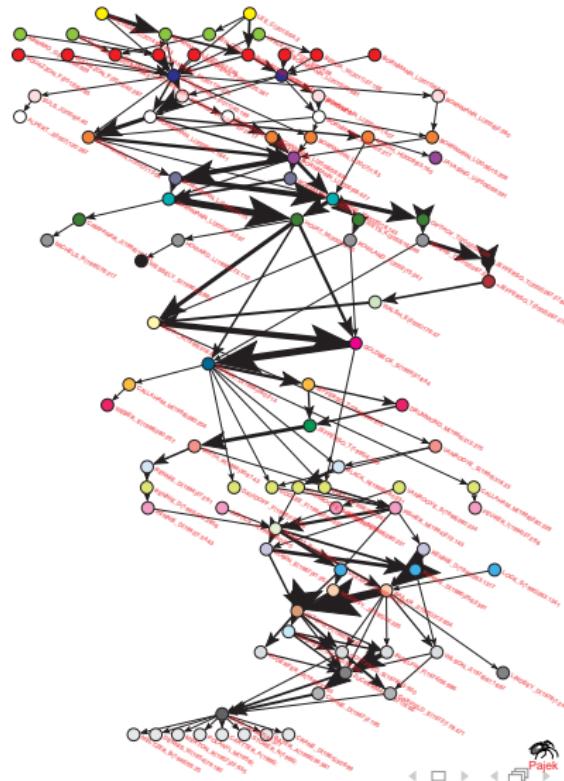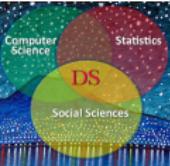
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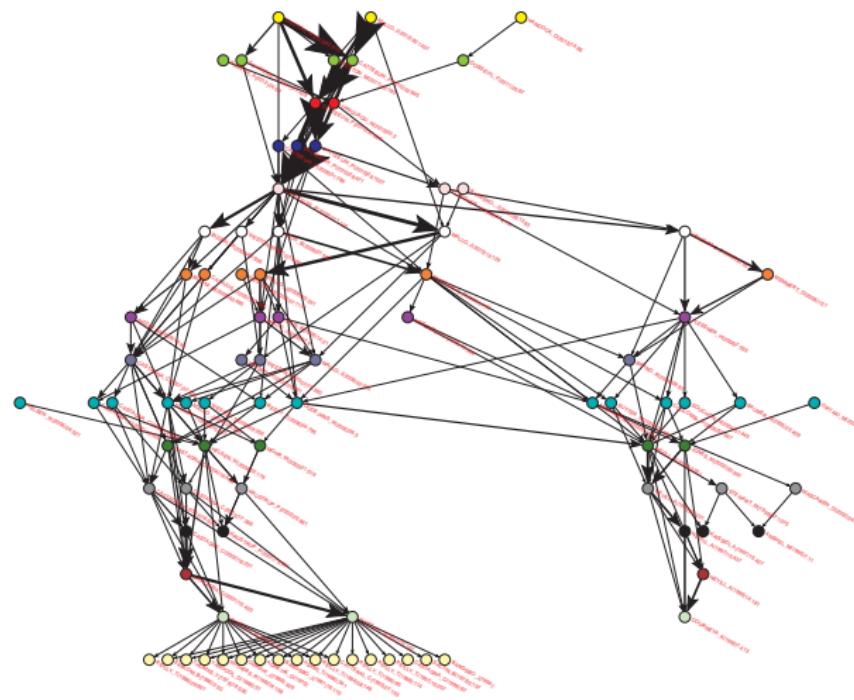
References

