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Graph-based ranking algorithms

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UNIVERSITAT
ROVIRA I VIRGILI

Why analyze bibliographic data?

Scientific motivation

Electronic databases store a huge amount of information about scientific publications (only in 2006, Journals $\sim 10^4$ Papers $\sim 10^6$ Citations $\sim 10^7$)

SCOPUS

GoogleTM
Scholar BETA

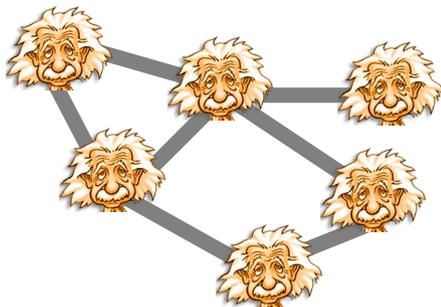
CiteSeer.IST
Scientific Literature Digital Library

SPIRES

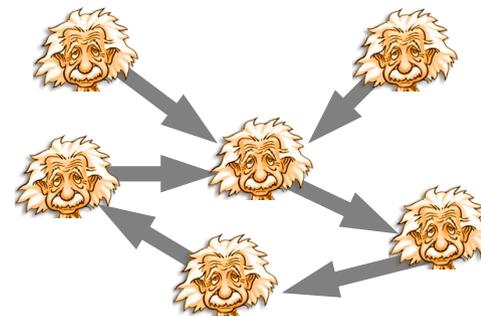
ISI Web of KnowledgeSM

citebase

Collaboration networks



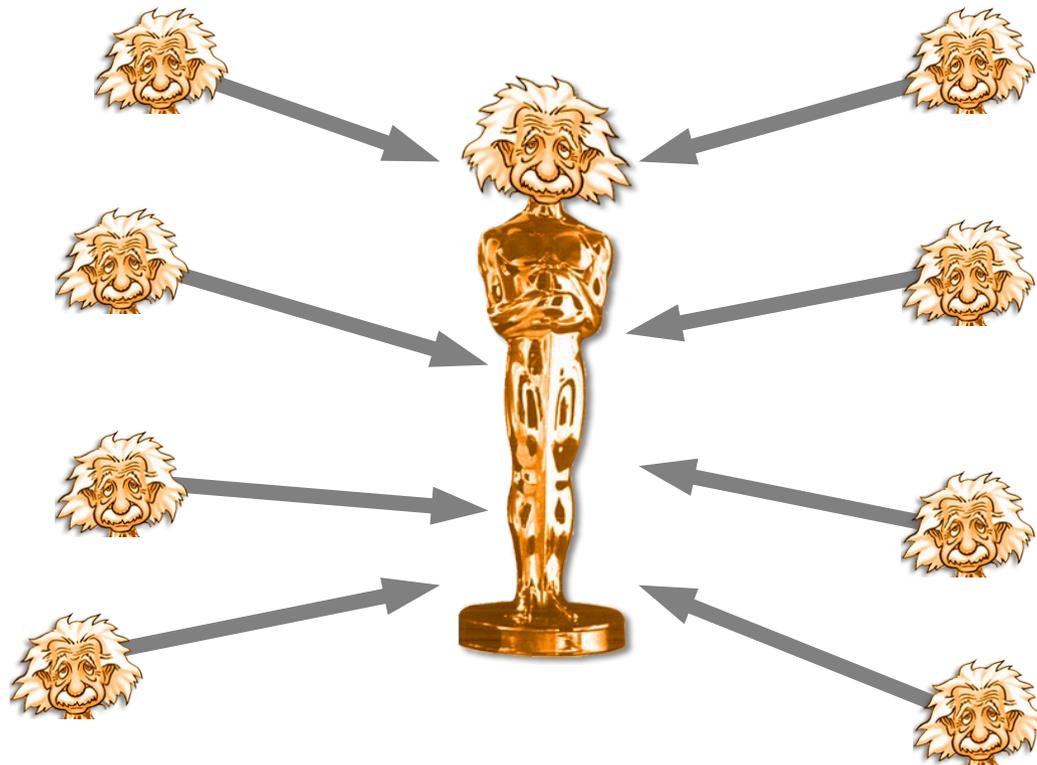
Citation networks



Why analyze bibliographic data?

Practical motivation

Citations represent the fundamental units used to measure the **scientific relevance** of papers, journals, scientists, research groups and institutions



A practical example

Discipline	Researcher	Ass. Professor	Full Professor
Mathematics	$P \geq 1$ in $T \leq 5$	(1) $P \geq 5$ in $T \leq 7$ (2) $P \geq 0.8 \cdot T$, if $T < 13$ (3) $P \geq 10$, if $T > 13$	(1) $P \geq 8$ in $T \leq 10$ (2) $P \geq T$, if $T < 20$ (3) $P \geq 20$, if $T > 20$ $C \geq 10$
Physics	$P \geq 5$ in $T \leq 5$	$P \geq 7$ in $T \leq 7$ and $C \geq 50$	$P \geq 10$ in $T \leq 10$ and $C \geq 100$
Biology	$P \geq 5$ and $P \geq 3$ in $T \leq 5$	$P \geq 20$ and $P \geq 10$ in $T \leq 8$	$P \geq 30$ and $P \geq 15$ in $T \leq 10$
Computer Sci.	$P \geq 2$ with $C \geq 2$ each	$P \geq 5$ with $C \geq 5$ each	$P \geq 7$ with $C \geq 7$ each
Chemistry	$\sum_{j=1}^P \text{IF}_j \geq 7 \cdot \langle \text{IF} \rangle$	$\sum_{j=1}^P \text{IF}_j \geq 1.1 \cdot 25 \cdot \langle \text{IF} \rangle$	$\sum_{j=1}^P \text{IF}_j \geq 1.2 \cdot 45 \cdot \langle \text{IF} \rangle$

P = # publications, T = period of activity, C = total # of citations

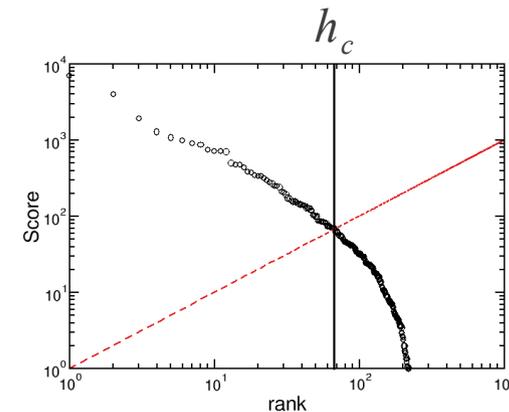
A practical example

1) Number of papers: $I(N_p, A_A) = \frac{10 N_p}{A_A}$

2) Total number of citations: $I(N_C, A_A) = \frac{N_C}{A_A}$

3) Contemporary h-index: $S(i, t_i, t) = \frac{4}{(t - t_i + 1)} C(i, t_i, t)$

A. Sidiropoulos et al., *Scientometrics* **72**, 253 (2007)



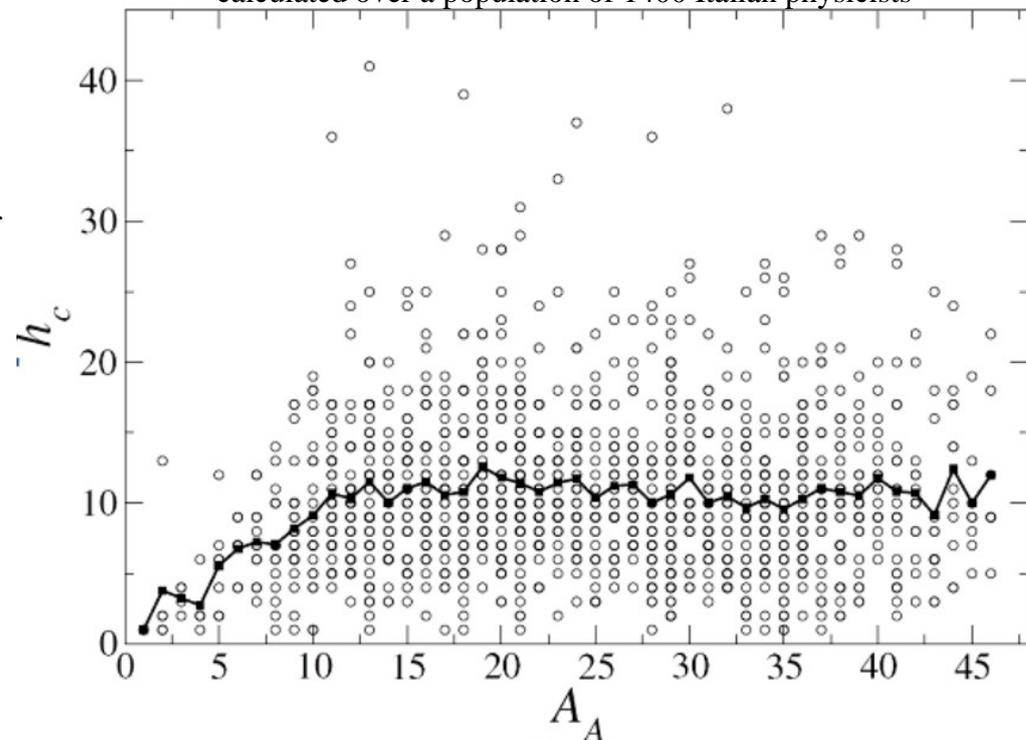
N_p total number of papers

A_A academic age

N_C total number of citations

$C(i, t_i, t)$ citations accumulated by paper i published in year t_i and measured in year t

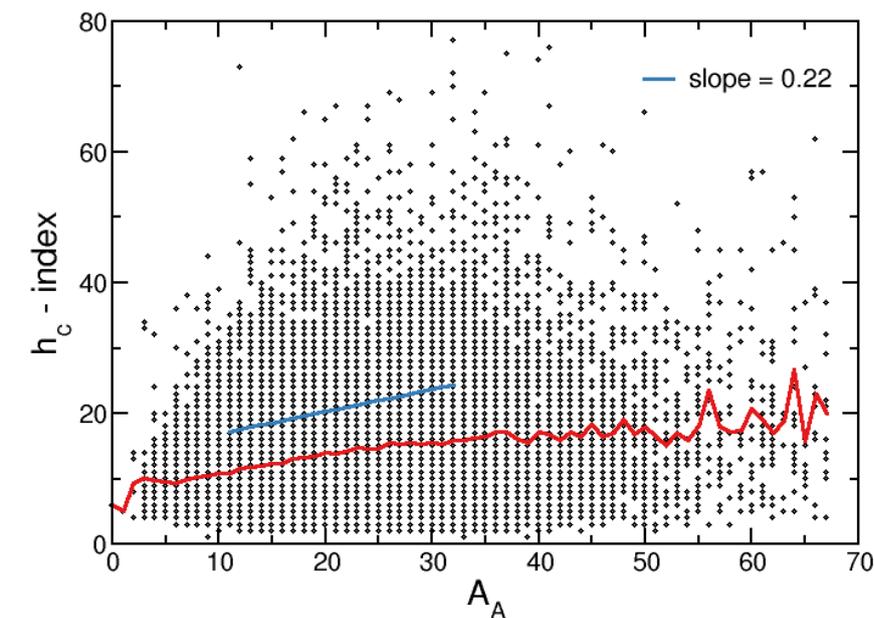
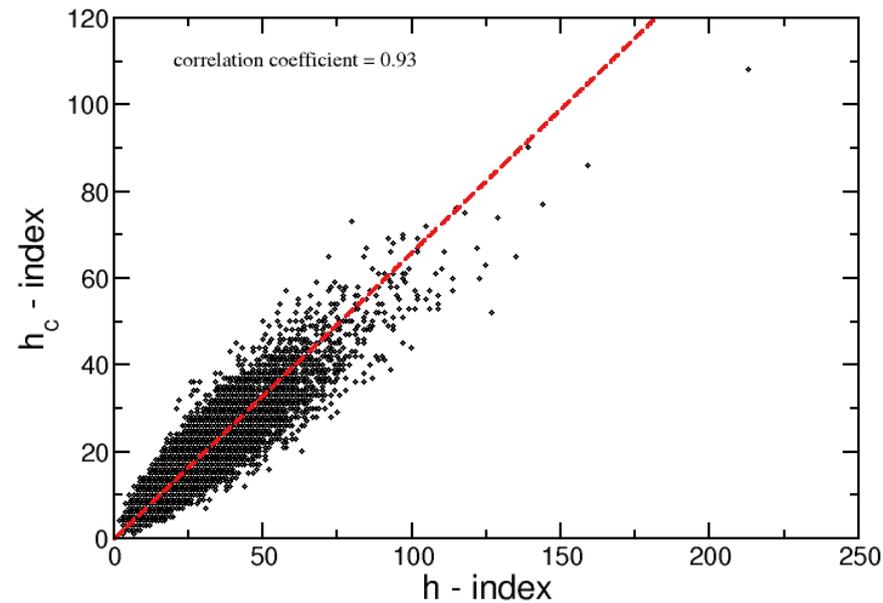
calculated over a population of 1400 Italian physicists



