Appropriate and Inappropriate Uses of Journal Bibliometric Indicators (Why do we need more than one?)

Gianluca Setti

Department of Engineering, University of Ferrara 2013-2014 IEEE Vice President, Publication Services and Products gianluca.setti@unife.it



Consiglio Scientifico GTTI
"Linee di indirizzo per una valutazione di qualità della produzione scientifica
Roma, 11 Gennaio 2016



IEEE Initiatives on Proper Use of Bibliometrics

Make clear that manipulation of any bibliometric indicato unethical



- 2. Promote the **adoption of multiple bibliometric indicators** to evaluate the impact of scientific publications and of individual papers
- Educate the community on the significance of all bibliometric indicator and their proper use
 - a) panel discussion at the 2013 and 2014 IEEE Panel of Editors
 - b) presentation on this subject and major IEEE conferences (so far ISCAS2013 ICIP2013, CDC2013, ISCAS2014, PES-GM 2014), NSF and to the Association of Heads of Electrical and Computer Engineering Departments (ECEDHA)













IEEE Initiatives on Proper Use of Bibliometrics

Make clear that manipulation of any bibliometric indicato unethical



- 2. Promote the **adoption of multiple bibliometric indicators** to evaluate the impact of scientific publications and of individual papers
- Educate the community on the significance of all bibliometric indicator and their proper use
 - a) panel discussion at the 2013 and 2014 IEEE Panel of Editors
 - b) presentation on this subject and major IEEE conferences (so far ISCAS2013 ICIP2013, CDC2013, ISCAS2014, PES-GM 2014), NSF and to the Association of Heads of Electrical and Computer Engineering Departments (ECEDHA)
- 4. IEEE position statement on correct use of bibliometrics (approved by BoD in 09/2013)

/www.ieee.org/publications_standards/publications/rights/bibliometrics_statement.html



IEEE Initiatives on Proper Use of Bibliometrics



- The use of multiple complementary bibliometric indicators is fundamentally important to offer an appropriate, comprehensive and balanced view of each journal in the space of scholarly publications.
- 3. Any journal-based metric is not designed to capture qualities of individual papers and must therefore not be used as a proxy for single-article quality or to evaluate individual scientists.
 - 3. While bibliometrics may be employed as a source of additional **information** for quality assessment within a specific area of research, the primary manner for assessment of either the scientific quality of a research project or of an individual scientist should be peer review.
 - The IEEE **explicitly and firmly condemns** any practice aimed at influencing the number of citations to a specific journal with the sole purpose of artificially influencing the corresponding indices.

















