

Webometric Ranking of University of Zagreb and Other World Universities

Krešimir Pavlina
Department of Information Sciences,
Faculty of Humanities and Social Sciences, University of Zagreb
Ivana Lučića 3, Zagreb, Croatia
kpavlina@ffzg.hr

Summary

This paper shows the shortcomings in the implementation of the algorithm used by Aguillo et al. for ranking of world universities, which negatively influenced ranking of 768 world universities, including the University of Zagreb. By correct application of the algorithm, ranking of University of Zagreb extremely improves, so the University of Zagreb is ranked 174th in the world (as opposed to 1355th by Aguillo et al.), 41st in Europe, 3rd in Central and Eastern Europe and 1st in Croatia.

Key words: webometrics, university ranking, University of Zagreb

1. Introduction

There are several algorithms used for ranking world universities. Rankings are usually calculated using combination of factors such as the number of Nobel prize winners who were educated or had worked at the university at the time of obtaining award, number of scientific papers published in selected journals, number of employed highly cited scientists, interest of potential students for enrollment or results from quality control survey.[1][2]

Usually universities with better funding have advantage in these rankings because they have greater financial resources which can attract highly cited scientists and candidates for the Nobel Prizes.[3]

In year 2004 Aguillo and colleagues launched the Webometrics Ranking of World's Universities (www.webometrics.info) [4], the ranking of universities by their presence on the Internet with the aim of promoting and enriching the content of university web pages.

2. Webometrics ranking algorithm

Aguillo et al. collected results from web search engines (Yahoo, Google Search, Google Scholar) for domain of each university and ranked universities according to collected results.

Algorithm for ranking world universities, used by Aguillo et al., is based on four basic parameters.

2.1. Visibility

Number of web pages linking to university web site, indirectly shows the relevance of university web pages. Universities are ranked from the most linked, the less linked.

2.2. Number of university web pages

Number of web pages that are crawled by web search engines (Google, Yahoo) on university domain shows the size of the university web site.

2.3. Rich files

Number Adobe Acrobat (.pdf), Adobe Postscript (.ps), Microsoft Word (.doc) and Microsoft PowerPoint (.ppt) documents indexed by Google's search engine at the university domain. Number of documents represents the amount of educational material that the university published.

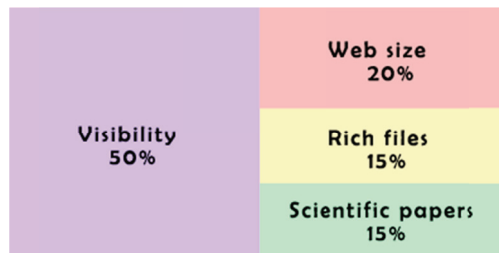
2.4. Scientific papers indexed in Google Scholar

Number of scientific papers containing the name of the university, which is indexed by Google Scholar.

2.5. Total rank

When calculating total rank different weight is given to this parameters so visibility bring 50%, size of Web pages 20%, rich files 15% and scientific papers 15%.

Diagram 1. Graphical visualization of weight factors given to each parameter



3. Methodological inconsistencies conducted by Aguillo et al. in ranking of world universities

Aguillo et al. insist on using the results from only one domain for every university, and claim that the use of multiple domains is a bad practice that should be eradicated. They claim that it is easier to achieve greater recognition of the university and that it will allow better navigation for foreign students while searching for information at university web pages.

They also claim that the use of multiple domains reduces the visibility factor of the university on the World Wide Web. Using multiple domains does not diminish the visibility factor, because it is possible to sum results of all domains of certain university.

Information systems should support and facilitate real life, the introduction of a centralized domain would impede operations at the University of Zagreb. Each faculty of the University of Zagreb now has its own domain, e.g. domain Faculty of Humanities and Social Sciences is ffzg.hr, while domain of the Faculty of Electrical Engineering and Computing is fer.hr. By pooling all the domains of faculties under central university domain, faculties would be represented by subdomains under unizg.hr domain, so the previous two faculties would be available on the subdomains ffzg.unizg.hr and fer.unizg.hr. It would probably lead to the use of these subdomains in e-mail addresses, so, for example, my email address would no longer be kpavlina@ffzg.hr but kpavlina@ffzg.unizg.hr. Hereby, we would virtually eliminate the possibility of using faculty subdomains because it would certainly be more difficult to remember the address forum.ffzg.unizg.hr instead of the forum.ffzg.hr.

