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RANKINGS SCIENTISTS, JOURNALS AND COUNTRIES USING h-INDEX

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ABSTRACT

Indexes in scientometrics are based on citations. However, in contrast to the journal impact factor, which gives only the ranking of the scientific journals, ordered by impact factor, indexes in scientometrics are suitable for ranking of scientists, scientific journals and countries. In this paper the h-index, h5-index, the World ranking the top of 25 Highly Cited Researchers ($h > 100$) and the ranking of 25 scientists in Hungarian Institutions according to their Google Scholar Citations public profiles are considered. These indexes (h5-index) are applied for making of the list of top 20 publications (journals and proceedings) in the field of Robotics. The World ranking is done of the best 50 countries according to h-index in year 2014. Data are obtained from the portal *Scimago*.

KEY WORDS

citations, h-index, robotics, portal *Scimago*, Webometrics Ranking

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INTRODUCTION

Indexes in scientometrics are based on citations. In this paper the h-index, h5-index, the world ranking of the top of 25 Highly Cited Researchers ($h > 100$) according to Google Scholar Citations, the ranking of the top of 25 scientists in Hungarian institutions according to their Google Scholar public profiles and are considered. These indexes (h5-index) are applied for making of the list of top 20 publications (journals and proceedings) in the field of Robotics. The World ranking is done for the best 50 countries according to h-index in 2014. Data are obtained from the portal *Scimago*.

The article is organized as follows: in Section 1 the Introduction is given. In Section 2 the h-index, h5-index are presented. In Section 3 the world ranking of top of 25 Highly Cited Researchers ($h > 100$) according to their Google Scholar Citations public profiles is illustrated. In Section 4 the ranking of 25 scientists in Hungarian institutions according to their Google Scholar Citations public profiles is illustrated. In Section 5, presents the list of top 20 publications (journals and proceedings) in the field of Robotics. In Section 6, the World ranking of the best 50 countries according to h-index in year 2014, taken from the portal *Scimago* are illustrated. Conclusions are given in Section 7.

THE h-INDEX AND h5-INDEX

The h-index, as a particularly simple and useful way to characterize the scientific output of a researcher, was introduced by Jorge E. Hirsch in August 2005 [1], and it is defined as follows: "A scientist has index h if h of his/her N_p papers have at least h citations each, and the other $N_p - h$ papers have no more than h citations each".

The h-index was applied to compare:

- scientists,
- scientific journals,
- research teams and
- research institutions and countries.

The h-index, has become popular because it is:

- logically sound,
- simple to understand and, most importantly and
- simple to calculate with easily obtained data.

Hirsch argues that the h-index is preferable as the:

- total number of published papers,
- the total number of citations and
- average number of citations per article.

The advantage the h-index is that it combines both the:

- quantity – number of articles and
- quality – citations to these articles.

A researcher cannot have a high h-index without publishing a considerable number of articles. The h-index favors researches that publish a continuous stream of articles. A disadvantage of the h-index is that it cannot "reduce".

An individual's h-index is obtained by searching one of the following scientific databases:

- Thompson's ISI Web of Knowledge, Web of Science (WOS). WOS was the first data-base to provide citation data,

- Scopus developed by Elsevier, from November 3, 2004. Scopus provides citation data only for the items indexed by it and
- Google Scholar, from November 18, 2004, unlike WOS and Scopus is freely accessible [2, 3].

The Hirsch's h-index is not correlated with the journal Impact Factor, this implies that:

- the Impact Factor is not a good measure of research quality or influence,
- but there is good correlations between the number of publications/citations and h-index of individuals.

When the h-index is high, to increase the h-index is difficult. The h-index is insensitive to highly cited papers. Mester prefer to consider the research group, for example „Robotics" as the basic unit for computing the h-index [4-20]. For example: Mester's h-index is 21, this means he has 21 articles with 21 or more citations. The h5-index is the h-index for articles published in the last 5 complete years. It is the largest number *h* such that *h* articles published in 2009-2013 have at least *h* citations each [2].

WORLD RANKING OF TOP OF 25 HIGHLY CITED RESEARCHERS (*h* > 100) ACCORDING TO THEIR GOOGLE SCHOLAR CITATIONS PUBLIC PROFILES

The World ranking of scientists based on their performance: h-index and citations according to their Google Scholar Citations public profiles [3]. The list in Table 1 of the public profiles of the most highly cited researchers (h-index larger than 100) according to their declared presence in the Google Scholar Citations database is shown.

The list of top of 25 highly cited authors (that includes both living and deceased), is ranked first by:

- h-index in decreasing order and
- then by the total number of citations as a secondary criteria [3].

On this ranking list, position of Albert Einstein is 546.

TOP OF 25 SCIENTISTS IN HUNGARIAN INSTITUTIONS RANKED ACCORDING TO THEIR GOOGLE SCHOLAR CITATIONS PUBLIC PROFILE

The ranking of top 25 Hungarian scientists is presented in Table 2 according to their declared presence in the Google Scholar Citations database [3]. The list is ranked first by h-index in decreasing order and then by the total number of citations as a secondary criteria.