Island2 – Refereeing in sport.
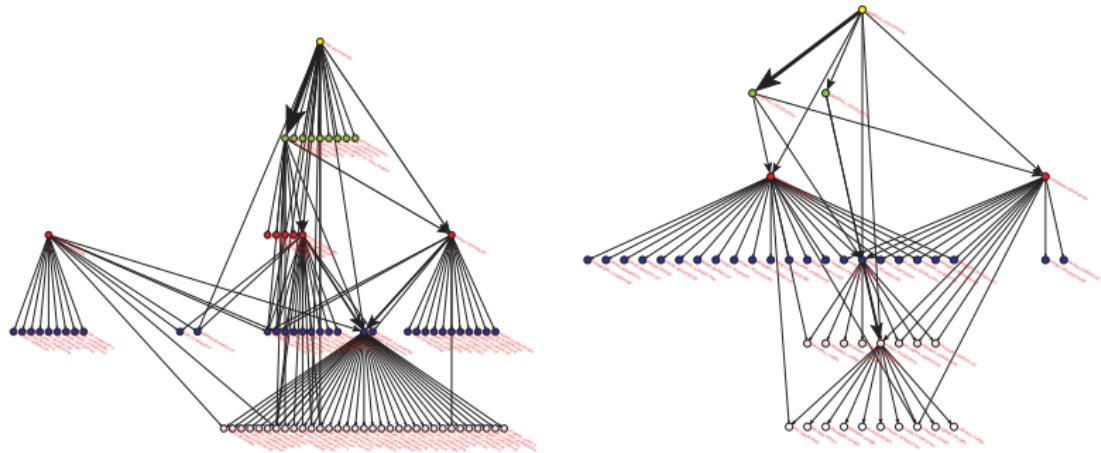
Island3 – isotopes / nuclear physics;
Island4 – athletic training.
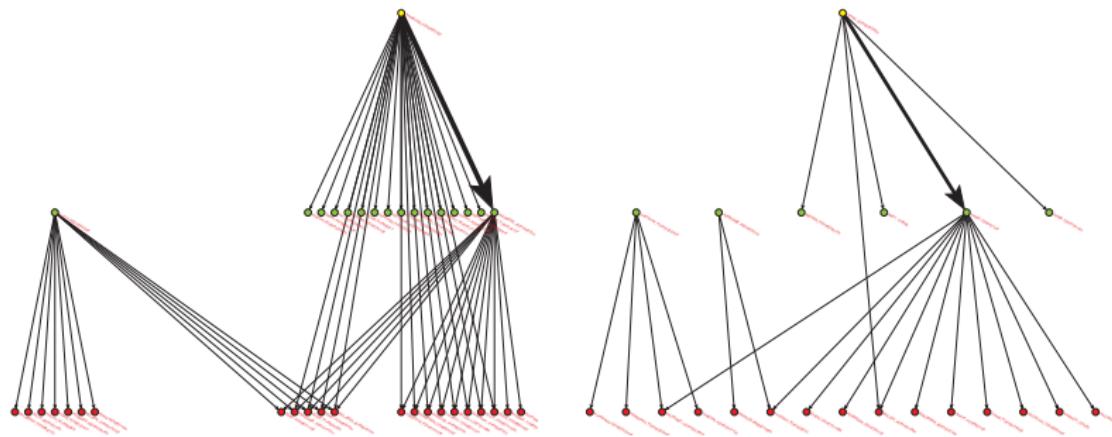
Island5 – dentures;
Island6 – genome.

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Collaboration network: $Co = WA^T * WA$

Network normalization: $N = n(WA) = \text{diag}(\frac{1}{\max(1, \text{outdeg}_{WA}(v))})_{v \in W} * WA$

Normalized collaboration: $Cn = N^T * N$

Authors using keywords: $AK = WA^T * WK$

Authors publishing in journals: $AJ = WA^T * WJ$

Works citing authors: $WciA = Ci * WA$

Authors citing authors: $Aci = WA^T * Ci * WA$

Distribution of the size of weak components in the collaboration network $Co = WA^T * WA$

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Weak component sizes
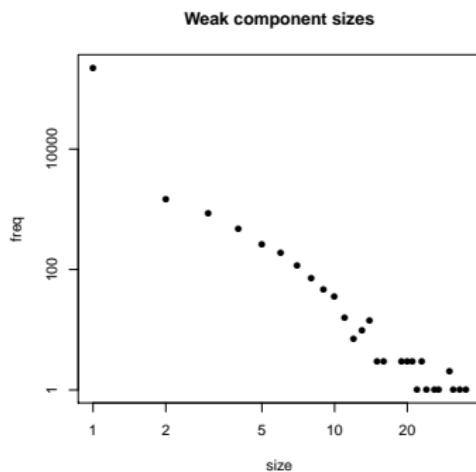
The 268258 authors form 228584 weak components. The "giant" component contains 30047 authors.