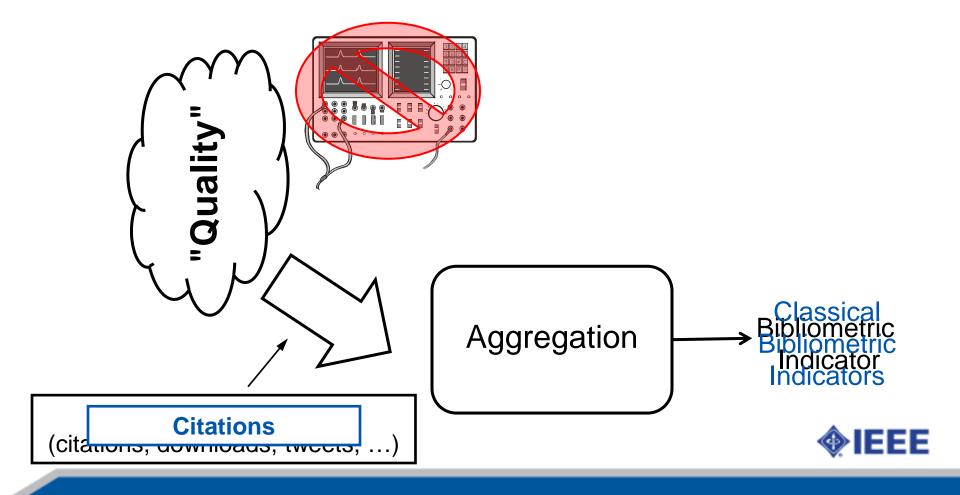
Outline

- 1. Overview on journal bibliometric indicators
- Show that the "quality" of a journal as measured by journal bibliometric indicators is a multidimensional concept which <u>cannot be</u> <u>captured by any single indicator</u>
- 3. Show that the bibliometric indicators should not be misused by giving them <u>"more significance than they have":</u>
 - a) the impact of an <u>individual paper cannot be measured</u> by the impact of the journal in which it has appeared
 - b) there is **no strong correlation** between the Impact Factor of a journal and its **selectivity** (rejection rate)
 - c) the Impact Factor of a journal is not a good proxy for the probability that an individual paper will be highly cited
- 4. Highlight that the misuse of journal bibliometric indicators has undesired consequences in the behavior of editors and individuals



Bibliometrics

 Definition: Bibliometrics is a set of methods to <u>quantitatively</u> <u>analyze</u> scientific and technological literature (it is part of Informetrics, which does the same for all information)



Journal Bibliometric Indicators, i.e. ...numbers, numbers, numbers, numbers...

Many bibliometric indicators exist, each aiming to measure "journal quality"; they should:

- 1. Give a result which corresponds to the technical quality of the papers published in that journal: <u>Nature</u>, <u>Science</u> or <u>Proceedings of the IEEE</u> and the "<u>Journal of Obscurity</u>" should have a very different value of the indicator
- 2. Be "fair" if applied to different areas: different areas/communities may have different citation practices (e.g., long/short citation list)
- 3. Be immune to external manipulation: it should be very difficult to artificially manipulate its value



Impact Factor and its criticisms - I

- Introduced by Eugene Garfield (1972) to help librarians understand how much a journal was being used (useful in renewal process)
- It is an <u>average</u> measure of usage across <u>an entire journal</u>
- It contains <u>no information</u> on the impact of an <u>individual paper</u>
- For a journal J_i in a year n

$$IF(J_i, n) = \frac{\#\{ \text{ citations to all items published in } J_i \text{ in } n-1 \text{ and } n-2 \}}{\#\{ \text{articles and letter published in } J_i \text{ in } n-1 \text{ and } n-2 \}}$$

Pros: simple, easy to compute, known and disseminated

Impact Factor and its criticisms - II

Cons/criticisms:

 Only 2 years of data to account for citations may not be enough in some areas to reach the citation peak ⇒ <u>IF varies very</u> <u>significantly among (sub)areas</u>

```
Ex: In SC Eng. E&E, \boldsymbol{E}[IF_{2011}]=1.32; max[IF_{2011}]=7
In SC Biology, \boldsymbol{E}[IF_{2011}]=2.10; max[IF_{2011}]=11.45
In SC Bioch and Molec. Bio \boldsymbol{E}[IF_{2011}]=3.78; max[IF_{2011}]=34.31
```

- 2. Citations are counted in the same way <u>independently of the</u> <u>source</u> (i.e. a citation obtained from *Science* is the same as the "*Journal of Obscurity*")
- 3. IF has an "non-consistent" definition: elements considered at the numerator are different than the denominator
- 4. IF is liable to active manipulation

Impact Factor: manipulation (1/3)

- How has IF been manipulated?
- 1. <u>Inconsistent definition</u>: citations to notes/"letters to the editor"/editorials count in the numerator but the same items are not counted in the denominator. They can be cited and, even more importantly, their citations count normally.

Neth Heart J (2012) 20:481–482 DOI 10.1007/s12471-012-0336-0



EDITOR'S COMMENT

The NHJ 2012 in retrospect: which articles are cited most?

