A comparison of coverage and citation matching in Google Scholar, Web of Science and Scopus

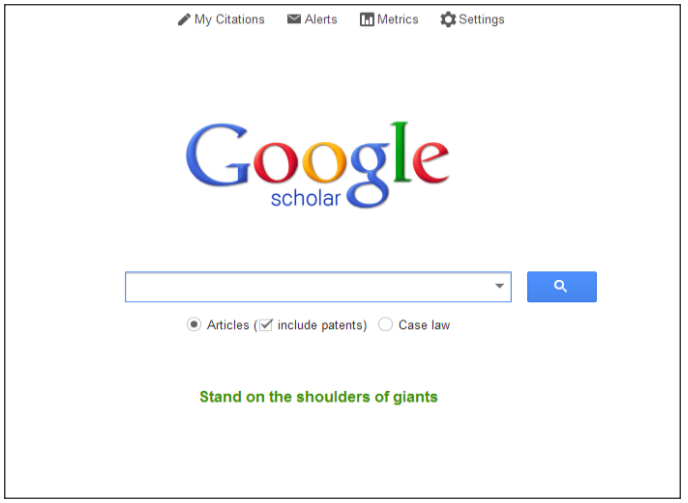
Peter Sjögårde
KTH Royal Institute of Technology,
ECE School, Publication Infrastructure

- Why don´t you use Google Scholar for bibliometrics?

- My publications get more citations in Google Scholar

Why don´t you use Google Scholar for bibliometrics?

- **No access to structured data**
- **Questionable quality of data (duplicates)**
- **Possible to manipulate**
- **Contents not defined**
- **Contains non-peer reviewed papers, popular science, educational material**

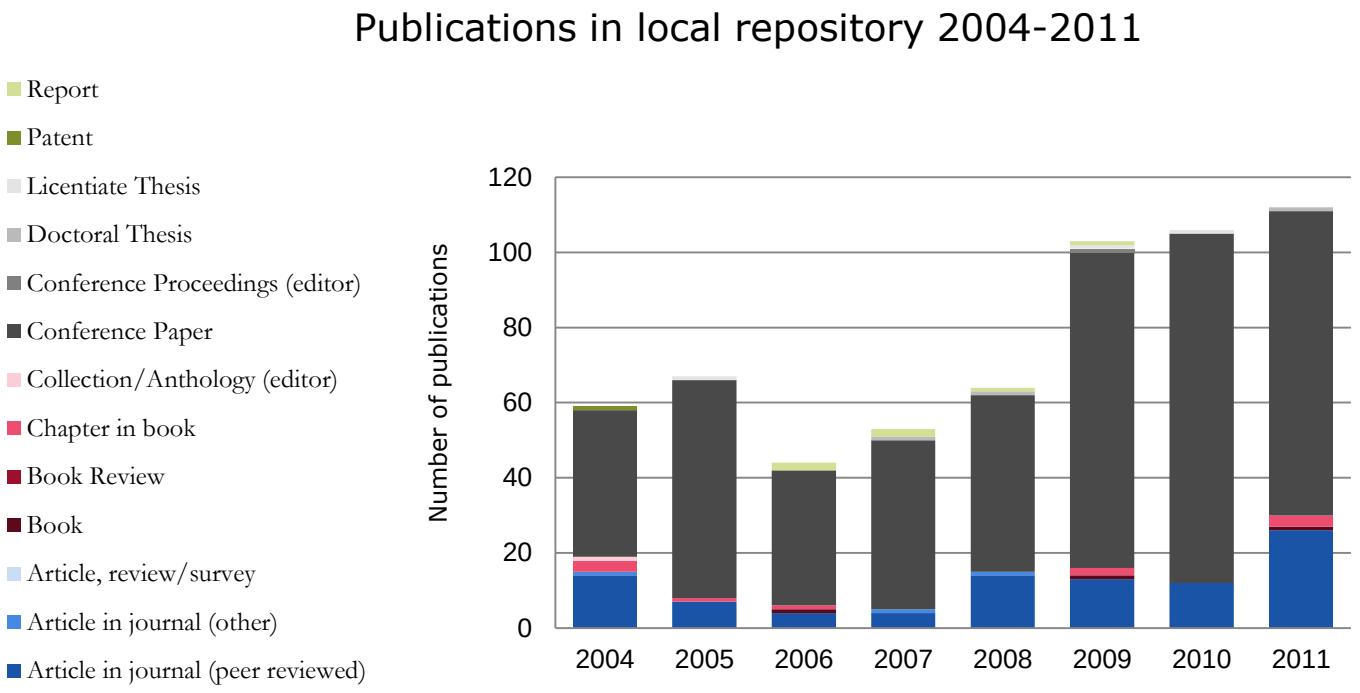


Aguillo, Isidro. “Is Google Scholar Useful for Bibliometrics? A Webometric Analysis.” *Scientometrics* 91, no. 2 (2012): 343–351. doi:10.1007/s11192-011-0582-8.
Lopez-Cozar, Emilio Delgado, Nicolas Robinson-Garcia, and Daniel Torres-Salinas. “Manipulating Google Scholar Citations and Google Scholar Metrics: Simple, Easy and Tempting.” *arXiv:1212.0638 [cs]*, December 4, 2012. http://arxiv.org/abs/1212.0638.