R. Manella and P. Rossi, arXiv:1207.3499 (2012)

On a larger sample of scientists

35000 profiles on Google Scholar citations



Filippo Radicchi [Edit](#)

Ramón y Cajal Researcher, Department of Chemical Engineering, Universitat Rovira i Virgili [Edit](#)

[Complex Systems - Networks - Science of Science - Sport Statistics](#) [Edit](#)

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Verified email at urv.cat [Edit](#)

My profile is public [Edit](#) [Link](#) [Homepage](#) [Edit](#)

Citation indices

	All	Since 2007
Citations	1662	1506
h-index	14	14
i10-index	16	16

Citations to my articles

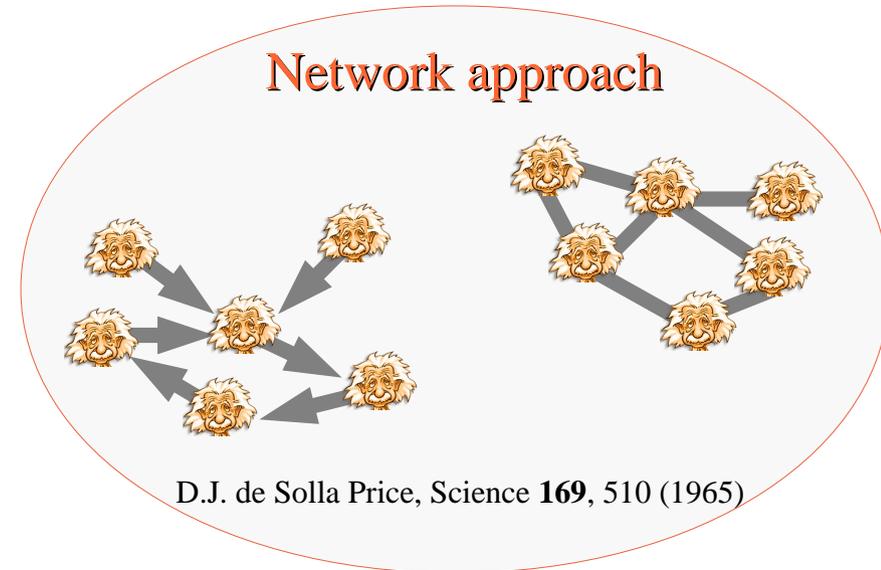
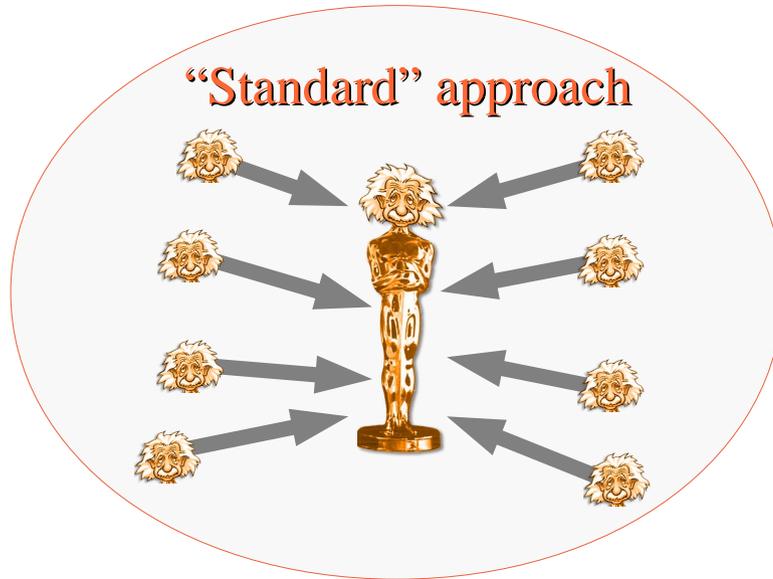


Select: [All](#), [None](#) [Actions](#)

Show: [20](#) [1-20](#) [Next >](#)

Title / Author	Cited by	Year
Defining and identifying communities in networks <input type="checkbox"/> F Radicchi, C Castellano, F Cecconi, V Loreto, D Parisi Proceedings of the National Academy of Sciences of the United States of ...	854	2004
Benchmark graphs for testing community detection algorithms <input type="checkbox"/> A Lancichinetti, S Fortunato, F Radicchi Physical Review E 78 (4), 046110	227	2008
Universality of citation distributions: Toward an objective measure of scientific impact <input type="checkbox"/> F Radicchi, S Fortunato, C Castellano Proceedings of the National Academy of Sciences 105 (45), 17268	112	2008
Diffusion of scientific credits and the ranking of scientists <input type="checkbox"/> F Radicchi, S Fortunato, B Markines, A Vespignani Physical Review E 80 (5), 056103	69	2009
Explosive percolation in scale-free networks <input type="checkbox"/> F Radicchi, S Fortunato Physical review letters 103 (16), 168701	54	2009
Explosive percolation: A numerical analysis <input type="checkbox"/> F Radicchi, S Fortunato Physical Review E 81 (3), 036110	50	2010
Finding statistically significant communities in networks <input type="checkbox"/> A Lancichinetti, F Radicchi, JJ Ramasco, S Fortunato PloS one 6 (4), e18961	40	2011
Self-similar scale-free networks and disassortativity <input type="checkbox"/> SH Yook, F Radicchi, H Meyer-Ortmanns Physical Review E 72 (4), 045105	36	2005
Complex networks renormalization: Flows and fixed points <input type="checkbox"/> F Radicchi, JJ Ramasco, A Barrat, S Fortunato Physical review letters 101 (14), 148701	32	2008

The network structure of citation data is often neglected in research evaluation



papers

Citation counts

CiteRank

journals

Impact factor

Eigenfactor

scientists

h-index, g-index, ...

?

Graph-based ranking of scientists

Physical Review Series I (**PRI**), Physical Review (**PR**), Physical Review Letters (**PRL**), Physical Review A (**PRA**), Physical Review B (**PRB**), Physical Review C (**PRC**), Physical Review D (**PRD**), Physical Review E (**PRE**), Reviews of Modern Physics (**RMP**) between 1893 and 2006

PHYSICAL REVIEW B

VOLUME 23, NUMBER 10

15 MAY 1981

Self-interaction correction to density-functional approximations for many-electron systems

J. P. Perdew

Department of Physics and Quantum Theory Group, Tulane University, New Orleans, Louisiana 70118

Alex Zunger

*Solar Energy Research Institute, Golden, Colorado 80401
and Department of Physics, University of Colorado, Boulder, Colorado 80302*

(Received 31 October 1980)

¹E. Fermi and E. Amaldi, *Accad. Ital. Rome* **6**, 119 (1934).

²J. C. Slater and J. H. Wood, *Int. J. Quantum Chem.* **4**, 3 (1971).

³N. W. Ashcroft and N. D. Mermin, *Solid State Physics* (Holt, Rinehart and Winston, New York, 1976).

⁴A. B. Kunz, *Phys. Rev. B* **12**, 5890 (1975).

⁵J. C. Slater, *The Self-Consistent Field for Molecules and Solids* (McGraw-Hill, New York, 1974).

⁶P. Hohenberg and W. Kohn, *Phys. Rev.* **136**, B864 (1964).

⁷W. Kohn and L. J. Sham, *Phys. Rev.* **140**, A1133 (1965).

⁸U. von Barth and L. Hedin, *J. Phys. C* **5**, 1629 (1972).
Also A. K. Rajagopal and J. Callaway, *Phys. Rev. B* **7**, 1912 (1973).

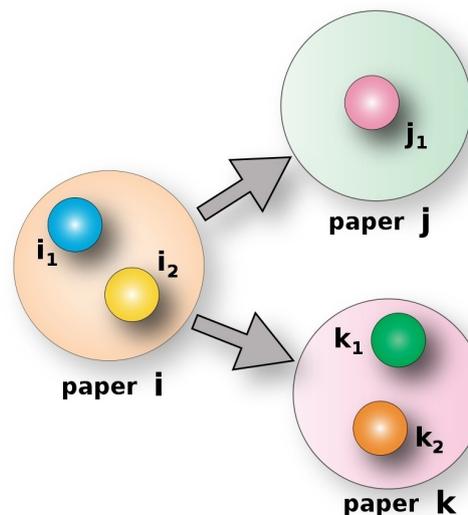
⁹O. Gunnarsson, B. I. Lundqvist, and J. W. Wilkins, *Phys. Rev. B* **10**, 1319 (1974).

¹⁰O. Gunnarsson, J. Harris, and R. O. Jones, *J. Chem. Phys.* **67**, 3970 (1977).

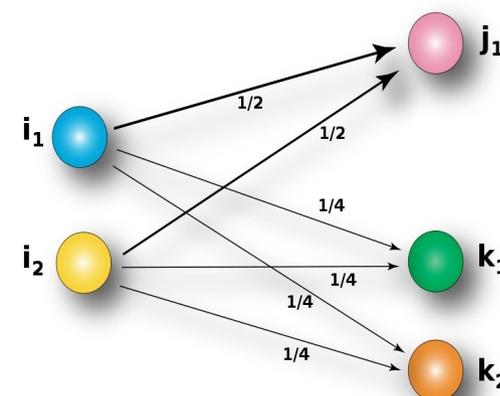
¹¹B. I. Dunlap, J. W. Connolly, and J. R. Sabin, *J. Chem. Phys.* **71**, 4993 (1979).

¹²V. L. Moruzzi, J. F. Janak, and A. R. Williams, *Calculated Electronic Properties of Metals* (Pergamon, New York, 1978).