1	2	3	4	5	6	7	8	9	10
224968	1488	860	470	264	187	116	73	47	36

11	12	13	14	15	16	19	20	21	22
16	7	10	14	3	3	3	3	3	1

23	24	26	27	30	31	33	35	30047
3	1	1	1	2	1	1	1	1

Collaboration count/ link cut at level 10

$$Co = WA^T * WA$$
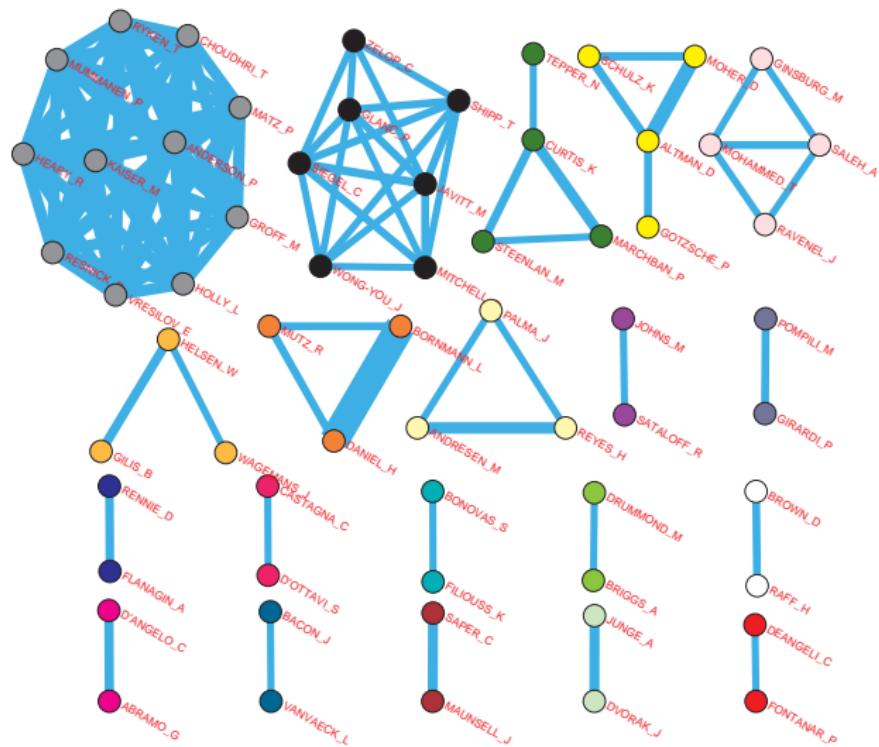
Normalized collaboration / link cut at level 2