My publications get more citations in Google Scholar

- Is this true?
- If true:
  - How big is the difference?
  - Where do the citations come from?
  - Why are they not counted in Web of Science and Scopus?

Case study: Embedded electronics and computer systems at KTH



Data

- Publications from 2009
- Peer reviewed Articles and Conference papers
- 91 publications

Publications and Citations

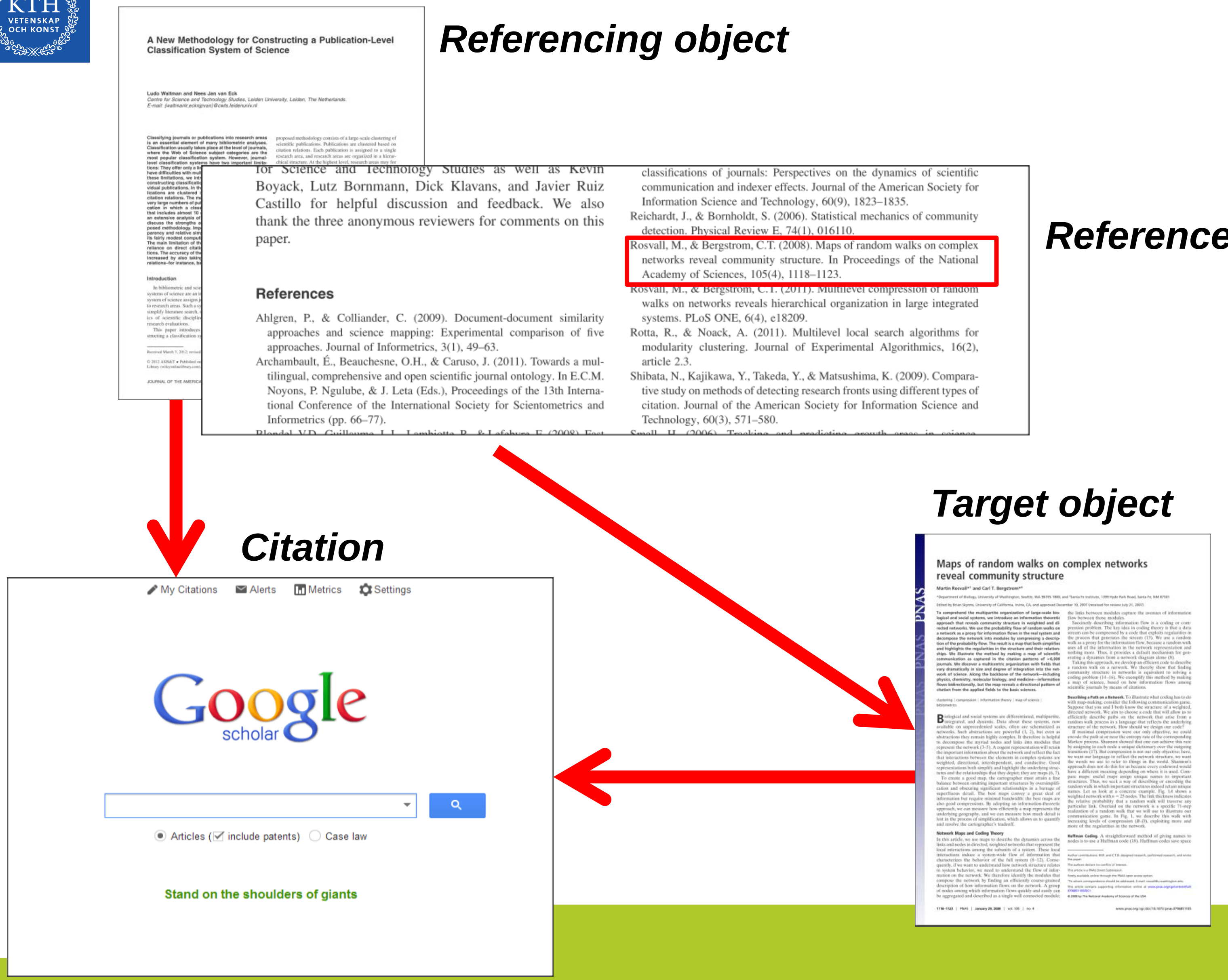
	Publications	Coverage	Citations	Cit./Publ.
Web of Science	58	64%	73	1.26
Scopus	77	85%	206	2.68
Google Scholar	91	100%	714	7.85

Where do the citations come from?