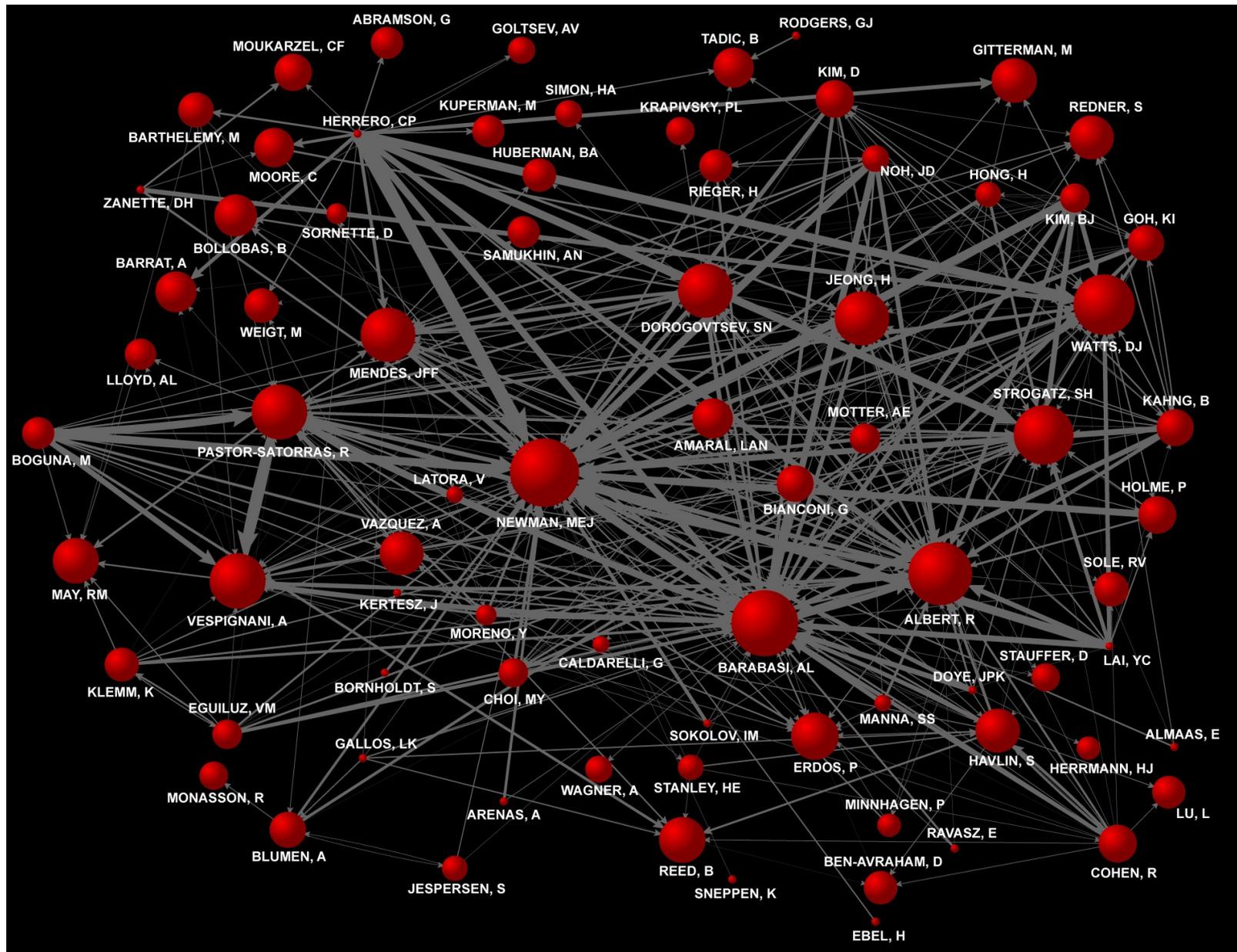
Paper Citation Network



Weighted Author Citation Network



Weighted author citation network



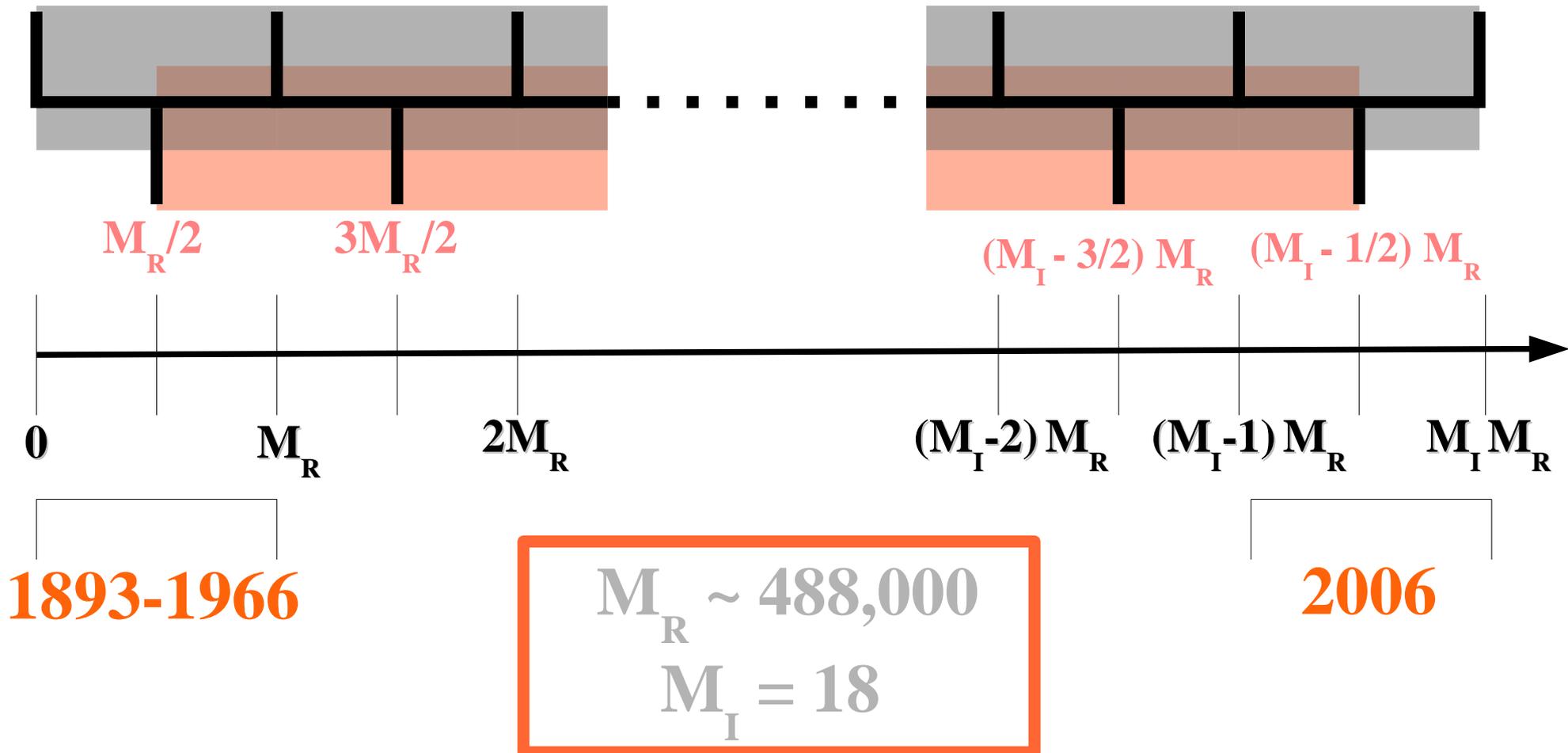
key-words: "complex network", "scale-free network", "small-world network", etc..

Dynamical representation

Divide 8,783,994 total references into homogeneous intervals

$M_I = \#$ of intervals

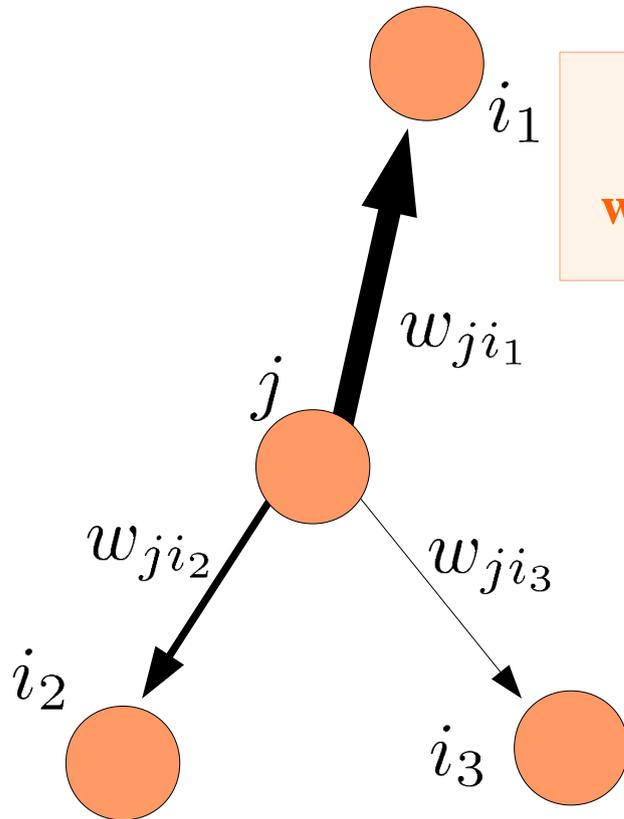
$M_R = \#$ of references in each interval



Science Author Rank Algorithm

Diffusion equation

$$P_i = (1 - q) \sum_j \frac{P_j}{s_j^{out}} w_{ji} + q z_i + (1 - q) z_i \sum_j P_j \delta(s_j^{out})$$



$$w_{ji}$$

weight of the arc from j to i

$$s_j^{out} = \sum_i w_{ji}$$

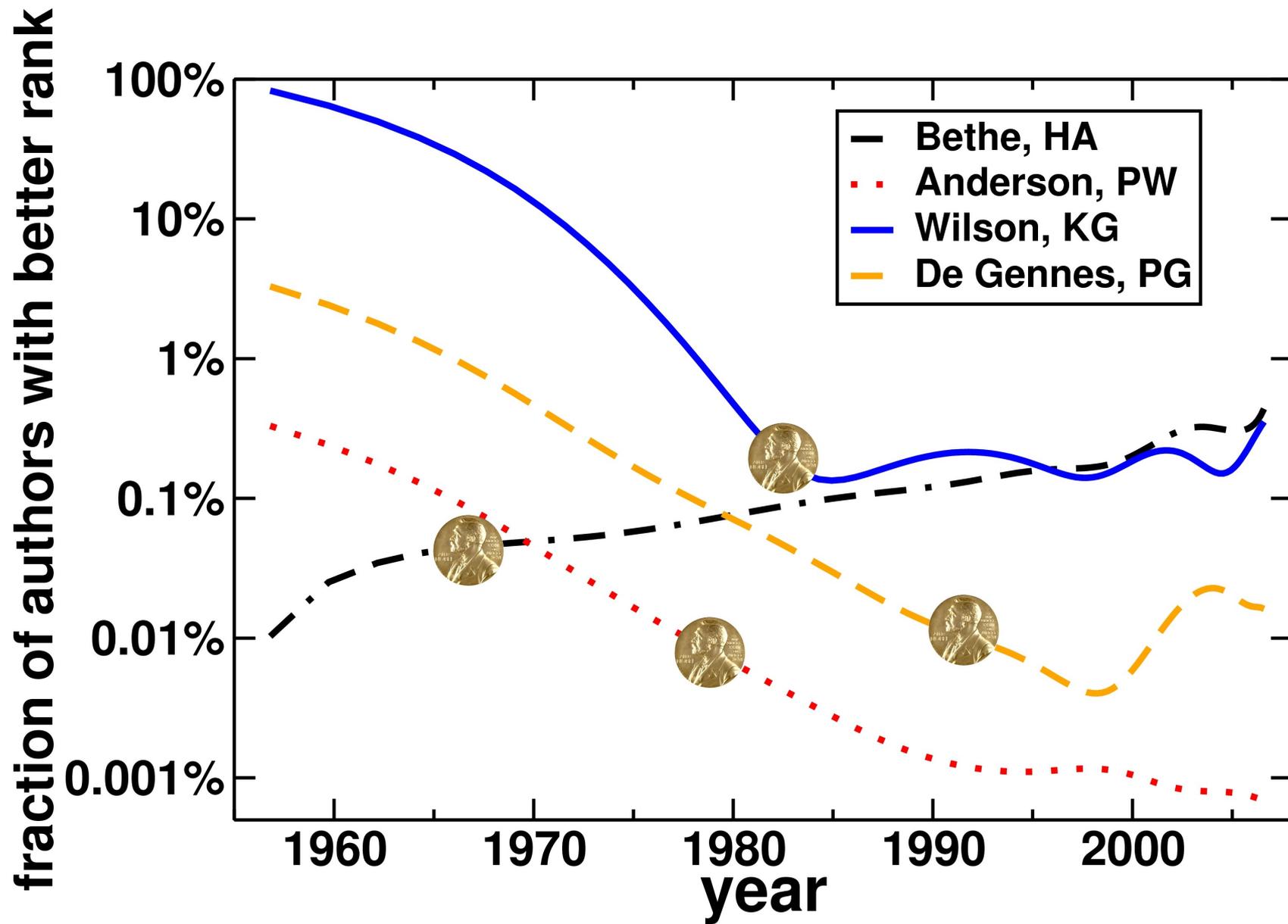
out-strength of the node j

$$z_i = \frac{\sum_p \delta_{p,i} 1/n_p}{\sum_j \sum_p \delta_{p,j} 1/n_p}$$

each paper carries a "scientific credit", equally divided among its authors

SARA scores depend on the choice of the redistribution probability q

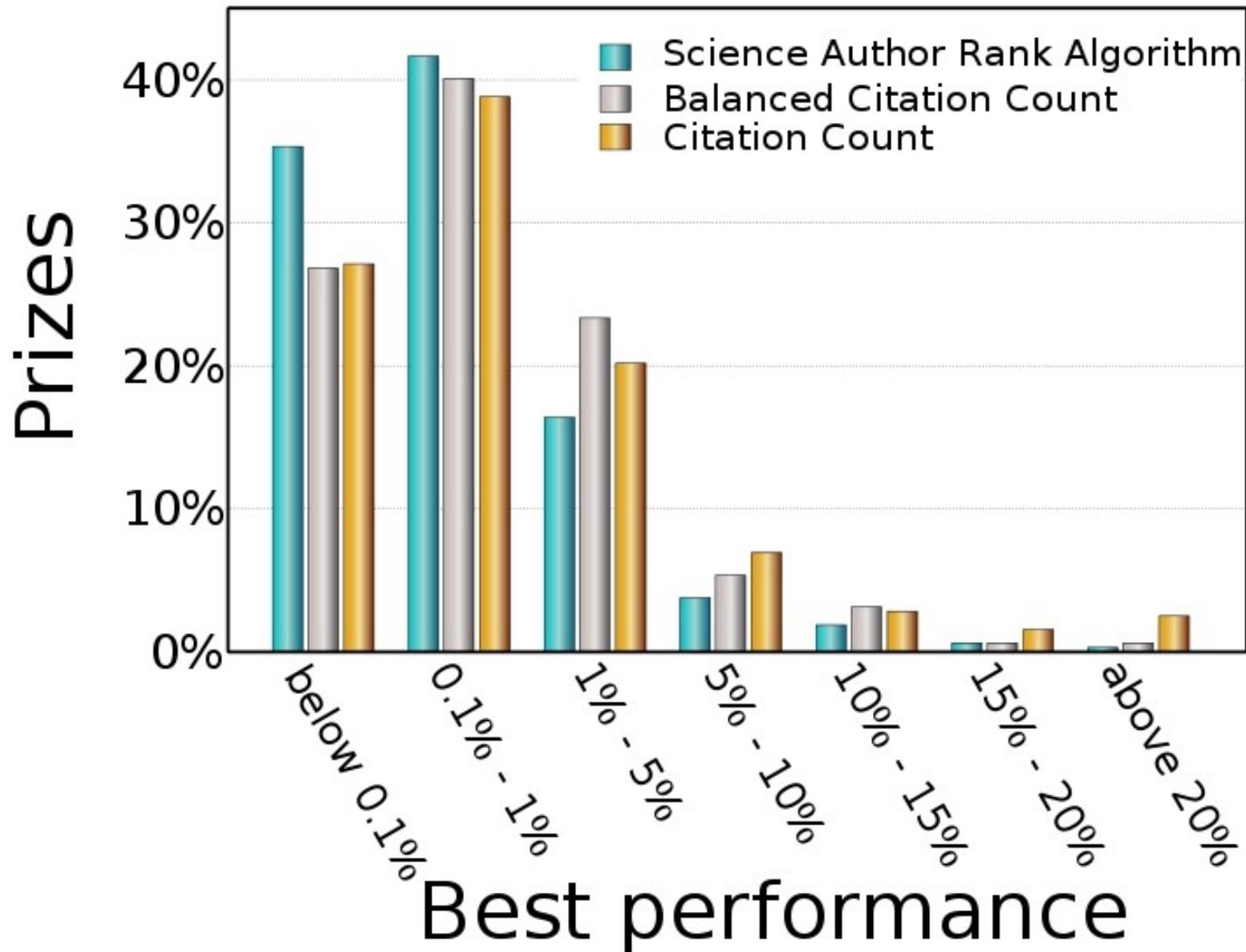
Science Author Rank Algorithm



$$R_i = 1/N \sum_{j \neq i} \theta(P_j - P_i)$$

Comparison with different metrics

Benchmarking SARA



Considered prizes: Nobel prize, Wolf prize, Boltzmann medal, Dirac medal and Planck medal