TOP 20 PUBLICATIONS OF ROBOTICS

The ranking of the top 20 publications (journals and proceedings) in the field of Robotics [3] according to their h5-index is given in Table 3.

WORLD RANKING OF TOP OF 50 COUNTRIES ACCORDING TO H-INDEX IN YEAR 2014 FROM THE PORTAL SCIMAGO

The World ranking of top 50 countries according to h-index in year 2014 taken from the portal *Scimago* [21] is given in Table 4.

Table 1. World Ranking of top of 20 Highly Cited Researchers ($h > 100$).

RANK	NAME	INSTITUTION	H-INDEX	CITATIONS
1	Sigmund Freud	University of Vienna	251	367305
2	Graham Colditz	Washington University in St. Louis	249	217355
3	Eugene Braunwald	Brigham and Women's Hospital; Harvard Medical School	232	250876
4	Michel Foucault	Collège de France	218	531709
5	Ronald C Kessler	Harvard University	214	204645
6	Pierre Bourdieu	Centre de Sociologie Européenne; Collège de France	210	383484
7	Robert Langer	Massachusetts Institute of Technology MIT	209	167773
8	Richard A Flavell	Yale University	197	145338
9	Gordon Guyatt	McMaster University	192	138831
10	Eric Topol	Scripps Research Institute	191	155672
11	Peter Barnes	Imperial College London	187	150959
12	T W Robbins	University of Cambridge	187	106693
13	Michael Graetzel	Ecole Polytechnique Fédérale de Lausanne	185	172708
14	A S Fauci	National Institutes of Health NIH	185	143864
15	Edward Witten #	Institute for Advanced Study in Princeton	183	166066
16	Chris Frith	University College London	182	126757
17	Karl Friston	University College London	180	135793
18	Richard Frackowiak	University of Lausanne	178	120094
19	Matthias Mann	Max Planck Gesellschaft MPG	177	143407
20	Frank B Hu	Harvard University	175	115149
21	Guido Kroemer	INSERM	173	124638
22	Younan Xia	Georgia Institute of Technology	171	115946
23	Amartya Sen	Harvard University	170	209435
24	Mark P Mattson	National Institutes of Health NIH	170	103321
25	Joseph E Stiglitz	Columbia University	169	175827

Table 2. Ranking of top of 15 scientists in Hungarian institutions.

RANK	NAME	INSTITUTION	H-INDEX	CITATIONS
1	Zoltán Trócsányi	University of Debrecen	85	32765
2	László Lovász #	Eötvös Loránd University	84	39438
3	István Csabai	Eötvös Loránd University	82	48046
4	Ferenc Siklér	Hungarian Academy of Sciences	81	30460
5	József Pálinkás	Hungarian Academy of Sciences	78	29462
6	Dan Sperber	Institut Nicod; Central European University Budapest	70	37646
7	Tamas Vicsek	Eötvös Loránd University	69	31014
8	Eva Mezey	NIH; Budapest Utrecht	67	19701
9	Herbert Gintis #	Santa Fe Institute; Central European University Budapest	66	38995
10	Balázs Sarkadi	Hungarian Academy of Sciences; Semmelweis University	62	13742
11	Ferenc Nagy	Hungarian Academy of Sciences	62	13524
12	Tamás Csörgő	Hungarian Academy of Sciences	60	15408
13	Stellan Hjertén	Uppsala University; University of Pécs	59	16994
14	Jozsef Karger Kocsis	Hungarian Academy of Sciences; Budapest University of Technology and Economics	58	13095
15	Eva Kondorosi	Hungarian Academy of Sciences	57	8135
16	Ákos Koller	University of Pecs; New York Medical College	54	9121
17	János Kertesz	Budapest University of Technology and Economics; Central European University Budapest	52	9649
18	Gábor Halmos	University of Debrecen	52	7332
19	Gergely Csibra	Central European University Budapest; Birkbeck University of London	51	10483
20	Imre Dékány	University of Szeged	51	10407
21	Laszlo Patthy #	Hungarian Academy of Sciences	51	8023
22	Péter Csermely	Semmelweis University	50	10225
23	Rosario Nunzio Mantegna	Central European University Budapest; University of Palermo	49	14292
24	Imre Vass	Hungarian Academy of Sciences	47	7444
25	Ádám Miklosi	Eötvös Loránd University	47	7040

Table 3. Top 20 publications in the field of Robotics.