Its bibliography contains 25 citations to the same journal, 24 of which count toward the 2012 IF



Impact Factor: manipulation (2/3)

2. <u>Coerce self-citations</u>: EiCs "force" authors to add citations to their journal (not necessarily to the authors) to increase IF

Coercive Citation in Academic Publishing

3 FEBRUARY 2012 VOL 335 **SCIENCE** www.sciencemag.org

Published by AAAS

Allen W. Wilhite*† and Eric A. Fong*

- EICs of 175/832 journals in the area of economics, sociology, psychology, and multiple business disciplines were found to "coerce" self-cites
- Coercing was more frequent with young authors than experienced ones
- Relation to area: if one journal coerces its authors other journals will most likely follow

Impact Factor: manipulation (3/3)

- 3. Citation Cartel/Stacking: EiCs or other members of editorial board of J_A and J_B :
 - publish in J_A a paper with (several) tens of citation to J_B
 - publish in another journal as authors to do the same

Brazilian citation scheme outed

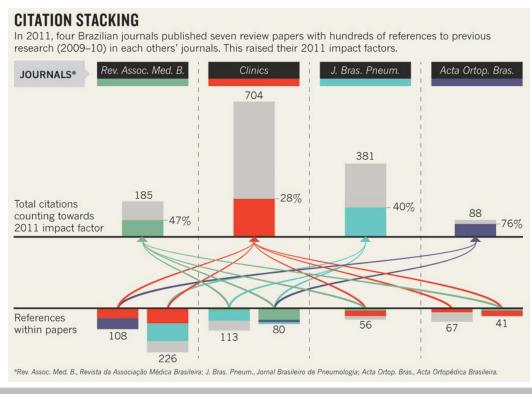
Thomson Reuters suspends journals from its rankings for 'citation stacking'.

Richard Van Noorden



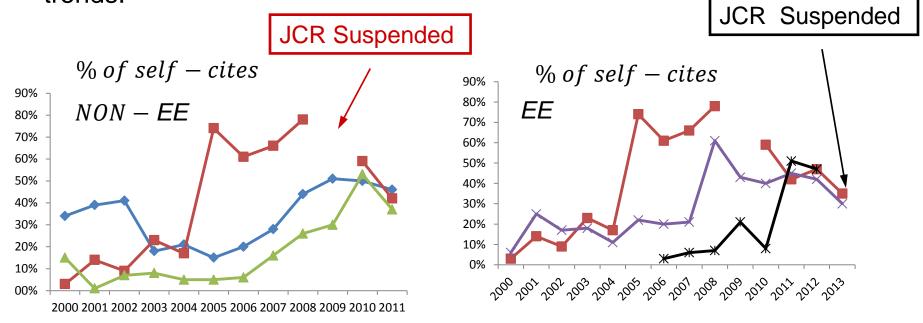
27 August 2013

- Four Brazilian journals
 (Rev Assoc. Medic B,
 Clinics, J. Bras. Pneum,
 Acta Ortop Bras.) were
 found to establish a citation
 cartel
- Three Italian journals in the area of medicine (with the same EiC!)



Is the phenomenon widespread?

 No systematic study yet: one must use JCR data: For citation cartels the systematic analysis is very difficult, but one can rely on self-citation trends:



- Laser and Particles Beams (Phy Applied), Cortex (Neuroscience),
 Int. Journal of Hydrogen Energy (Energy and Fuels) show an increasing self-citation trend (and similar examples exist in many more areas)
- Our Area: Int J. Circuit Theory and Applications and Asian Journal of Control shows that we are not immune.

What is wrong with this conference paper?

Abstract-There is difficulty when mobile sensors/robots that patrol in a group sizes with the comparison o

Index Terms— bio-inspired comm

I INTRODUCT

The major challenge of communi complex field is that the number insufficient for continuously commi intra/inter-groups. While each group communication within the group at for constant end-to-end data commi source and destination in different a are always unmonitored locations, di mobile sensors/robots that cannot me field. With an intention to solve suc mobile robots/sensors need to natrol cover it completely. Unfortunately, a to group the robots/sensors so that th is high. The size of the robot/sensor g or small.