Best physicists according to SARA

1973

Rank	Author	NP	WP	BM	DM	PM
1	GELL-MANN, M	1969	-	-	-	-
2	WEINBERG, S	1979	-	-	-	-
3	SCHWINGER, J	1965	-	-	-	-
4	FEYNMAN, RP	1965	-	-	-	-
5	LEE, TD	1957	-	-	-	-
6	ANDERSON, PW	1977	-	-	-	-
7	BJORKEN, JD	-	-	-	2004	-
8	YANG, CN	1957	-	-	-	-
9	SLATER, JC	-	-	-	-	-
10	ADLER, SL	-	-	-	1998	-
11	GLAUBER, RJ	2005	-	-	-	-
12	CHEW, GF	-	-	-	-	-
13	WIGNER, EP	1963	-	-	-	1961
14	LOVELACE, C	-	-	-	-	-
15	SATCHLER, GR	-	-	-	-	-
16	MOTT, NF	1977	-	-	1985	-
17	FISHER, ME	-	1980	1983	-	-
18	MANDELSTAM, S	-	-	-	1991	-
19	BETHE, HA	1967	-	-	-	1955
20	PHILLIPS, JC	-	-	-	-	-

2004

Rank	Author	NP	WP	BM	DM	PM
1	ANDERSON, PW	1977	-	-	-	-
2	WITTEN, E	-	-	-	1985	-
3	TOKURA, Y	-	-	-	-	-
4	PERDEW, JP	-	-	-	-	-
5	KOHN, W	-	-	-	-	-
6	KRESSE, G	-	-	-	-	-
7	BÜTTIKER, M	-	-	-	-	-
8	WEINBERG, S	1979	-	-	-	-
9	CIRAC, JI	-	-	-	-	-
10	ZUNGER, A	-	-	-	-	-
11	BARABÁSI, AL	-	-	-	-	-
12	LEE, PA	-	-	-	2005	-
13	VANDERBILT, D	-	-	-	-	-
14	SACHDEV, S	-	-	-	-	-
15	NEWMAN, MEJ	-	-	-	-	-
16	AFFLECK, I	-	-	-	-	-
17	MACDONALD, AH	-	-	-	-	-
18	HIRSCH, JE	-	-	-	-	-
19	ZOLLER, P	-	-	-	2006	2005
20	PARISI, G	-	-	1992	1999	-

NP= Nobel prize, WP= Wolf prize, BM= Boltzmann medal, DM= Dirac medal, and PM= Planck medal

Phys Author Rank Algorithm

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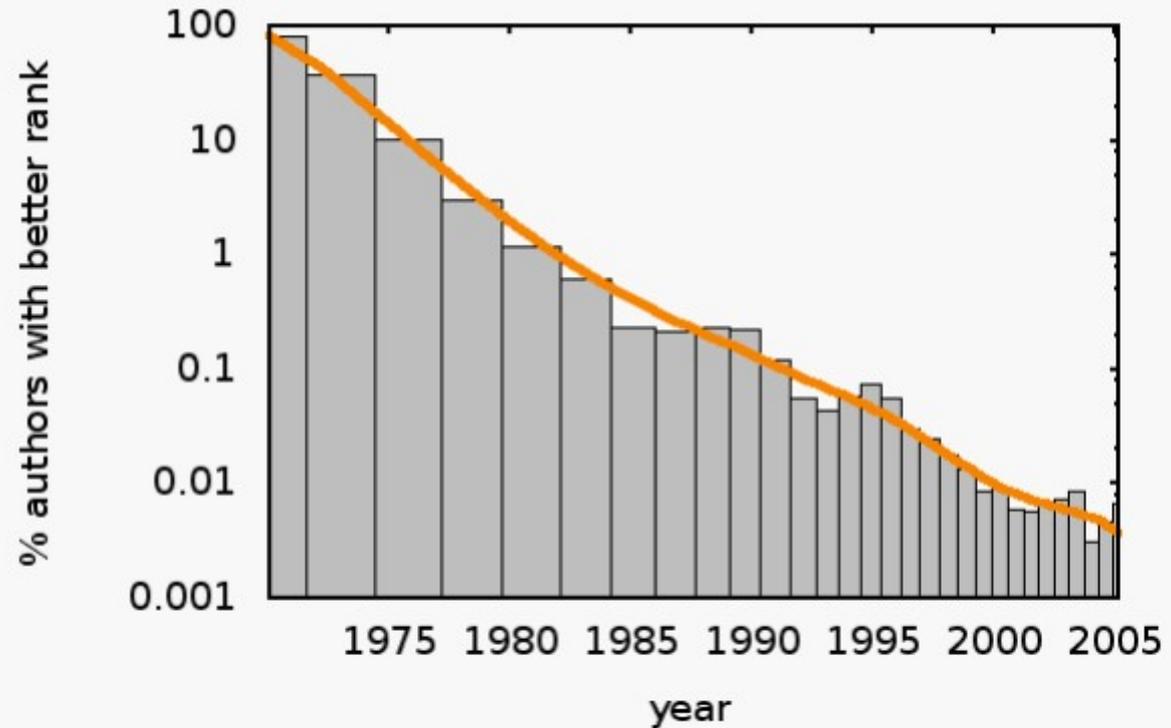
Author Search

Search/Rank

Insert the lastname eventually followed by the initials of the author as in "Bethe HA"

Rank's evolution

Rank analysis for **PERDEW, JP**

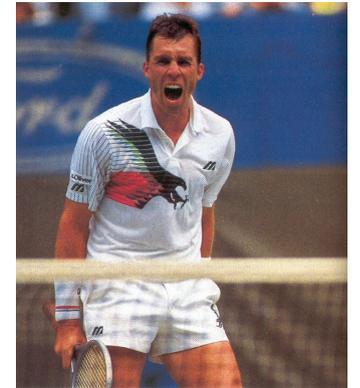
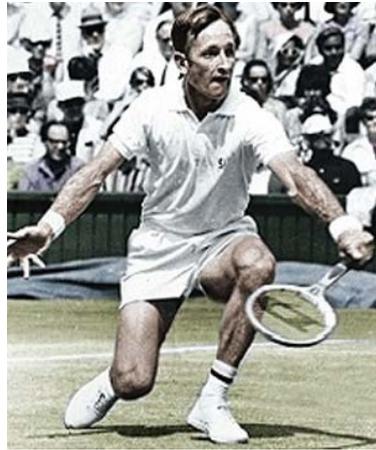
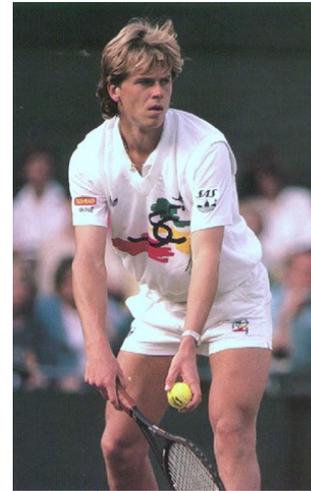


Best performance **0.0031%**

Last performance **0.0069%**

physauthorsrank.org

Ranking tennis players



ATP points distribution as of 2009

Tournament category	W	F	SF (3rd/4th)	QF	R16	R32	R64	R128	Additional qualifying points	
Grand Slam	2000	1200	720	360	180	90	45	10	25	
ATP World Tour Finals	1500 [^] 1100 ^m	1000 [^] 600 ^m	600 [^] 200 ^m	(200 for each round robin match win, +400 for a semifinal win, +500 for the final win)						
Masters 1000	1000	600	360	180	90	45	10 (25)	(10)	25	
Olympics	750	450	340 (bronze) 270 (4th)	135	70	35	5			
500 Series	500	300	180	90	45	(20)			20	
250 Series	250	150	90	45	20	(5)			12	

source: wikipedia.org

Grand Slams: Australian Open, Roland Garros, Wimbledon, US Open

4

Masters 1000: Indian Wells, Miami, Monte Carlo, Madrid, Rome, Canada, Cincinnati, Shanghai, Paris

9

500 Series: Rotterdam, Memphis, Acapulco, Dubai, Barcelona, Hamburg, Washington, Beijing, Tokyo, Basel, Valencia

11

250 Series: Doha, Chennai, Brisbane, Sydney, Auckland,

40

Best results in **18** tournaments: **4 Grand Slams**, **8 Masters 1000**, best **4** results in **500 Series** and best **2** results in **250 Series**

ATP World Tour Finals: reserved to the best 8 players in the ranking

ATP points 2009

Tournament Category	W	F	SF (3rd/4th)	QF	R16	R32	R64	R128	Additional qualifying points	
Grand Slam	2000	1200	720	360	180	90	45	10	25	
ATP World Tour Finals	1500 [^] 1100 ^m	1000 [^] 600 ^m	600 [^] 200 ^m	(200 for each round robin match win, +400 for a semifinal win, +500 for the final win)						
Masters 1000	1000	600	360	180	90	45	10 (25)	(10)	25	
500 Series	500	300	180	90	45	(20)			20	
250 Series	250	150	90	45	20	(5)			12	

ATP points 2008

Tournament Category	Total Financial commitment [€]	W	F	SF (3rd/4th)	QF	R16	R32	R64	R128	Additional qualifying points
Grand Slam	\$6,784,000 to \$9,943,000	1000	700	450	250	150	75	35	5	15
Tennis Masters Cup	\$4,450,000	750 [^] 550 ^m	500 [^] 300 ^m	300 [^] 100 ^m	(100 for each round robin match win, +200 for a semifinal win, +250 for the final win)					
ATP Masters Series	\$2,450,000 to \$3,450,000	500	350	225	125	75	35	5(20)	(5)	15*
Olympics		400	280	205/155	100	50	25	5		
International Series Gold	\$1,000,000	300	210	135	75	25	0(15)	(0)		10*
International Series Gold	\$800,000	250	175	110	60	25	0(15)	(0)		10*
International Series	\$1,000,000	250	175	110	60	25	0(15)	(0)		10*

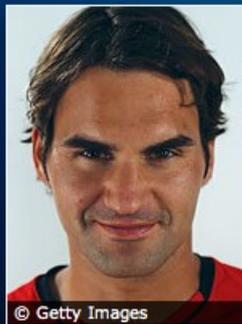
ATP data cover all tournaments since 1968

RESULTS ARCHIVE

2010		Grand Slams			
Date DD.MM.YYYY	Tournament	Surface	Prize Money (Total Financial Commitment)	Draw	Winners
18.01.2010	Australian Open Australia Grand Slams	Outdoor Hard	A\$11,048,640 (A\$11,048,640)	SGL 128 DBL 64	Singles: Roger Federer Doubles: Mike Bryan, Bob Bryan
24.05.2010	Roland Garros France Grand Slams	Outdoor Clay	€7,580,800 (€7,580,800)	SGL 128 DBL 64	Singles: Rafael Nadal Doubles: Nenad Zimonjic, Daniel Nestor
21.06.2010	Wimbledon Great Britain Grand Slams	Outdoor Grass	£6,196,000 (£6,196,000)	SGL 128 DBL 64	Singles: Rafael Nadal Doubles: Philipp Petzschner, Jurgen Melzer
30.08.2010	US Open NY, U.S.A. Grand Slams	Outdoor Hard	\$10,508,000 (\$10,508,000)	SGL 128 DBL 64	Singles: Rafael Nadal Doubles: Mike Bryan, Bob Bryan

ROGER FEDERER

Print
Email



© Getty Images

Age: 30 (08.08.1981)
Birthplace: Basel, Switzerland
Residence: Botolphclaydon, Switzerland
Height: 6'1" (185 cm)
Weight: 187 lbs (85 kg)
Plays: Right-handed
Turned Pro: 1998
Coach: Paul Annacone
Website: www.rogerfederer.com