$$Cn = N^T * N$$

Peer Review
from WoS
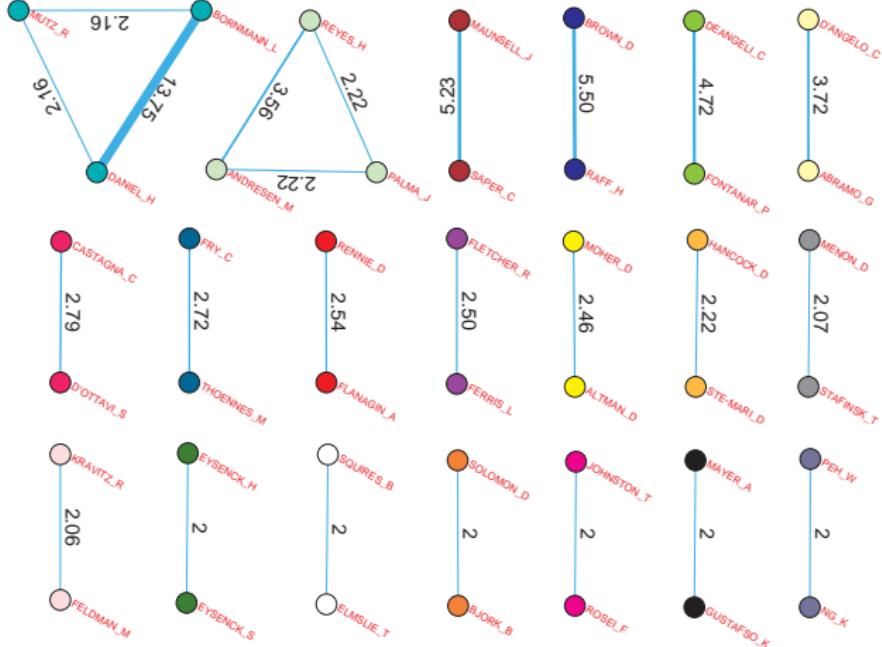
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A. Ferligoj