The introduction of a central university domain would aggravate life for all students, teachers and other regular visitors to faculty web sites, because they would inevitably have to remember one more domain in address of web pages of their faculties, under the pretext that we want to enhance navigation to visiting foreign students who are only a minority users which access university web pages.

It is interesting to note that Aguillo et al., explicitly state that they do not want to sum results of all domains of faculties of the University of Zagreb, while for "John Hopkings" university, University of Manchester, Technical University of Munich, Harvard University, Cardiff University, University of Barcelona, Kansas State University, University of Illinois and "Pierre and Marie Curie" university they summed results for several of their domains, according to Aguillo.[5] This proves biased collection of results, because the rule on one domain for every university was applied for some universities, and wasn't applied for other. It is interesting to note that of 12.000 universities ranked by Aguillo et al., 6.4% universities (768), according to their data, used more than one domain.

It is worth to mention that on page www.webometrics.info, Aguillo et al. published the results of their webometric ranking of world universities in a

nontransparent way, because they publish only ranks of the university, rather than absolute results that would allow the verifiability of the results. Ranks are published under the pretext that the results of the search engines are changing daily and that publishing of the absolute results wouldn't allow any comparisons, but there remains no doubt that the publication of only ranks reduced verifiability of results of their research.

4. Methodology

The aim of this research is to determine the ranking of the University of Zagreb and other world universities using webometric research methods used by Aguillo et al.[6] The study was conducted in June 2011 and corrected methodological inconsistencies conducted by Aguillo et al. during the research by not including results for all domains of the University of Zagreb. This research included results from central domain and 29 faculties, 3 academies and 1 subsidiary of University of Zagreb.

Table 1. Domains of constituent units of University of Zagreb

www.agr.hr	www.ffzg.hr	www.pmf.hr
www.arhitekt.hr	www.geof.hr	www.rgn.hr
www.erf.hr	www.gfv.hr	www.sfzg.hr
www.efzg.hr	www.grad.hr	www.sumfak.hr
www.fer.hr	www.grf.hr	www.ttf.hr
www.fkit.hr	www.kbf.hr	www.ufzg.hr
www.foi.hr	www.kif.hr	www.vef.hr
www.fpzg.hr	www.mef.hr	www.adu.hr
www.fpz.hr	www.simet.hr	www.alu.hr
www.fsb.hr	www.pravo.hr	www.muza.hr
www.pharma.hr	www.pbf.hr	www.hrstud.hr

During data collection following number of results was collected for 12.000 universities:

- 961.495.021 web pages
- 816.858.295 links to university web pages
- 67.707.058 rich files
- 192.029 638 research papers indexed in Google Scholar search engine

5. Results

The results show extreme improvement in ranking of University of Zagreb, which is ranked at 174th place in the world, as opposed to the 1355th place where it was ranked by Aguillo et al.[7]

University of Zagreb also achieved a higher rank among European universities, so it is ranked in 41st place of the 5044 European universities, which placed it in the top 1% of European universities.

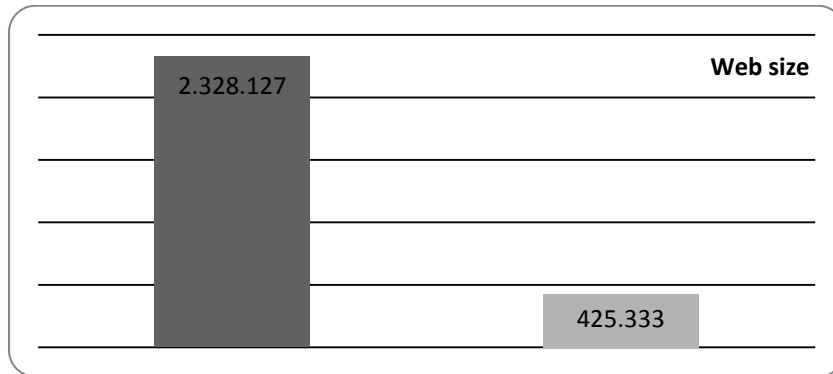
The success of the University of Zagreb is more significant if we take into account the average expenditure for higher education in countries where universities are located. According to UNESCO data [8], the average investment in higher education for the top 50 universities in Europe amounts to \$ 464 per capita, while allocations for higher education in the Republic of Croatia amounted to \$ 191 per capita, which is only 41% average. The Republic of Croatia is a country with the lowest financing of higher education between European countries that have a university ranked in the top 50 universities in Europe. Portugal is a country with the next lowest higher education funding (\$ 299 per capita), which has a university located in the 50 highest-ranked universities in Europe. Portugal invests 56% more funding on higher education per capita with respect to the Republic of Croatia.