Random sample of 100 of the GS citations

Manually search in Google Scholar for each of the 100 documents citing the publications published by the UoA. Noted document type and source.

Manually search in Web of Science and Scopus for the same documents, to see if they were indexed in these databases and if so, if they had resulted in a citation.


Referencing object
A New Methodology for Constructing a Publication-Level Classification System of Science
Ludo Waltman and Nees Jan van Eck
Reference
Boyack, Lutz Bornmann, Dick Klavans, and Javier Ruiz Castillo for helpful discussion and feedback. We also thank the three anonymous reviewers for comments on this paper.
References
Ahlgren, P., & Colliander, C. (2009). Document-document similarity approaches and science mapping: Experimental comparison of five approaches. Journal of Informetrics, 3(1), 49–63.
Archambault, É., Beauchesne, O.H., & Caruso, J. (2011). Towards a multilingual, comprehensive and open scientific journal ontology. In E.C.M. Noyons, P. Ngulube, & J. Leta (Eds.), Proceedings of the 13th International Conference of the International Society for Scientometrics and Informetrics (pp. 66–77).
classifications of journals: Perspectives on the dynamics of scientific communication and indexer effects. Journal of the American Society for Information Science and Technology, 60(9), 1823–1835.
Reichardt, J., & Bornholdt, S. (2006). Statistical mechanics of community detection. Physical Review E, 74(1), 016110.
Rosvall, M., & Bergstrom, C.T. (2008). Maps of random walks on complex networks reveal community structure. In Proceedings of the National Academy of Sciences, 105(4), 1118–1123.
walks on networks reveals hierarchical organization in large integrated systems. PLoS ONE, 6(4), e18209.
Rotta, R., & Noack, A. (2011). Multilevel local search algorithms for modularity clustering. Journal of Experimental Algorithmics, 16(2), article 2.3.
Shibata, N., Kajikawa, Y., Takeda, Y., & Matsushima, K. (2009). Comparative study on methods of detecting research fronts using different types of citation. Journal of the American Society for Information Science and Technology, 60(3), 571–580.
Citation
My Citations
Alerts
Metrics
Settings
Google scholar
Articles (include patents)
Case law
Stand on the shoulders of giants
Target object
Maps of random walks on complex networks reveal community structure
PNAS

Are the references in Google Scholar hitting the correct target?

Comment	Count
Correct reference in referencing object	95
Not possible to verify	4
Incorrect citation	1
Total	**100**

Document type of referencing objects

Document type	Count
Conference papers	65
Articles	12
Doctorate thesis	12
Chapters in books	3
? (Chinese)	3
No source	1
Report	1
Student thesis	2
Duplicates	1
Total	100

Publishers of the referencing conference papers and articles

Source per document type	N
Conference Paper	**65**
IEEE	55
ACM	2
Now Publishers Inc.	1
World Academic Publishing	1
Academic Press Inc.	1
Foundation of Computer Science	1
Article in Journal	**12**
Springer	3
Elsevier	3
ACM	2
Now Publishers Inc.	1
World Academic Publishing	1
Academic Press Inc.	1
Foundation of Computer Science	1
Total	**77**

Coverage of referencing objects and target objects in databases

	Google Scholar	Web of Science	Scopus
Referencing object in database	77	19	65
Both referencing and target object in database	77	16	62
Reference matched to target object resulting in a citation	77	9	31

References not matched even though both referencing and target object are indexed in the database

	Web of Science	Scopus
Correct reference	6	1
Incorrect reference	1	30
Totalt	**7**	**31**

Example of incorrect reference in Scopus

Reference in orginial publication

REFERENCES

[1] C. Claus, B. Zhang, W. Stechele, L. Braun, M. Hübner, J. Becker, *A multi-platform controller allowing for maximum Dynamic Partial Reconfiguration throughput*, Proc. of the International Conference on Field Programmable Logic and Applications, pp. 535-539, 2008.

[2] Liu Ming, W. Kuehn, Lu Zhonghai, A. Jantsch, *Run-time Partial Reconfiguration speed investigation and architectural design space exploration*, Proc. of the International Conference on Field Programmable Logic and Applications, pp. 498-502, 2009.