Citations

Collaboration
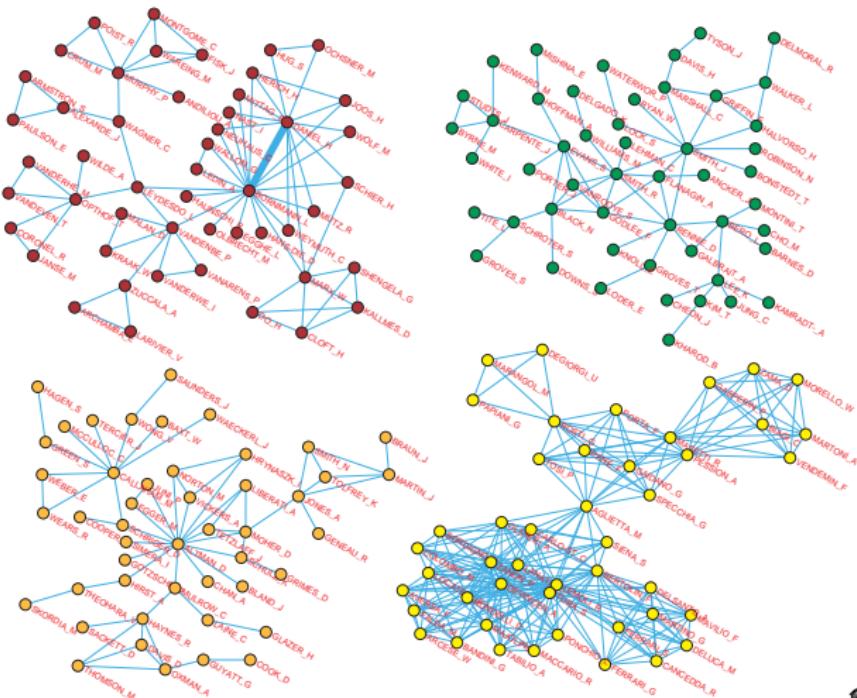
References

AK indeg ; $AK = WA^T * WK$

Main keywords for selected islands

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i	f	Island14	f	Island21	f	Island19	f	Island1
1	163	review	150	review	180	quality	65	cell
2	136	peer	118	peer	165	trial	59	leukemia
3	78	journal	106	quality	143	review	58	colony-stimulating
4	72	science	90	publication	129	randomize	58	factor
5	62	citation	85	trial	104	statement	51	chronic
6	60	analysis	63	research	102	report	51	myelogenous
7	58	research	58	recommendation	101	peer	48	transplantation
8	55	publication	56	report	92	journal	47	stem
9	55	manuscript	54	journal	85	publication	40	myeloid-leukemia
10	50	study	52	biomedical	81	bias	36	hematopoietic
11	47	grant	43	randomize	77	clinical-trials	33	disease
12	46	quality	39	control	74	research	32	peripheral
13	46	validity	37	bias	73	guideline	32	blood
14	45	selection	37	referee	69	systematic	32	cord
15	42	bias	35	effect	68	medical	32	marrow
16	41	angewandte-chemie	35	reviewer	63	control	32	bone
17	41	impact	33	health	59	consort	32	allogeneic
18	41	scientific	32	congress	57	controlled-trials	30	use
19	38	decision	31	peer-review	54	recommendation	29	clinical
20	36	indicator	30	risk	53	health	28	t-lymphocytes
21	36	performance	30	international	50	reviewer	28	human
22	36	index	25	standard	50	analysis	28	dendritic
23	31	committee	24	medical	50	clinical	28	cytotoxic
24	30	effect	24	clinical	49	article	26	bone-marrow
25	29	chemistry	22	therapy	47	outcome	22	source
26	28	referee	22	manuscript	46	editor	22	versus-host
27	28	predictive-validity	22	intervention	45	elaboration	22	peripheral-blood
28	28	process	22	subcommittee-a	45	study	22	umbilical-cord-blood
29	28	reliability	21	cancer	44	explanation	22	graft-versus-host
30	25	use	21	impact	42	metaanalysis	21	natural-killer-cells
31	25	reviewer	21	woman	42	intervention	21	long-term
32	23	predictive	20	surgery	38	improve	21	graft-versus-leukemia
33	23	case	20	improve	38	protocol	20	progenitor
34	23	evaluation	20	analysis	37	randomise	18	tumor-necrosis-factor
35	22	count	20	author	37	author	17	antigen-presenting
36	22	editor	19	peer-reviewed	36	manuscript	16	chemotherapy