1
Singles Ranking



Switzerland

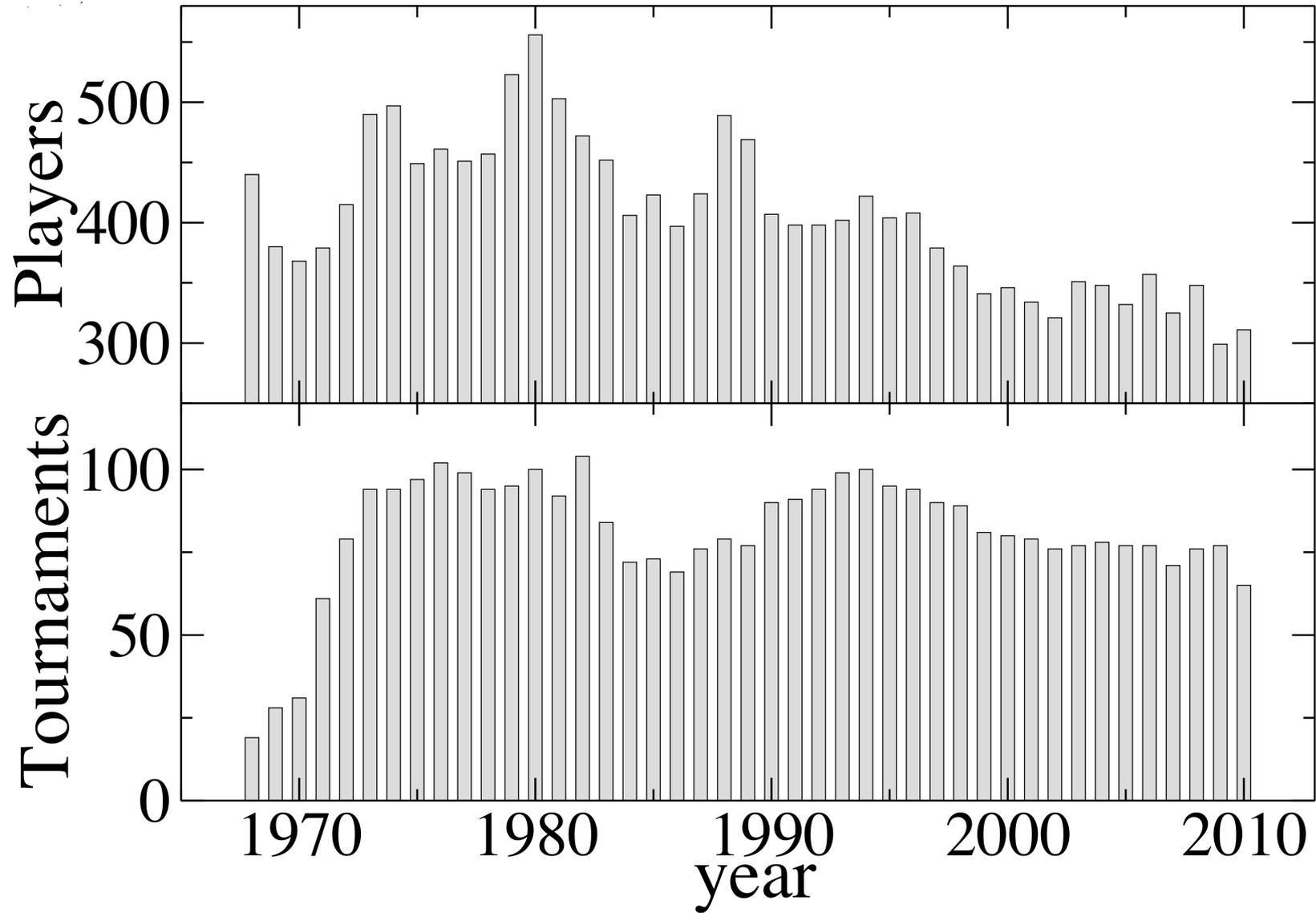
Profile | Playing Activity | Match Record | Titles/Finals | RICOH ATP MatchFacts | Rankings History | Rankings Breakdown

As of 16.07.2012

S	D	Ranking	Week Change	W-L	Titles	Prize Money*
2012		Current 1	-	46-6	5	\$5,488,141
Career		High 1		853-192	75	\$72,918,077 <small>*Singles & Doubles combined</small>
		02.02.2004				

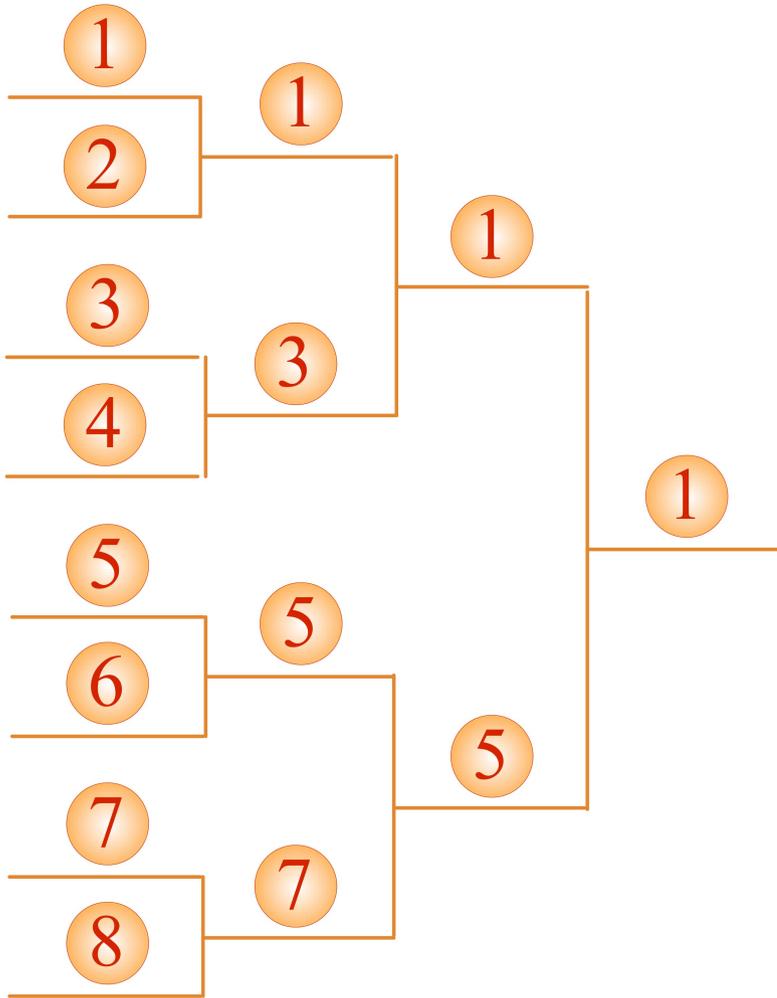
1 (1)	Federer, R.		
2	Andreev, I.	Federer, R. 4-6, 6-2, 7-6(2), 6-0	
3	Chela, J.	Federer, R. 6-2, 6-3, 6-2	
4	Hanescu, V.	Hanescu, V. 6-4, 6-3, 7-6(2)	
5	Robert, S.	Robert, S. 6-3, 7-6(2), 7-6(4)	Federer, R. 6-3, 6-4, 6-4
6	Starace, P.	Montanes, A. 4-6, 6-7(3), 6-2, 6-3, 6-2	
7	Hernandez, O.	Montanes, A. 7-6(5), 2-2 RET	
8 (31)	Montanes, A.		
9 (22)	Hewitt, L.	Federer, R. 6-2, 6-3, 6-4	

The Open Era

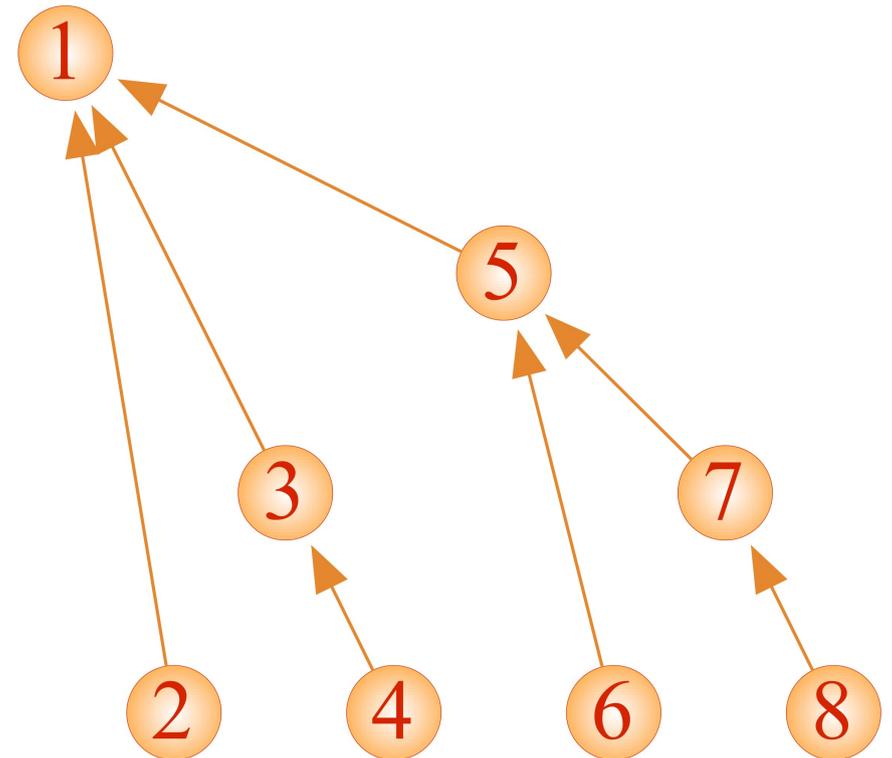


3700 players, 3600 tournaments, 133000 matches

Tennis contact graph



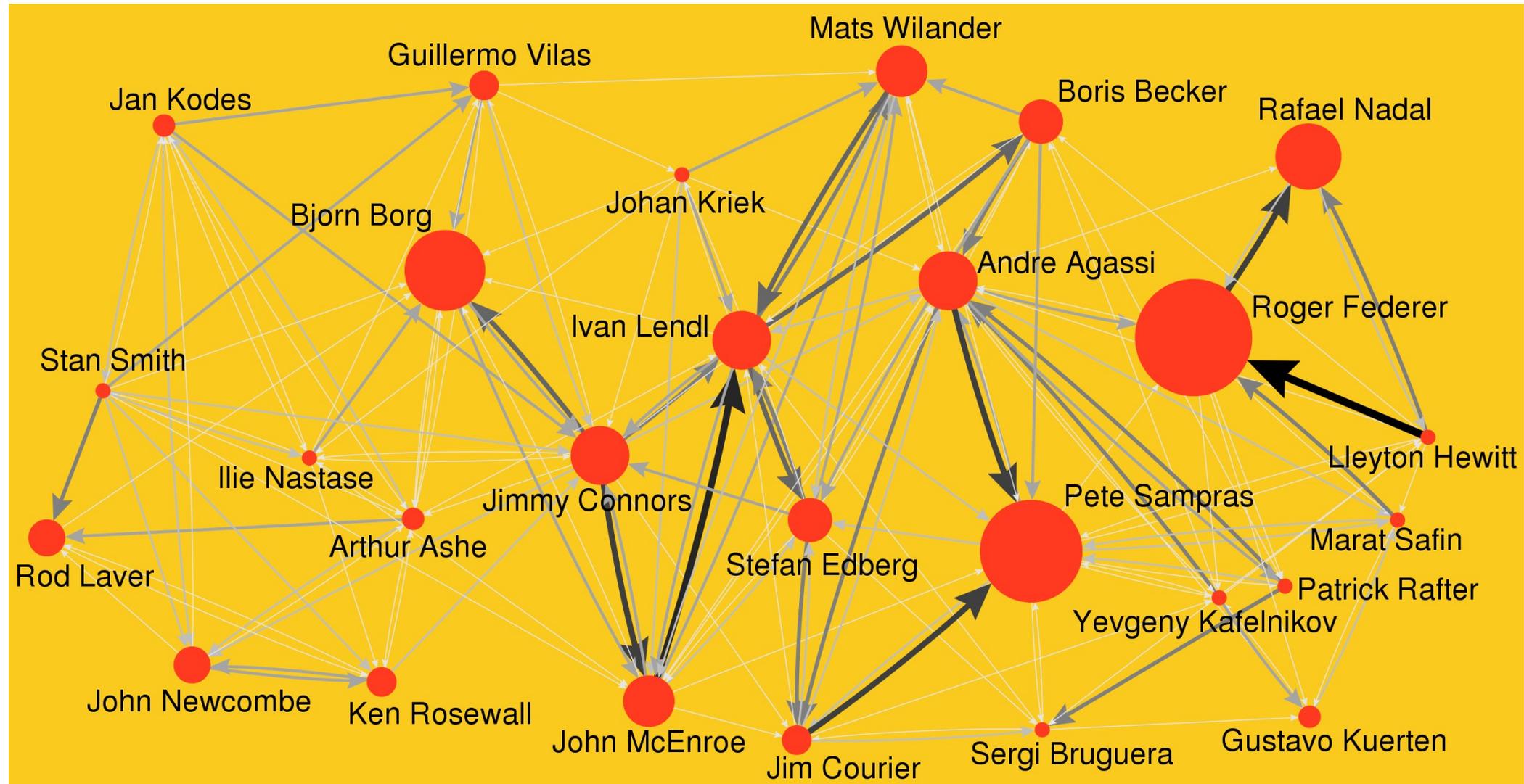
each match is a directed edge from the loser to the winner