A similar choice bothers primate macagnes and titi monkeys are to usually live in groups in order to defend against intruders, and search t live in large groups that normall individuals, regardless of habitat typ group communicate via facial expre vocal communication [1, 2]. Commu obtains complications from the large group. Titi monkeys, however, live consist of the parents and their offst titi monkeys contains a total of two t

Resides thesus macaques and titi other primate types that have solved However, rhesus macaques and territory-patrolling problem in two ways: large group and small group. these interesting strategies in non-hi we can apply similar strategies an systems, such as the robot grou environments. Throughout this wo grouping in primate species to study provide a study on the performance

tool called MASON [6]. The T10-1091.

 $2\sum_{i=1}^{K_{k,j}}R_{k,j}$

 $-2\sum_{i}^{3k_{B}}R_{kj}\times v_{i}$

Therefor

the k., sub f

where v_k is

the kth sub f

is simultan

groups of r

maximum

where v_k is

the kth sub f

If we ass

mobile rob

only one in

the gk group

probability

probability

beating an

probability

beating an

 $p_{nki} = 1$

The prob

1/g_i, and t

beating an i

 $p_{p,k} = \frac{1}{g}$

Hence th

an intruder

 $p_{\rho} = \prod p_{\rho}$

We sim

generated

assumption

II unless sta

III and the

problem de

The mov

Times :

The contributions of this bio-inspired modeling and which aspects of primate a problems discussed in this grouping concerning comm

The rest of this paper is or we present the description at as the model. In Section II comparison of the performa Finally, we conclude this pa

II GROUP BEHAVIOR

A Problem Description

For convenience, the rect smaller rectangle areas, calle mobile sensors/robots that ca by one hop as well as multip A sub field has the possibil more groups. Mobile sensors through certain sub fields t these sub fields. These rob detect intruders and with o attacks. Assume that the rob not able to communicate v distances might be longer t courier (an UAV or a mobile among these groups along a groups. The courier receives over and sends data received

There are many manners linear movement, random However, we assume the lin Intruders may invade the fi one robot to find and bea therefore the large group intruder than the small g robots/sensors in a large gro

Naturally, we know that a beating the intruder, but the the group results in a longer communication overhead. The delay, collisions, comm data transmissions in a sma large group, but the robots/s collaborate as powerfully as ability of each robot

Our goal is to study the large and small groupings.

This subsection provides field of the robots/sensors, robots/sensors, and to cale

deal with more intruders th large group, the slow-movi interference in large groups



Fig. 1 Robots In summary, the patrol tir than that of the large grouping small; the successful trans

- [1] Rhesus macaque. Available: Rhosus Macaque, Available: http://www.hsus.org/animals
- us macaque html Titi Monkeys (New World M http://www.animalcomer.co.
- [4] Titi, Available: http://en.wikipedia.org/wiki/1 rosalia." Antmal Behaviour,
- http://www.cs.gnm.edu/-eclal [7] J. Zheng, Y. Huang, Y. War communication Faihures on (Wireless Communications at
- Sons, accepted DOI: 10.10 [8] Y. Zhang, Y. Xiao, and Scent-marking, and Their / Networks," International Jo
- [9] J. Liu, Y. Xiao, O. Hao, and I in Agile Sensing for Target Networks, Vol. 5, No. 2, 200 [10] X. Liang and Y. Xiao, "A St
- DOT: 10 1007/s12652-012-0 hy Mohile Sensors" (Flu
- [12] X. Liang and Y. Xiao, "Mol Shape of Curves," (Elsevier DOI: 10.1016/j.mcm.2012.0 [13] J. Zheng, Y. Huang, and
- Naturalis (TISNat) Vol. 11 [14] X. Liang, Y. Xiao, J. Zhang. Event Capturing with a Sing Mobile Sensor Networks St
- [15] Y. Xiao, Y. Zhang, and X Methods for Mobile and Article 26, pp. 26:1-26:37, De