37	21	physics	19	article	35	meta-analyses	15	therapy
38	21	approach	19	science	34	care	15	high-dose

AJ indeg ; $AJ = WA^T * WJ$

Main journals for selected islands

| i	f	Island14	f	Island21	f	Island19	f	Island1
1	19	SCIENTOMETRICS	80	JAMA-J AM MED ASSOC	47	JAMA-J AM MED ASSOC	65	HAEMATOLOGICA
2	12	RES EVALUAT	39	BRIT MED J	39	*****	17	ADV THER
3	7	J INFORMETR	32	J ASSOC OFF AGR CHEM	31	BRIT MED J		
4	6	J AM SOC INF SCI TEC	8	ANN INTERN MED	28	ANN EMERG MED		
5	5	J R STAT SOC A STAT	7	J GEN INTERN MED	26	ANN INTERN MED		
6	5	PLOS ONE	7	J ROY SOC MED	23	PLOS MED		
7	4	NETH HEART J	6	MATURITAS	19	BMJ-BRIT MED J		
8	4	ACAD MED	5	TOB CONTROL	18	J CLIN EPIDEMIOL		
9	4	NEUROPSYCHOBIOLOGY	5	LANCET	15	LANCET		
10	4	HUM PSYCHOPHARM CLIN	4	J EPIDEMIOL COMMUN H	14	TRIALS		
11	4	AM J NEURORADIOL	4	BMJ-BRIT MED J	8	BMJ OPEN		
12	3	J DOC	4	CLIN TRIALS	7	BMC MED		
13	3	Z ERZIEHWISS	4	CONTROL CLIN TRIALS	5	PLOS ONE		
14	3	HIGH EDUC	4	BMJ OPEN	6	CAN MED ASSOC J		
15	3	TRANSPORT J	3	PUBLIC HEALTH REP	5	ANASTH INTENSIVMED		
16	3	EUR HEART J	3	BMC MED	5	STAT MED		
17	3	CARDIOVASC RES	3	HEAD NECK-J SCI SPEC	4	ERGONOMICS		
18	3	Z PSYCHOL	3	J NATL COMPR CANC NE	4	MED CLIN-BARCELONA		
19	3	RES TEACH ENGL	3	J AM COLL RADIOL	4	JAMA		
20	3	REV EDUC RES	3	J CLIN EPIDEMIOL	4	J BONE JOINT SURG AM		
21	3	INT J PERF ANAL SPOR	3	NEW ENGL J MED	4	J SPORT SCI		
22	2	INT J SELECT ASSESS	3	STAT METHODS MED RES	4	J HUM MOVEMENT STUD		
23	2	LEARN PUBL	2	SCI ENG ETHICS	4	FORENSIC SCI INT		
24	2	AM J EVAL	2	VALUE HEALTH	3	CLEFT PALATE-CRAN J		
25	2	J MIDWIFERY WOM HEAL	2	J ASSOC OFF ANA CHEM	3	REGION ANESTH		
26	2	LIBR INFORM SCI RES	2	ONCOL NURS FORUM	3	MED J AUSTRALIA		
27	2	ANGEW CHEM INT EDIT	2	J AM ACAD NURSE PRAC	2	VALUE HEALTH		
28	2	CHIMIA	2	MED J AUSTRALIA	2	INT J CLIN PRACT		
29	2	EDUC RES REV-NETH	2	AUST LIBR J	2	MARKET LETT		
30	2	HIGH EDUC POLICY	2	J NANOSCI NANOTECHNO	2	MED KLIN-INTENSIVMED		
31	1	ANNU REV INFORM SCI	2	PREV SCI	2	COCHRANE DB SYST REV		
32	1	THEOR MED BIOETH	2	ENVIRON ENG SCI	2	APPL PSYCHOPHYS BIOF		
33	1	QUAL SAF HEALTH CARE	2	B MED LIBR ASSOC	2	GLOBAL HEALTH ACTION		
34	1	OSTEOPOROSIS INT	2	APPL VEG SCI	2	ANAESTHESIST		
35	1	EUR J OBSTET GYN R B	2	SCHOLARLY PUBL	2	CHEST		