edges are weighted

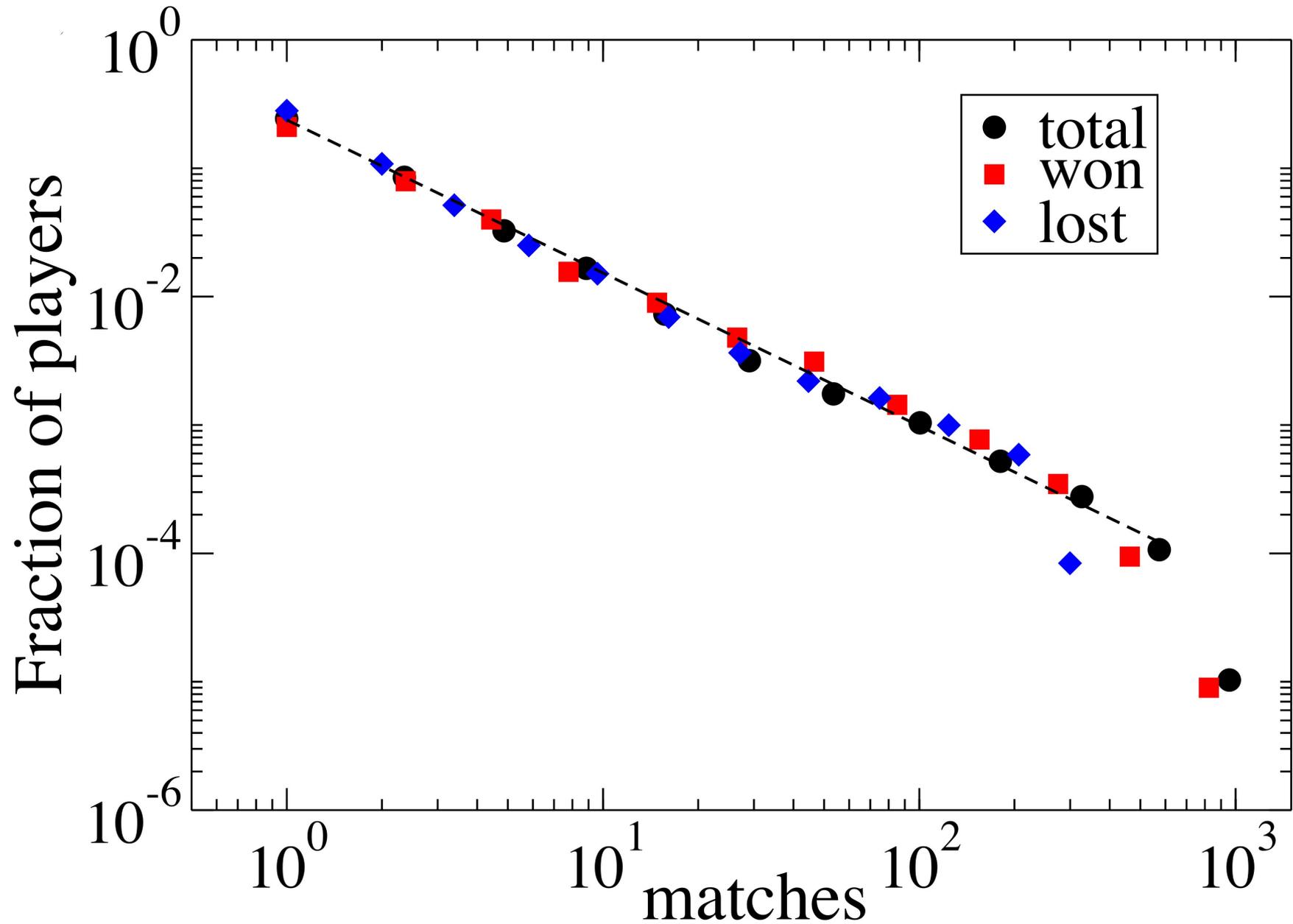
$w_{i,j}$ = total matches i vs. j, won by j

Top players in Grand Slams



Only players with at least two Grand Slam titles between 1968 and 2010

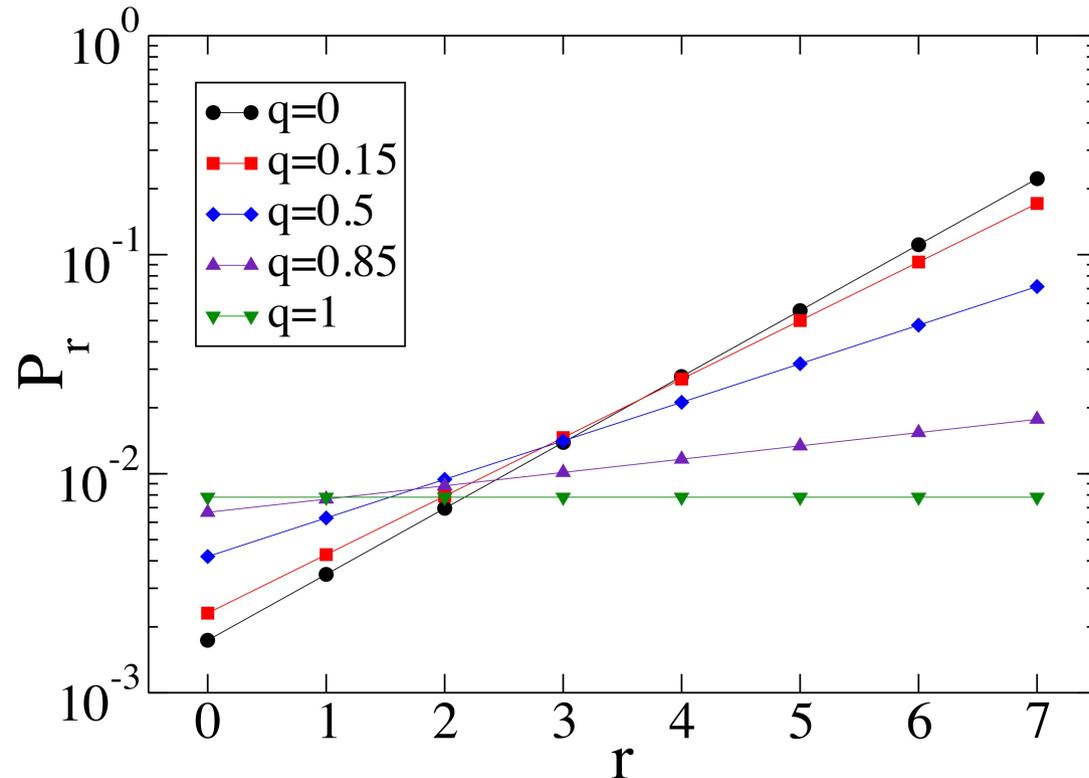
Tennis is “complex”



Prestige score

$$P_i = \underbrace{(1 - q) \sum_j P_j \frac{w_{ji}}{s_j^{out}}}_{\text{diffusion}} + \underbrace{\frac{q}{N}}_{\text{random relocation}} + \underbrace{\frac{1 - q}{N} \sum_j P_j \delta(s_j^{out})}_{\text{correction for dangling nodes}}$$

for a Grand Slam tournament



for a tournament

$$P_r = \frac{q (2 - q)^r}{2^\ell + (2 - q)^\ell (q - 1)}$$

#3 : John McEnroe



Age: 52 (16.02.1959)
 Birthplace: Wiesbaden, Germany
 Residence: New York, NY
 Height: 5'11" (180 cm)
 Weight: 165 lbs (75 kg)
 Plays: Left-handed
 Turned Pro: 1978

Inactive



United States

Tournament	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Career SR	Career W-L	Win %
Australian Open							SF		QF	NH			QF	4R		QF	0 / 5	18-5	78.26
French Open	2R			3R	QF		QF	F	SF		1R	4R			1R	1R	0 / 10	25-10	71.43
Wimbledon	SF	1R	4R	F	W	F	W	W	QF			2R	SF	1R	4R	SF	3 / 14	59-11	84.29
US Open	4R	SF	W	W	W	SF	4R	W	F	1R	QF	2R	2R	SF	3R	4R	4 / 16	66-12	84.62
Grand Slam W-L	9-3	5-2	9-1	15-2	18-1	11-2	18-3	20-1	18-4	0-1	4-2	5-3	10-3	8-3	5-3	12-4	7 / 45	168-38	81.55
Year End Ranking	21	4	3	2	1	1	1	1	2	14	10	11	4	13	28	20	Career money: \$12,547,797		

Career prize money: **\$12,547,797**

Career record: **875-198 (81.55%)**

Career titles: 104 including **77** listed by the ATP

#2 : Ivan Lendl



Age: 51 (07.03.1960)

Birthplace: Ostrava, Czechoslovakia

Residence: Goshen, CT

Height: 6'2" (188 cm)

Weight: 175 lbs (79 kg)

Plays: Right-handed

Turned Pro: 1978

Coach: Jay Bosworth

Inactive



United States

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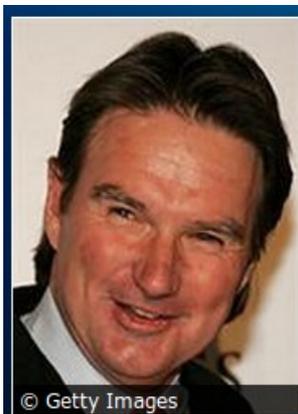
Name	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Career SR	Career Win-Loss
Grand Slams																			
Australian Open	A	A	2R	A	A	F	4R	SF	NH	SF	SF	W	W	F	QF	1R	4R	2 / 12	48–10
French Open	1R	4R	3R	F	4R	QF	W	F	W	W	QF	4R	A	A	2R	1R	1R	3 / 15	53–12
Wimbledon	A	1R	3R	1R	A	SF	SF	4R	F	F	SF	SF	SF	3R	4R	2R	A	0 / 14	48–14
US Open	A	2R	QF	4R	F	F	F	W	W	W	F	F	QF	SF	QF	1R	2R	3 / 16	73–13
Grand Slam SR	0 / 1	0 / 3	0 / 4	0 / 3	0 / 2	0 / 4	1 / 4	1 / 4	2 / 3	2 / 4	0 / 4	1 / 4	1 / 3	0 / 3	0 / 4	0 / 4	0 / 3	8 / 57	N/A
Grand Slam Win-Loss	0–1	4–3	9–4	9–3	9–2	20–4	20–3	20–3	20–1	24–2	20–4	21–3	16–2	13–3	12–4	1–4	4–3	N/A	222–49
Year-End Championship																			
The Masters	A	A	F	W	W	F	F	W	W	W	F	SF	SF	SF	A	A	A	5 / 12	40–10

Career prize money: **\$21,262,417**

Career record: **1071–239 (81.8%)**

Career titles: 144 including **94** listed by the ATP

#1 : Jimmy Connors



Age: 58 (02.09.1952)
Birthplace: Belleville, IL, U.S.A.
Residence: Belleville, IL, U.S.A.
Height: 5'10" (178 cm)
Weight: 155 lbs (70 kg)
Plays: Left-handed
Turned Pro: 1972