- [28] X. Zhang, L. Xie, and X. allocation schemes in wire Sensor Networks, Vol. 11,
- [29] A. Abbasi, M. F. Younis, at repair algorithm for pa mational Journal of 250-262
- [30] R. Beghdad, "Efficient co International Journal of S [31] B. Chen and W. Liu, "A
- network for distributed Journal of Sensor Network [32] C. Pham, "Coverage and : networks for surveillance Networks, Vol. 11, No.3 p
- in wireless sensor network of Sensor Networks, Vol. 1 [34] G. S. Thakur, U. Kumar
- mobility characteristics an International Journal of S [35] H. Xu, L. Huang, Z. Zhan
- assignment for static energ of Sensor Networks, Vol. 1 [36] H. Zeghilet, M. Maimour passive clustering in wir
- Journal of Sensor Network [37] A. Nandi and S. Kundu International Journal of Se
- [38] M. Balakrishnan and D. emergency medium acces Networks, Vol. 11, No. 2, [30] S Shan W Wn W Wan
- minimum interference co Naturniks Vol. 11 No. 2
- uriralass sansor naturniks 11, No. 2, 2012, pp. 109 -[41] J. Zheng, Y. H Consistency of Group ?
- [42] G.U. Gamm, M. Kostic, M. Journal of Sensor Network [43] D. Li, L. Liu, and H. Du,
- [44] J. Cao, X. Jia, and L. Shu
- [45] R. Silva, J. Silva, J. M. L. Networks, Vol. 11, No. 1. [46] S. Medjiah, T. Ahmed, and
- Sensor Networks, Vol. 11 [47] W. C. Chia, L. W. Chew. stitching and compression International Journal of Se 32. DOI:
- [48] L. W. Chew, W. C. Chia, compression architecture u in wireless multimedia sen Networks, Vol. 11, No. 1, [49] S. Chinnappen-Rimer and info-gap decision theory

- [73] Reiner Jedermann, Markus Becker, Carmelita Gorg, Walter Lang
- "Testing network protocols and signal attenuation in packed food transports," International Journal of Sensor Networks, Vol. 9, No.3/4, 2011, pp. 170 - 181 [74] Y. Taniguchi, T. Kitani, and K. Leibnitz, "A uniform airdrop deployment
- method for large-scale wireless sensor networks," International Journal of Sensor Networks, Vol. 9, No.3/4, 2011, pp. 182 - 191. [75] T. D. Tran, J. I. Agbinya, and A. A. Al-Jumaily, "Per node deploymen based detection of controlled link establishment attack in distributed
- sensor networks " International Journal of Sensor Networks, Vol. 9 No.3/4, 2011, pp. 192 - 208. 1761 D. Li O. Zhu, and W. Chen, "Efficient algorithm for maximum lifetime
- many-to-one data aggregation in wireless sensor networks," International Journal of Sensor Networks, Vol. 9, No.2 pp. 61 68, 2011. [77] M. B. Haider, S. Imahori, and K. Sugihara, "Success guaranteed routing in almost Delaumay planar nets for wireless sensor communication. International Journal of Sensor Networks, Vol. 9, No.2 pp.69 - 75, 2011.
- [78] K.-S. Hung and K.-S. Lui, "On perimeter coverage in wireless sensor networks with minimum cost " International Journal of Sensor Networks Vol. 9, No.2 pp.76 - 88, 2011
- [70] C.-M. Vu. C.-C. Li. C.-S. Lu. S.-V. Kuo. "An amplication-driven attack probability-based deterministic pairwise key pre-distribution scheme for n-uniformly deployed sensor networks, Vol. 9, No.2 pp.89 - 106, 2011.
- [80] S. N. Vecherin, D. K. Wilson, and C. L. Pettit, "Optimal sensor placement with signal propagation effects and inhomogeneous coverage preferences." International Journal of Sensor Networks, Vol. 9, No. 2 pp.
- [81] S. Ouni, S. Gherairi, and F. Kamoun, "Real-time quality of service with
- delay guarantee in sensor networks, International Journal of Sensor Networks, Vol. 9, No.1, pp. 50 60, 2011.