Research results will be displayed by individual variables Aguillo et al. use when ranking universities.

5.1. Number of university web pages

For the University of Zagreb Aguillo et al. have taken only the number of pages available on the university domain (unizg.hr). It is apparent that the stated number of web pages represents only 18.2% of the total number of web pages found on domains of all faculties of the University of Zagreb. Aguillo et al. placed University of Zagreb, according to the number of web pages, at 2583rd place in the world [7], and taking into account the number of web pages found on domains of all faculties of the University of Zagreb, it is placed on 77th place in the world.

Chart 1. Comparison of web size of University of Zagreb

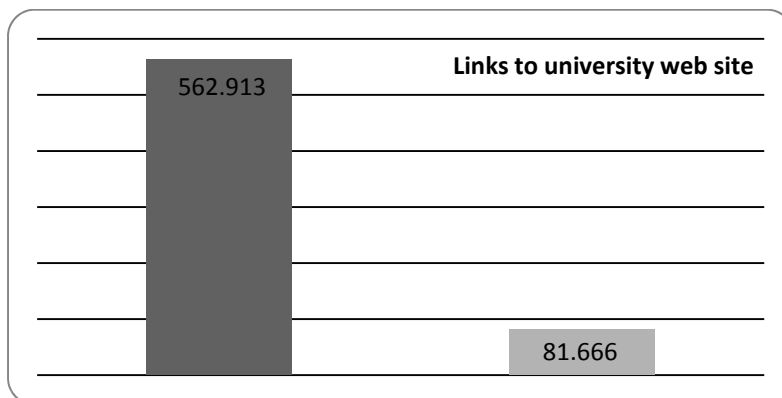


Five domains of the University of Zagreb with the largest number of web pages contribute to the total number of web pages with 82.58%.

5.2. Visibility

To domain unizg.hr refers 81.666 links from other websites, and the 562.913 links point to web pages on domains of all faculties of University of Zagreb. It is evident that Aguillo et al. in the research reduced number of links pointing to domains of University of Zagreb by 85.5%. Visibility have very large influence in ranking (50% of the total grade), so the rank of University of Zagreb was greatly lower. Aguillo et al. placed, by number of links, University of Zagreb on 1448th place in the world [7], according to this study it is on the 257th place.

Chart 2. Comparison of number of links to University of Zagreb web site(s)

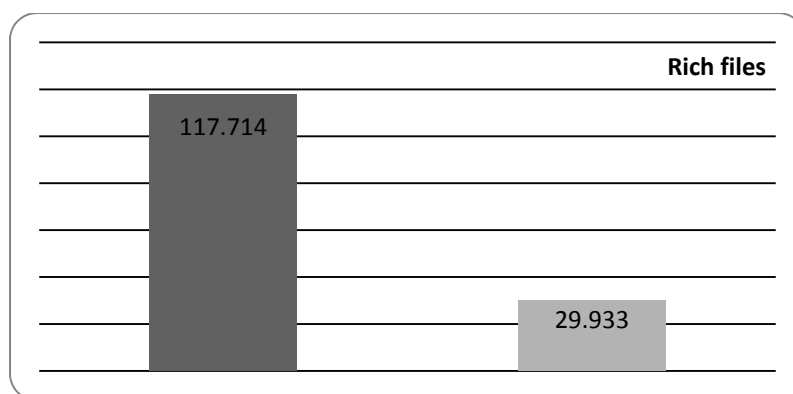


Ten faculties with the highest number of links pointing to their websites, contribute to the total number of links of University of Zagreb with 80.9%.