Author citation / link cut at level 20

$$Aci = WA^T * Ci * WA$$

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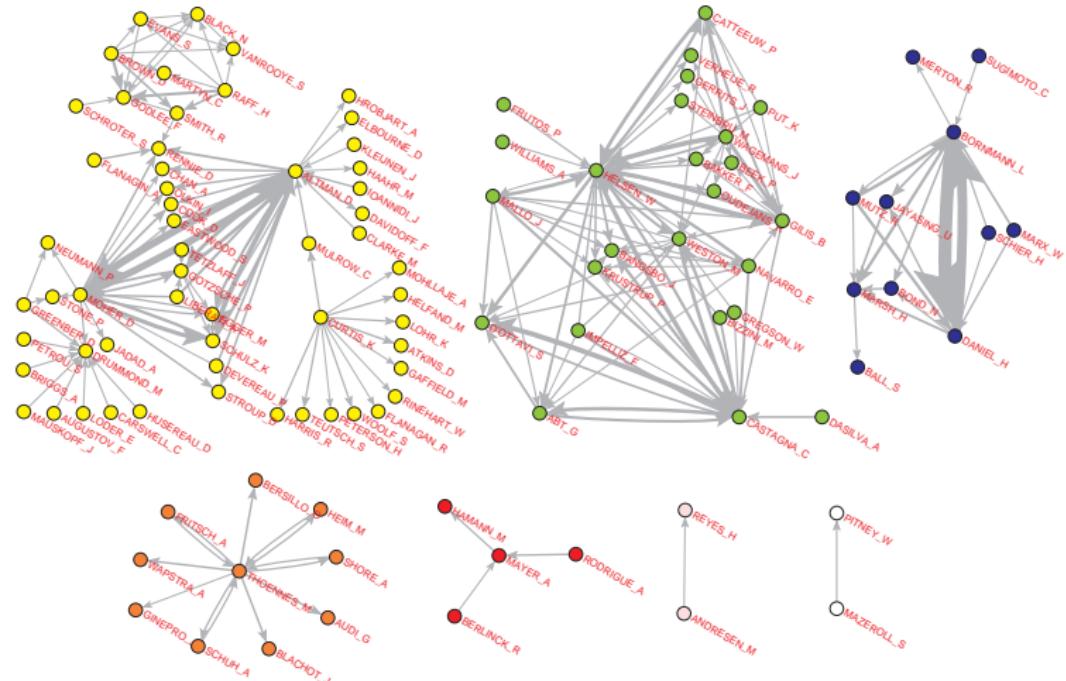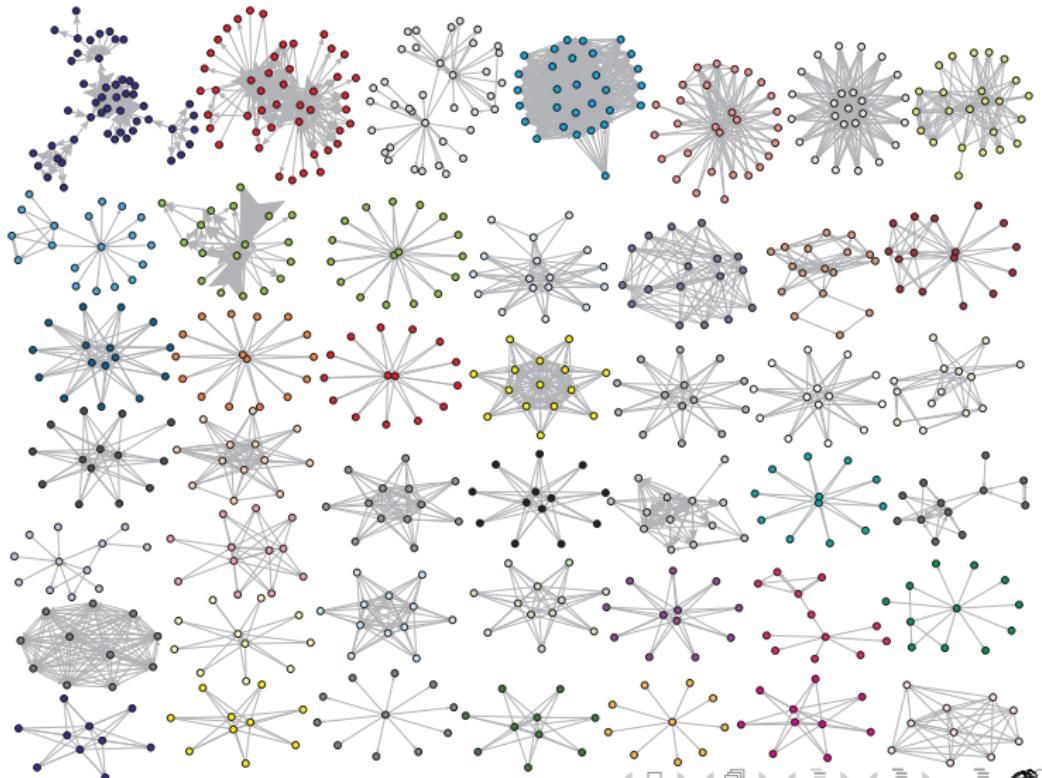
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A. Ferligoj