 [82] M. Chen, V. C. M. Loung, X. Huang, and M. Li, "Editorial," International Journal of Sensor Networks, Vol. 9, No.1, pp. 1 2, 2011. [83] J. Zhang, C.W. Lip, S.K. Ong, and A.Y.C. Nee, "Development of a
- [53] J. Zamag, C. v. 139, S.A. Ong and A. F.O. Voice. Development of a short-mounted assistive user interface for navigation. International Journal of Sensor Networks, Vol. 9, No. 1, pp. 3 12, 2011.
 [54] P. A.C.S. Neves, A. Estaves, R. Cunha, and J. J.P.C. Rodrigues, "User-centric data gathering multi-channel system for IPv6-snabled wireless sensor networks," International Journal of Sensor Networks, Vol.
- 9, No. 1, pp. 13 23, 2011.
 [85] Md. B. Uddin and C. Castelluccia, "Towards clock skew based services in wireless sensor networks," International Journal of Sensor Networks, Vol. 9, No.1, pp. 24 - 37, 2011.
- [86] W. Chen, J. Hu, S. Bouwstra, S. B. Oetomo, and L. Feijs, "Senso integration for parinatology research," International Journal of Sensor Networks, Vol. 9, No. 1, pp. 38 - 49, 2011. [87] D. Toscani, F. Archetti, M. Frigerio, and E. Messina, "IKNOS: inference
- and knowledge in networks of sensors." International Journal of Sensor Networks, Vol. 8, No. 3/4, pp. 209 - 221, 2010.
 [88] R. Machado, S. Tekinay, W. Zhang, and G. Wang, 'Diffusion-based
- approach to deploying wireless sensor networks, 'International Journal of Sensor Networks, Vol. 8, No.3/4, pp.222 232, 2010. [89] X. Li, "Collaborative multi-sensor tracking in mobile wireless sensor networks "International Journal of Sensor Networks, Vol. 8, No 3/4, no
- 1901 H. Chen and M. Li. "Editorial." International Journal of Sensor Networks
- [91] S. Seok, W. Song, and D. Choi, "Implementation of Pastry-based P2P system to share sensor data," International Journal of Sensor Networks,
- Vol. 8, No.34, pp. 125 135, 2010.

 [92] J. M. Soares, B. J. Gencalves, and R. M. Rocha, "Practical issues in the development of a minimalistic power management solution for WSNs, International Journal of Sensor Networks, Vol. 8, No.3/4, pp. 136 - 146,
- [93] A. Bari, D. Teng, R. Ahmed, and A. Jaekel, "Relay node placement with energy and buffer constraints in wireless sensor networks using mobile data collector," International Journal of Sensor Networks, Vol. 8, No.3/4, pp. 147 - 159 , 2010.
- [94] M. Al-Otaibi and H. Soliman, "Efficient geographic routeless ros protocols with enhanced location update mechanism." Internations Journal of Sensor Networks, Vol. 8, No.3/4, pp. 160 - 171, 2010.