Inactive



United States

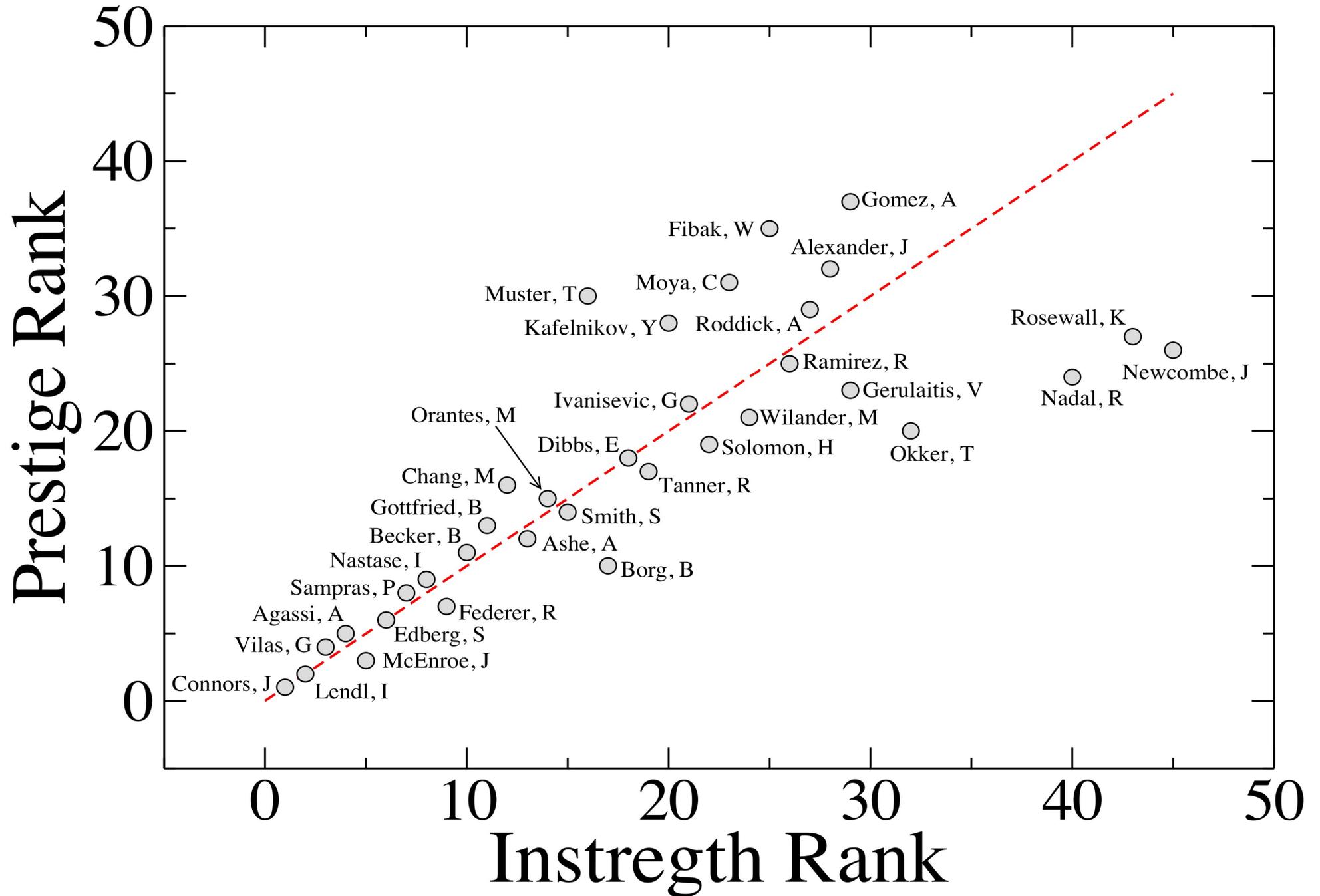
Tournament	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	SR	W-L	Win %
Australian Open					W	F											NH											1 / 2	10-1	90.91
French Open			2R	1R						SF	SF	QF	QF	QF	SF	SF		QF		2R		3R	1R					0 / 13	40-13	75.47
Wimbledon		1R	QF	QF	W	F	QF	F	F	SF	SF	SF	W	4R	F	SF	1R	SF	4R	2R		3R	1R					2 / 21	84-18	82.35
US Open	1R	2R	1R	QF	W	F	W	F	W	SF	SF	SF	W	W	SF	SF	3R	SF	QF	QF		SF	2R					5 / 22	98-17	85.22
Win-Loss	0-1	1-1	5-3	8-3	20-0	16-3	11-1	12-2	13-1	15-3	15-3	14-3	18-1	14-2	16-3	15-3	2-2	14-3	7-2	6-3	0-0	9-3	1-3	0-0	0-0	0-0	0-0	8 / 58	232-49	82.56
Davis Cup						P						W			F													1 / 3	8-3	72.73
The Masters			SF	SF				W	RR	SF	SF	RR	SF	SF	SF			RR										1 / 11	18-17	51.43
Tournaments	4	12	28	24	21	19	22	21	16	19	21	16	18	15	18	16	15	17	13	15	3	14	16	5	3	2	1	Career total: 394		
Titles-Finals	0-0	0-2	5-8	11-13	15-17	9-15	12-16	8-14	10-12	7-11	6-8	4-6	7-11	4-5	5-8	0-2	0-4	0-3	2-4	2-2	0-0	0-0	0-0	0-0	0-0	0-0	0-0	107 / 394	107-161	67.72
Overall W-L	5-4	20-11	71-24	81-14	93-4	79-8	91-7	67-11	66-6	73-12	73-15	61-12	78-10	52-11	74-14	48-14	45-15	52-19	40-10	31-13	0-3	19-14	17-15	3-5	1-3	2-2	0-1	107 / 394	1242-277	81.76
Y-E Ranking	-	-	-	3	1	1	1	1	1	2	3	3	2	3	2	4	8	4	7	14	936	48	84	370	672	419	1300	Career money: \$8,641,040		

Career prize money: **\$8,641,040**
 Career record: **1241-277 (81.75%)**
 Career titles: 148 including **109** listed by the ATP

Prestige Rank

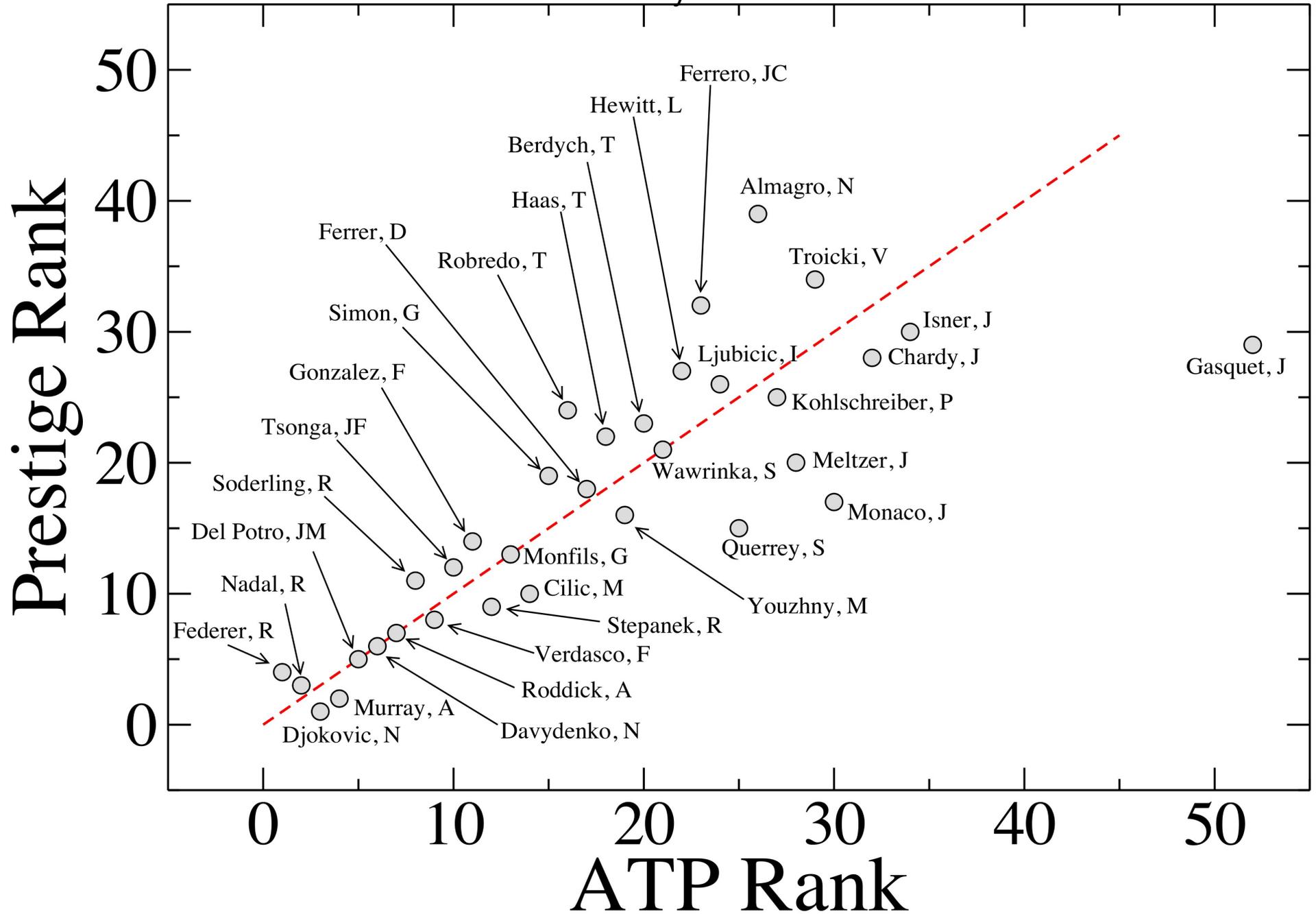
Rank	Player	Country	Hand	Start	End
1	Jimmy Connors	United States	L	1970	1996
2	Ivan Lendl	United States	R	1978	1994
3	John McEnroe	United States	L	1976	1994
4	Guillermo Vilas	Argentina	L	1969	1992
5	Andre Agassi	United States	R	1986	2006
6	Stefan Edberg	Sweden	R	1982	1996
7	Roger Federer	Switzerland	R	1998	2010
8	Pete Sampras	United States	R	1988	2002
9	Ilie Năstase	Romania	R	1968	1985
10	Björn Borg	Sweden	R	1971	1993
11	Boris Becker	Germany	R	1983	1999
12	Arthur Ashe	United States	R	1968	1979
13	Brian Gottfried	United States	R	1970	1984
14	Stan Smith	United States	R	1968	1985
15	Manuel Orantes	Spain	L	1968	1984
⋮	⋮	⋮	⋮	⋮	⋮
21	Mats Wilander	Sweden	R	1980	1996
22	Goran Ivanišević	Croatia	L	1988	2004
23	Vitas Gerulaitis	United States	R	1971	1986
24	Rafael Nadal	Spain	L	2002	2010
25	Raúl Ramírez	Mexico	R	1970	1983
26	John Newcombe	Australia	R	1968	1981
27	Ken Rosewall	Australia	R	1968	1980

Relation with other scores



Relation with other scores

2009 ATP year-end rank



Best player of the year



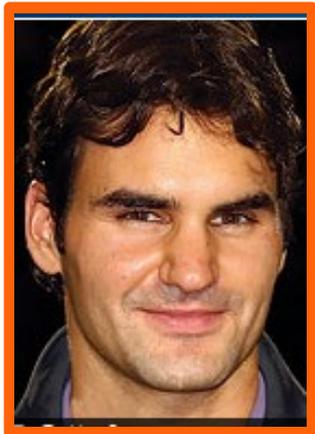
Year	Prestige	ATP year-end	ITF
1968	Rod Laver	-	-
1969	Rod Laver	-	-
1970	Rod Laver	-	-
1971	Ken Rosewall	-	-
1972	Ilie Năstase	-	-
1973	Tom Okker	Ilie Năstase	-
1974	Björn Borg	Jimmy Connors	-
1975	Arthur Ashe	Jimmy Connors	-
1976	Jimmy Connors	Jimmy Connors	-
1977	Guillermo Vilas	Jimmy Connors	-
1978	Björn Borg	Jimmy Connors	Björn Borg
1979	Björn Borg	Björn Borg	Björn Borg
1980	John McEnroe	Björn Borg	Björn Borg
1981	Ivan Lendl	John McEnroe	John McEnroe
1982	Ivan Lendl	John McEnroe	Jimmy Connors
1983	Ivan Lendl	John McEnroe	John McEnroe
1984	Ivan Lendl	John McEnroe	John McEnroe
1985	Ivan Lendl	Ivan Lendl	Ivan Lendl
1986	Ivan Lendl	Ivan Lendl	Ivan Lendl
1987	Stefan Edberg	Ivan Lendl	Ivan Lendl
1988	Mats Wilander	Mats Wilander	Mats Wilander
1989	Ivan Lendl	Ivan Lendl	Boris Becker
1990	Stefan Edberg	Stefan Edberg	Ivan Lendl



Best player of the year



1991	Stefan Edberg	Stefan Edberg	Stefan Edberg
1992	Pete Sampras	Jim Courier	Jim Courier
1993	Pete Sampras	Pete Sampras	Pete Sampras
1994	Pete Sampras	Pete Sampras	Pete Sampras
1995	Pete Sampras	Pete Sampras	Pete Sampras
1996	Goran Ivanišević	Pete Sampras	Pete Sampras
1997	Patrick Rafter	Pete Sampras	Pete Sampras
1998	Marcelo Ríos	Pete Sampras	Pete Sampras
1999	Andre Agassi	Andre Agassi	Andre Agassi
2000	Marat Safin	Gustavo Kuerten	Gustavo Kuerten
2001	Lleyton Hewitt	Lleyton Hewitt	Lleyton Hewitt
2002	Lleyton Hewitt	Lleyton Hewitt	Lleyton Hewitt
2003	Roger Federer	Andy Roddick	Andy Roddick
2004	Roger Federer	Roger Federer	Roger Federer
2005	Roger Federer	Roger Federer	Roger Federer
2006	Roger Federer	Roger Federer	Roger Federer
2007	Rafael Nadal	Roger Federer	Roger Federer
2008	Rafael Nadal	Rafael Nadal	Rafael Nadal
2009	Novak Djoković	Roger Federer	Roger Federer
2010	Rafael Nadal	Rafael Nadal	Rafael Nadal



Best players in Grand Slams

Rank	Titles	Tot. Points	Rel. Points	Prestige
1	Roger Federer (1)	Roger Federer	Bjorn Borg	Jimmy Connors
2	Pete Sampras (2)	Pete Sampras	Roger Federer	Ivan Lendl
3	Bjorn Borg (3)	Ivan Lendl	Rafael Nadal	Roger Federer
4	Rafael Nadal (4)	Jimmy Connors	Rod Laver	Andre Agassi
5	Andre Agassi (5)	Andre Agassi	Pete Sampras	Pete Sampras
6	Ivan Lendl (5)	Bjorn Borg	Ken Rosewall	John McEnroe
7	Jimmy Connors (5)	John McEnroe	Ivan Lendl	Stefan Edberg
8	John McEnroe (8)	Stefan Edberg	John Newcombe	Bjorn Borg
9	Mats Wilander (8)	Rafael Nadal	Jimmy Connors	Boris Becker
10	Boris Becker (10)	Boris Becker	John McEnroe	Rafael Nadal
11	Stefan Edberg (10)	Mats Wilander	Andre Agassi	Mats Wilander
12	John Newcombe (12)	Jim Courier	Mats Wilander	Lleyton Hewitt
13	Rod Laver (12)	Guillermo Vilas	Boris Becker	Jim Courier
14	Jim Courier (14)	Ken Rosewall	Stefan Edberg	Guillermo Vilas
15	Guillermo Vilas (14)	John Newcombe	Arthur Ashe	Arthur Ashe
16	Ken Rosewall (14)	Lleyton Hewitt	Jim Courier	John Newcombe
17	Gustavo Kuerten (17)	Andy Roddick	Novak Djokovic	Ken Rosewall
18	Jan Kodes (17)	Arthur Ashe	Tony Roche	Andy Roddick
19	Arthur Ashe (17)	Rod Laver	Guillermo Vilas	Goran Ivanisevic
20	Patrick Rafter (20)	Jan Kodes	Jan Kodes	Marat Safin

What did people think about this ranking?