[3] C. Claus, R. Ahmed, F. Altenried, W. Stechele, *Towards rapid dynamic partial reconfigurationin video-based driver assistance systems*, 6th Internation Symposium of Reconfigurable Computing: Architectures, Tools and Applications, pp. 55-67, 2010

[4] A. Usman, M. B. Malik, K. Munawar, *FPGA/soft-processor based real-time object tracking system*, Proc. of the 5th Southern Conference on Programmable Logic, pp. 33-37, 2009.

[5] K. Yamaoka, T. Morimoto, H. Adachi, K. Awane, T. Koide, H.J. Mattausch, *Multi-object tracking VLSI architecture using image-scan based region growing and featured matching*, Proc. of the International Symposium on Circuits and Systems, ISCAS 2006.

[6] Alpha Data, http://www.alpha-data.com

[7] Xilinx, *Virtex-4 FPGA user guide*, ug070 v2.6, 2008.

[8] Xilinx, *Virtex-4 FPGA configuration user guide*, ug071 v1.11, 2009.

[9] Xilinx, *Early access partial reconfiguration user guide*, ug208 v1.2, 2008.

Reference in Scopus

1 Claus, C., Zhang, B., Stechele, W., Braun, L., Hübner, M., Becker, J.
A multi-platform controller allowing for maximum dynamic partial reconfiguration throughput
(2008) *Proceedings - 2008 International Conference on Field Programmable Logic and Applications, FPL*, art. no. 4630002, pp. 535-538. Cited 27 times.
ISBN: 978-142441961-6
doi: 10.1109/FPL.2008.4630002
KTHB

2 Ming, L., Kuehn, W., Zhonghai, L., Jantsch, A.
(2009) *Proc. of the International Conference on Field Programmable Logic and Applications*, pp. 498-502.
KTHB

3 Claus, C., Ahmed, R., Altenried, F., Stechele, W.
(2010) *6th Internation Symposium of Reconfigurable Computing: Architectures, Tools and Applications*, pp. 55-67. Cited 4 times.
KTHB

4 Usman, A., Malik, M.B., Munawar, K.
(2009) *Proc. of the 5th Southern Conference on Programmable Logic*, pp. 33-37. Cited 2 times.
KTHB

5 Yamaoka, K., Morimoto, T., Adachi, H., Awane, K., Koide, T., Mattausch, H.J.
(2006) *Proc. of the International Symposium on Circuits and Systems, ISCAS*
KTHB

6 Alpha Data
KTHB

7 (2008) *Virtex-4 FPGA User Guide*. Cited 47 times.
Xilinx, ug070 v2.6
KTHB

8 (2009) *Virtex-4 FPGA Configuration User Guide*. Cited 28 times.
Xilinx, ug071 v1.11
KTHB

9 (2008) *Early Access Partial Reconfiguration User Guide*. Cited 91 times.
Xilinx, ug208 v1.2
KTHB

References not matched even though both referencing and target object are indexed in the database

	Web of Science	Scopus
Correct reference	6	1
Incorrect reference	1	30
Totalt	**7**	**31**

Example of references not resulting in a citation

Target object in Web of Science

Title: **Development and experimental verification of analytical models for printable interdigital capacitor sensors on paperboard**
Author(s): Feng, Yi; Hallstedt, Julius; Chen, Qiang; et al.
Book Group Author(s): IEEE
Conference: **8th IEEE Conference on Sensors** Location: **Christchurch, NEW ZEALAND** Date: **OCT 25-28, 2009**
Sponsor(s): **IEEE Sensors Council**
Source: 2009 IEEE SENSORS, VOLS 1-3 Pages: **1034-1039** DOI: **10.1109/ICSENS.2009.5398531** Published: **2009**

Reference in Web of Science

Title: **Development and experimental verification of analytical models for printable inter-digital capacitor sensors on paperboard**
Author(s): Yi, F.; Hallstedt, J.; Qiang, C.; et al.
Conference: **Proc. IEEE Sensors**
Source: P IEEE SENSORS Pages: **1034-1039** Published: **2009**

Summary

- Google Scholar covers more publications published by the UoA and more of the referencing objects.
- The sources of the citations in GS come from verifiable sources. A majority come from large publishers.
- Web of Science have a poor coverage of publications published by the UoA and of the referencing objects.
- The citation-matching algorithm in Web of Science systematically miss citations to conference papers.
- Scopus has a better coverage of publications published by the UoA and of the referencing objects.
- A large proportion of the references in referencing conference papers in Scopus are erroneously indexed, resulting in loss of citations.

Conclusions

- Non of the sources proved reliable for evaluation of the analyzed Unit of Assessment.
- It is problematic to use bibliometrics for evaluation of research groups that publish a high proportion of their papers in conference papers.
- When using Web of Science and Scopus, the impact of conference papers seems to be systematically underestimated.
- Be cautious when drawing conclusions about the impact of conference papers from bibliometric data.