	Publication	h5-index
1.	IEEE International Conference on Robotics and Automation	64
2.	The International Journal of Robotics Research	57
3.	IEEE Transactions on Robotics	52
4.	IEEE/ASME Transactions on Mechatronics	45
5.	IEEE/RSJ International Conference on Intelligent Robots and Systems	44
6.	Robotics and Autonomous Systems	36
7.	Autonomous Robots	35
8.	Robotics and Computer-Integrated Manufacturing	35
9.	IEEE Robotics & Automation Magazine	34
10.	Mechatronics	33
11.	ACM/IEEE International Conference on Human Robot Interaction	32
12.	Journal of Field Robotics	31
13.	Robotics: Science and Systems	30
14.	Journal of Intelligent & Robotic Systems	30
15.	Bioinspiration & Biomimetics	26
16.	International Journal of Social Robotics	25
17.	IEEE Transactions on Haptics	24
18.	arXiv Robotics (cs.RO)	24
19.	IEEE-RAS International Conference on Humanoid Robots (Humanoids)	24
20.	IEEE Transactions on Autonomous Mental Development	23

Table 4. The *Scimago* World ranking of top 50 countries according to h-index in year 2014.

	Country	Documents	Citable documents	Citations	Self-Citations	Citations per Document	H index
1	United States	552.690	494.790	352.934	194.831	0,64	1.648
2	United Kingdom	160.935	141.425	111.107	36.592	0,69	1.015
3	Germany	149.595	136.516	98.852	35.407	0,66	887
4	France	104.739	96.467	64.942	19.988	0,62	811
5	Canada	88.117	80.051	57.605	15.595	0,65	794
6	Japan	114.999	107.171	51.447	18.208	0,45	745
7	Italy	93.064	84.016	60.766	22.284	0,65	713
8	Netherlands	50.732	45.774	40.745	10.248	0,80	694
9	Switzerland	38.308	34.924	33.322	7.719	0,87	686
10	Australia	77.880	70.579	52.104	16.939	0,67	644
11	Sweden	33.847	31.076	24.987	5.722	0,74	614
12	Spain	78.817	71.795	47.018	14.359	0,60	591
13	Belgium	28.679	26.232	21.895	4.969	0,76	547
14	Denmark	22.187	20.292	19.412	4.672	0,87	518
15	Israel	17.388	15.836	11.577	2.453	0,67	496
16	China	452.877	438.601	152.140	95.472	0,34	495
17	Austria	21.117	19.102	14.825	3.292	0,70	449
18	Finland	17.203	15.936	11.606	2.851	0,67	443
19	South Korea	72.269	68.140	30.859	9.608	0,43	424
20	Norway	17.767	15.800	11.291	2.978	0,64	402
21	Russian Federation	50.430	49.018	15.155	6.892	0,30	390
22	India	114.449	106.078	34.961	15.607	0,31	383
23	Brazil	59.736	56.368	18.521	6.654	0,31	379
24	Poland	35.951	34.097	14.829	5.457	0,41	371
25	Hong Kong	14.982	14.145	9.432	1.937	0,63	359
26	New Zealand	12.455	11.270	7.414	1.951	0,60	351
27	Singapore	17.198	16.086	12.554	2.921	0,73	349
28	Ireland	11.272	10.159	7.406	1.528	0,66	332
29	Taiwan	37.966	35.926	14.562	4.178	0,38	331
30	Greece	16.734	15.074	9.443	2.135	0,56	326
31	Hungary	9.281	8.680	4.968	1.191	0,54	301
32	Portugal	19.911	18.447	10.609	2.823	0,53	297
33	Czech Republic	20.137	19.098	8.919	3.033	0,44	294
34	South Africa	17.464	16.215	8.578	2.627	0,49	292
35	Mexico	17.709	16.607	6.210	1.584	0,35	289
36	Argentina	11.472	10.679	5.130	1.235	0,45	273
37	Turkey	37.095	33.450	10.564	3.345	0,28	266
38	Chile	9.679	9.069	5.410	1.481	0,56	233
39	Thailand	12.061	11.394	4.007	1.057	0,33	213
40	Iceland	1.267	1.147	1.181	213	0,93	198
41	Slovenia	5.321	5.000	2.484	642	0,47	189
42	Iran	39.573	37.141	14.689	7.386	0,37	180
43	Slovakia	6.711	6.459	2.147	775	0,32	180
44	Croatia	5.533	5.186	2.245	518	0,41	177
45	Ukraine	9.218	8.931	2.727	913	0,30	174
46	Colombia	6.795	6.432	2.418	509	0,36	169
47	Bulgaria	3.480	3.348	1.583	466	0,45	167
48	Romania	12.563	12.091	3.973	1.215	0,32	167
49	Egypt	14.196	13.415	4.915	1.475	0,35	165
50	Kenya	2.067	1.910	1.308	357	0,63	165

CONCLUSIONS

Indexes in scientometrics are suitable for ranking of scientists, scientific journals, research teams, research institutions and countries. In this paper the h-index, h5-index, World ranking of the top of 25 Highly Cited Researchers ($h > 100$) and the ranking of 25 scientists in Hungarian institutions according to their Google Scholar Citations public profiles are considered. The ranking of the top 20 publications (journals and proceedings) in the field of Robotics according to their h5-index is illustrated. The World ranking list of the best 50 countries according to h-index in year 2014, taken from the portal *Scimago*, are given.

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