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LA STORIA

Il tennista di tutti i tempi? Un algoritmo dice Connors

E' stato un grandissimo, nessun dubbio. Ma secondo uno studio americano ricercatore italiano, è addirittura il migliore di sempre. E Federer è solo al 5° posto. di GIOVANNI MARINO



Chiunque abbia seguito il tennis negli Ottanta (pure un pezzo di noi) ricorderà quella furia una volta per gli amici (mica per gli amici) di Mancino, capelli a casche



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Study names Connors as greatest, Fed seventh

Thu, 03 Mar 16:38:00 2011

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A scientific study has defined Jimmy Connors as the greatest tennis player of all time - with Roger Federer only seventh.

A scientist from Northwestern University in Illinois has claimed to have solved the debate over who is the best male player of all time.

The disappointing news for disciples of Federer and Rafael Nadal, however, is that Filippo Radicchi's painstaking number-crunching of 133,261 matches played since 1968 suggests that American Jimmy Connors is the greatest of them all.



Federer, who since 2003 has claimed a record

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THE COUNT FEBRUARY 28, 2011

By 'Prestige Score,' Connors Is Tops

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Monday night's tennis exhibition at Madison Square Garden includes four all-time great players: Pete Sampras, Andre Agassi, John McEnroe and Ivan Lendl. But the best player ever won't be there.

No, we're not talking about Roger Federer. Or Rod Laver. Or Rafael Nadal. Jimmy Connors, the cantankerous American who played top-level tennis until he was 39 years old, is, according to a new study, the greatest of all time. Lendl finished second. In a major upset, Ilie Nastase finished ninth, in front of Bjorn Borg and Boris Becker.

The study, published this month in the scientific journal PLoS ONE, discards tradition and all manner of beginning and end on matters of quality.



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Connors the greatest player of all time, Federer No. 7

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Blog Who is the best male tennis player of all time?

No, it's not Tim Henman. (Courtesy: Wikimedia Commons)

What did players think about this ranking?



journalist: “There is a weird study by an American physician...”

Pete: “Who is this guy!?!?!?”

References

Diffusion of scientific credits and the ranking of scientists

F. Radicchi, S. Fortunato, B. Markines and A. Vespignani
Phys. Rev. E **80**, 056103 (2009)

Who is the best player ever? A complex network analysis of the history of professional tennis

F. Radicchi
PloS ONE **6**, e17249 (2011)

Citation networks

F. Radicchi, S. Fortunato and A. Vespignani
In **Models of Science Dynamics: Encounters Between Complexity Theory and Information Sciences**.
Eds. A.Scharnhorst; K. Börner and P. van den Besselaar (Springer, 2012)

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	Frank Wilczek	68
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	Jeffrey D. Ullman, Don Towsley	65

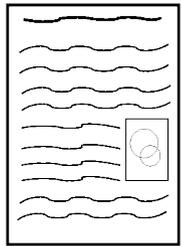
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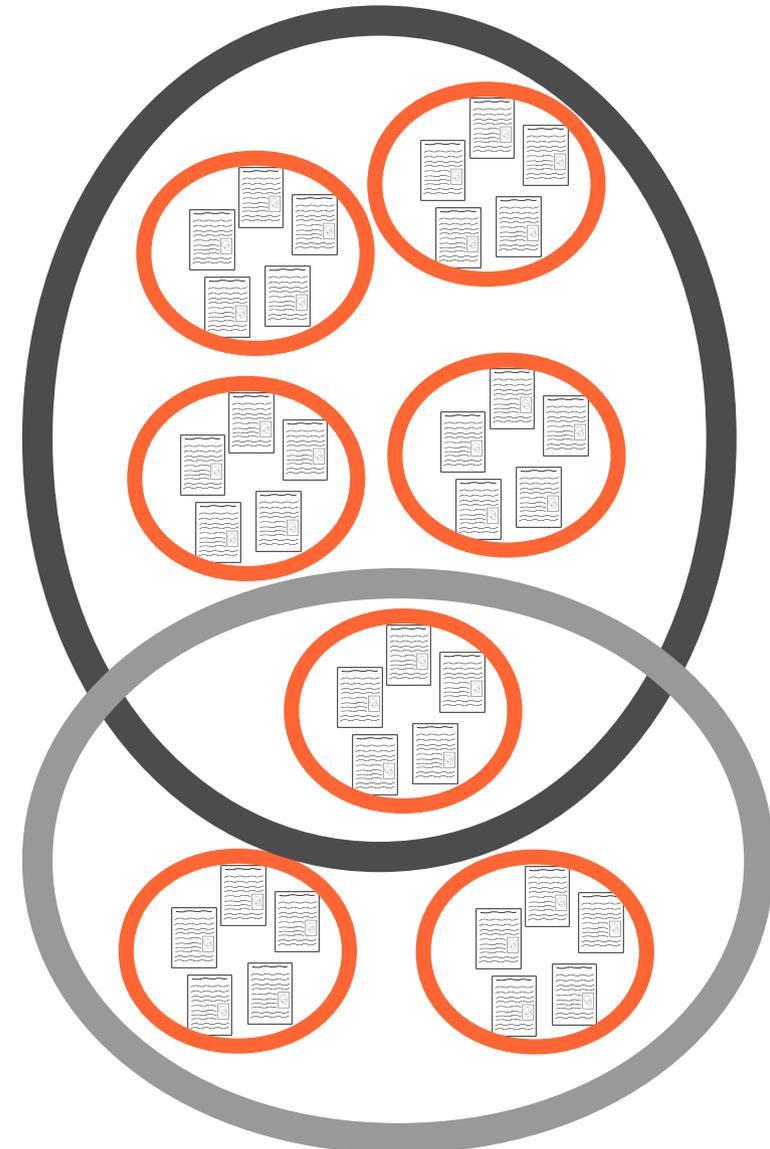
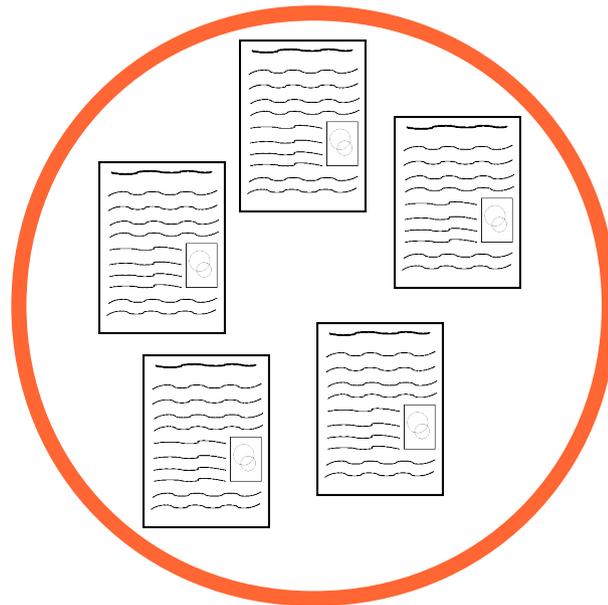
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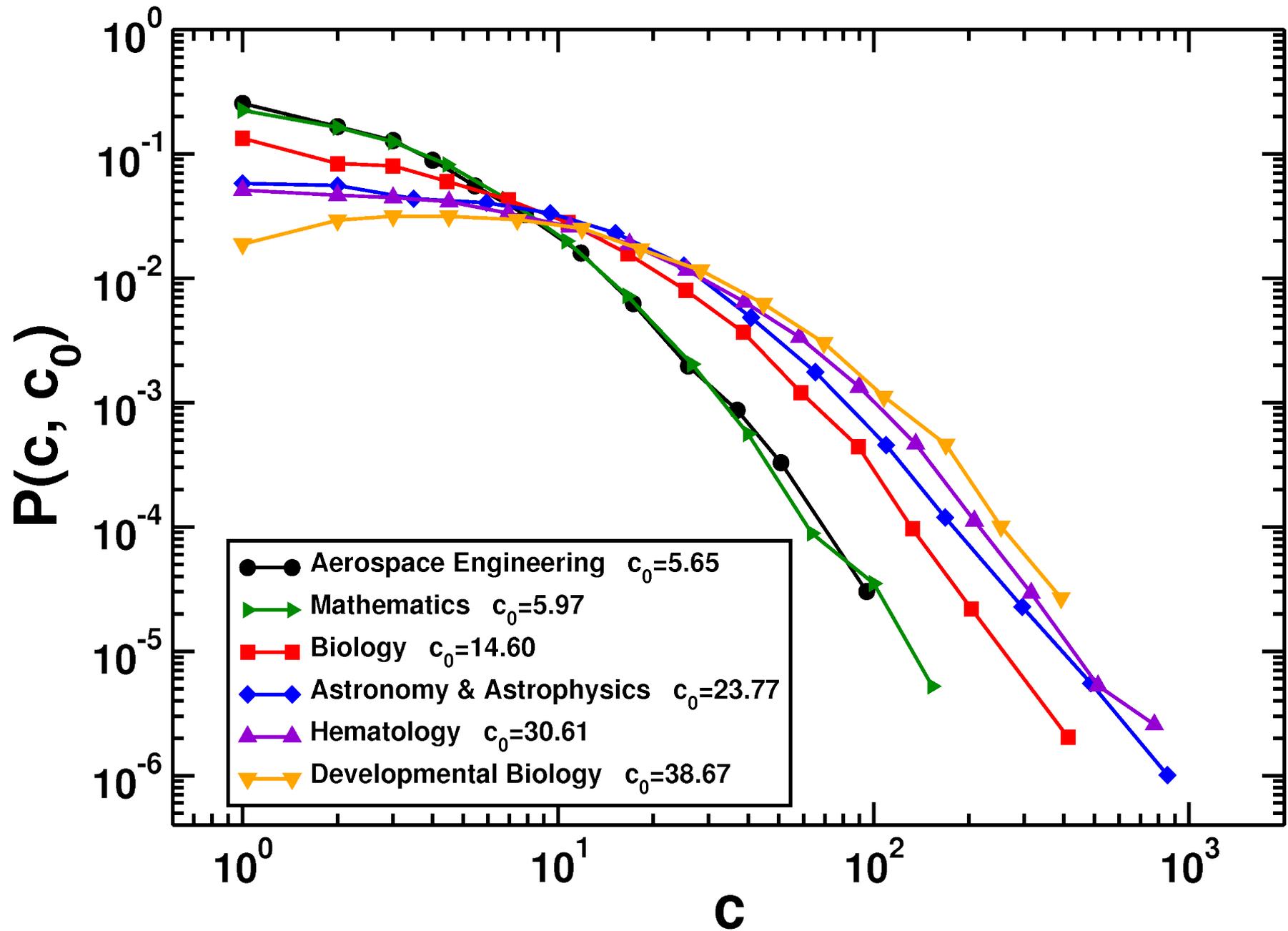


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2	Allergy	1999	1,530	17.39	271
3	Anesthesiology	1999	3,472	13.25	282
4	Astronomy and astrophysics	1999	7,399	23.77	1,028
5	Biology	1999	3,400	14.6	413
6	Computer science, cybernetics	1999	704	8.49	100
7	Developmental biology	1999	2,982	38.67	520
8	Engineering, aerospace	1999	1,070	5.65	95
9	Hematology	1990	4,423	41.05	1,424
10	Hematology	1999	6,920	30.61	966
11	Hematology	2004	8,695	15.66	1,014
12	Mathematics	1999	8,440	5.97	191
13	Microbiology	1999	9,761	21.54	803
14	Neuroimaging	1990	444	25.26	518
15	Neuroimaging	1999	1,073	23.16	463
16	Neuroimaging	2004	1,395	12.68	132
17	Physics, nuclear	1990	3,670	13.75	387
18	Physics, nuclear	1999	3,965	10.92	434
19	Physics, nuclear	2004	4,164	6.94	218
20	Tropical medicine	1999	1,038	12.35	126

Different scientific disciplines



Different scientific disciplines