5.3. Rich files

The total number of rich files found at all domains of the University of Zagreb is 117,714, while only 29,933 files are found at central university domain (unizg.hr). Aguillo et al. in research used only files found on the central university domain (unizg.hr), and they represent only 25.4% of the total number of documents found on the website of all faculties of University of Zagreb. According to the number of rich files Aguillo et al. rank University of Zagreb at 1324th place in the world [7], according to this study University of Zagreb is ranked at 80th place.

Chart 3. Comparison of number of indexed rich files on University of Zagreb domain(s)



Ten faculties with the highest number of rich files make up for 82.6% of the total number of files of University of Zagreb.

5.4. Scientific paper indexed in Google Scholar

University of Zagreb is represented with 38,767 papers in Google Scholar database. In this parameter there is a large discrepancy with respect to research conducted by Aguillo et al. Aguillo et al. ranked University of Zagreb, according to the number of scientific papers on 1295th place in the world [7], while according to this research it is at 612th place.

5.5. Comparison with world universities

There is a strong correlation in the ranks of leading universities, but it can also be noted that the ranking of University of Zagreb was extremely affected with methodological inconsistencies in research conducted by Aguillo et al., because

it was rated at the 1355th place [7], while by proper application of algorithm it is ranked 174th in the world.

Table 2. Excerpt from the ranking of world universities

Rank in this research	University	Rank in research conducted by Aguillo et al.
1.	Massachusetts Institute of Technology	1.
2.	Harvard University	2.
3.	Stanford University	3.
4.	University of California Berkeley	4.
5.	Cornell University	5.
6.	University of Michigan	7.
7.	University of Wisconsin Madison	6.
8.	Pennsylvania State University	11.
9.	University of Washington	9.
10.	University of Minnesota	8.
	...	
174.	University of Zagreb	1355.
	...	
225.	University of Ljubljana	205.
	...	
304.	University of Budapest	360.
	...	
763.	University of Belgrade	625.
	...	
2015.	University of Sarajevo	1949.

6. Conclusion

Aguillo et al. started ranking of world universities with the noble intention of raising academic public awareness about the importance of publishing information on the university websites, but unfortunately made several methodological errors in conceptualizing the research and data collection that compromised 768 universities, including University of Zagreb. This study showed that the University of Zagreb is ranked 174th in the world, not 1355th like in research of Aguillo et al., which certainly indicates that a large error in the methodology was done.

The final results of this study will be published in September 2011 at the website unirank.org. There will be published all of the results obtained in this

research and methodology will be described in detail so that independent researchers could repeat the study.

Problem of insufficient public information about the methodologies of ranking universities which often misguided uninformed readers was identified during the research. So this research represents the beginning of the project of creating website unirank.org where it will be possible to compare methodologies of different ranking systems of universities, and where they will be able to find results of ranking of universities according to a number of different rating systems.

References

- [1] Academic Ranking of World Universities – Ranking Methodology, (<http://www.arwu.org/ARWUMethodology2010.jsp>) (1.7.2011.)
- [2] HEEACT – Performance Ranking of Scientific Papers for World Universities, (<http://ranking.heeact.edu.tw/en-us/2010%20by%20field/page/methodology>) (24.7.2011.)
- [3] Billaut, J., Bouyssou, D., Vincke, P. Should you believe in the Shanghai ranking?, 2009. URL: (http://hal.archives-ouvertes.fr/docs/00/40/39/93/PDF/Shanghai_JCB_DB_PV.pdf) (1.7.2011.)
- [4] Aguillo, I. F.; Granadino, B.; Ortega, J. L.; Prieto, J. A.. Scientific research activity and communication measured with cybermetric indicators. *Journal of the American Society for the Information Science and Technology*, 57(10): 1296 - 1302., 2006.
- [5] Aguillo, I. F. Changes scheduled for the July 2009 edition, blog entry dated 5.3.2009. URL: <http://internetlab.blogspot.com/> (1.7.2011.)
- [6] Webometrics – Ranking of World’s Universities – Methodology. 2011. URL: <http://www.webometrics.info/methodology.html> (3.7.2011.)
- [7] Webometrics – Ranking of University of Zagreb. 2011. URL: <http://www.webometrics.info/details.asp?univ=unizg.hr> (3.7.2011.)
- [8] UNESCO Institute for Statistics – Education, 2011. URL: <http://www.uis.unesco.org/> (1.7.2011.)