Citations
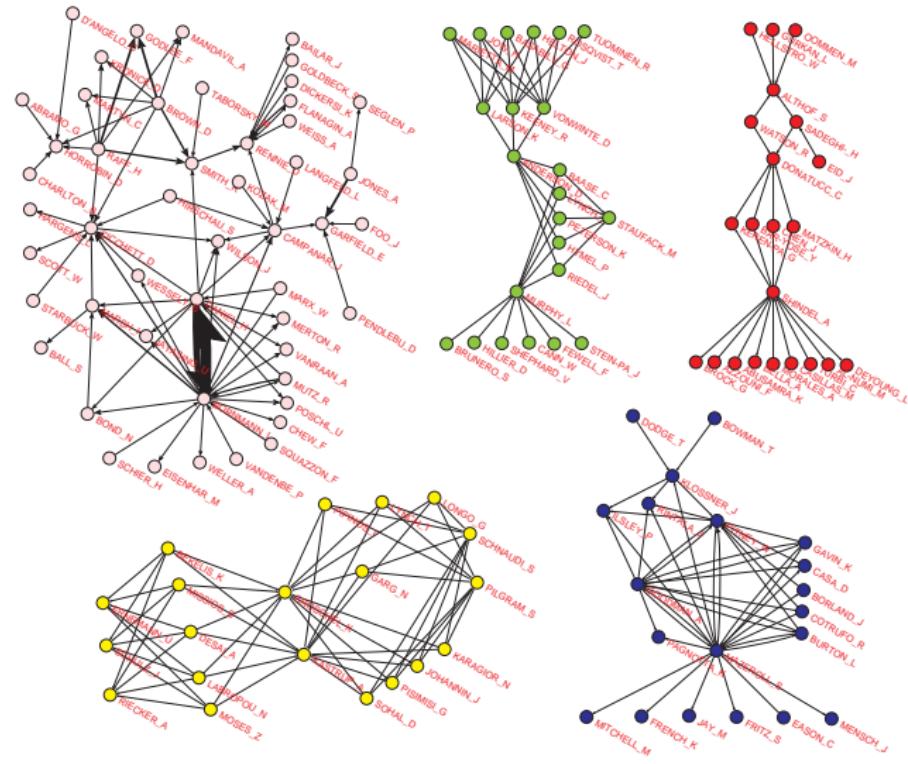
Collaboration

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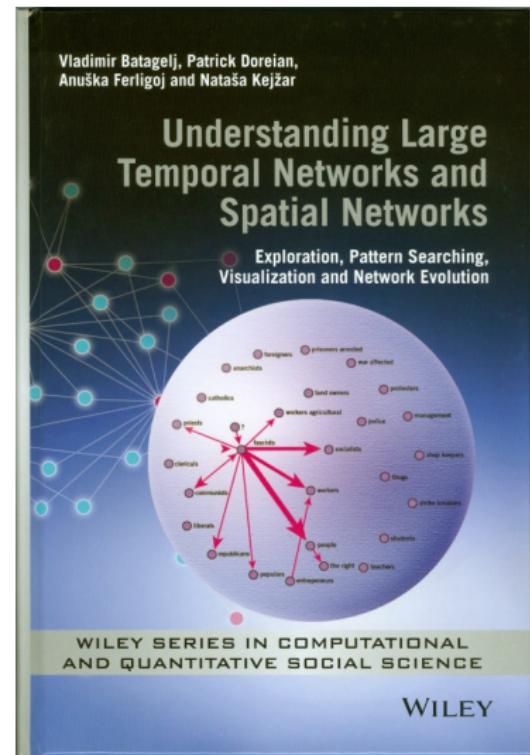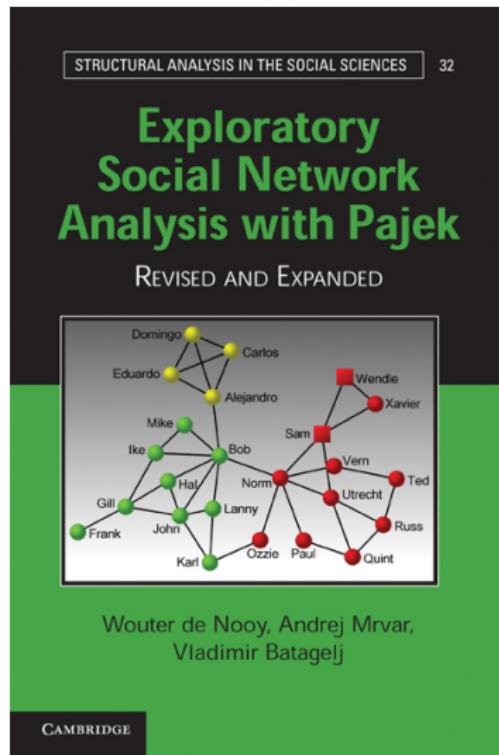
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