- International Journal of Sensor Networks, Vol. 9, No.3/4, 2011, pp. 158 [95] M. Zennaro and A. B. Bagula, "Design of a flexible and robust gateway to collect sensor data in intermittent power environments," International Journal of Sensor Networks, Vol. 8, No.3/4, pp. 172 - 181, 2010.
 - Journal of Senior Networks, Vol. 8, No.3/4, pp. 172 101, 2010.
 P. Szczechowiak, M. Scott, and M. Collier, "Securing wireless sensor networks: an identity-based cryptography approach," International Journal of Senior Networks, Vol. 8, No.3/4, pp. 182 192, 2010.
 - [97] M. Min, A. F. O'Brien, and S. Y. Shin, "Improved PSOR algorithm for minimum power multicast tree problem in wireless ad hoc networks," International Journal of Sensor Networks, Vol. 8, No.3/4, pp. 193 - 201,
 - [98] H.T. Kung and D. Vlah. "A spectral clustering approach to validating sensors via their peers in distributed sensor networks," International Journal of Sensor Networks, Vol. 8, No.3/4, pp. 202 - 208, 2010.
 - 1991 S. Ozdemir and V. Xiao, "FTDA: Outlier Detection Based Fault Tolerant Security and Communication Networks, DOI: 10.1002/sec. 604. accepted.
 - [100] B. Sun, X. Shan, K. Wu, and Y. Xiao, "Anomaly Detection based Secure Journal, accepted
 - Performance Bounds of Multi-hop Fair-Access for MAC Protocols in Wireless Sensor Networks and Underwater Sensor Networks," IEEE Transactions on Mobile Computing, Vol. 11, No. 10, Oct. 2012, pp
 - [102]M. Peng and Y. Xiao, "A Survey of Reference Structure for Sec Systems," IEEE Communications Surveys & Tutorials, Vol. 14, No. 3,
 - Third Quarter 2012, pp. 897-910. [1031M. Peng, H. Chen, Y. Xiao, S. Ozdemir, A. V. Vasilakos, and J. Wu. Impacts of Sensor Node Distributions on Coverage in Sensor Networks, Journal of Parallel and Distributed Computing, Vol. 71, No. 12, Dec
 - [104]F. Wang, P. Zeng, H. Yu, and Y. Xiao, "Random Time Source Protocol in Wireless Sensor Networks Synchronization in Industrial Environm (Wiley) Wireless Communications and Mobile Computing (WCMC) Journal, John Wiley & Sons, accepted
 - Journas, Joun Wiley & Sons, accepted [105] S. Ordemir and Y. Xino, "Integrity protecting hierarchical concealed data aggregation for wireless sensor networks," Computer Networks, Vol. 55, No. 8, June, 2011, pp.1735-1746.
 - [1061] Lin and V. Xiao, "Terrmoral Accountability and Anonymity in Medical Sensor Networks," ACM/Springer Mobile Networks and Applications (MONET), Special Issue: Wireless and Personal Communications, Vol. 16, No. 6, pp. 695-712, Dec. 2011.
 - [107] A. Olteanu, Y. Xiao, K. Wu, and X. Du, "Weaving a Proper Net to Catch Large Objects in Wireless Sensor Networks," IEEE Transactions on Wireless Communications, Vol. 9, No. 4, Apr. 2010, pp. 1360-1369.
 [108] Y. Xiao, H. Chen, K. Wu, B. Sun, Y. Zhang, X. Sun, and C. Liu,
 - Coverage and Detection of a Randomized Scheduling Algorithm in Wireless Sensor Networks," IEEE Transactions on Computers, Vol. 59, No. 4, Apr. 2010, pp. 507-521.
 - JM. Peng, Y. Xiao, and P. Wang, "Error Analysis and Kernel Density Approach of Scheduling Sleeping Nodes in Wireless Sensor Networks," IEEE Transactions on Vehicular Technology, Vol. 58, No. 9, Nov. 2009. [109]M. Peng, Y. Xiao

What is wrong with this conference paper? - II

- The authors published 2 conference papers with 100+109 items in the reference list.
- There are 74+82 citations to the International Journal of Sensor Networks (IJSN)
- One of the 2 authors is the EiC of the IJSN
- IJSN was not included by Thomson in the 2013 Journal Citation Report since the above citations account for 82% of the total citations to IJSN.
- The addition of the citation was done <u>after</u> the review process was completed

What is wrong with this conference paper? - II

- The authors published 2 conference papers with 100+109 items in the reference list.
- There are 74+82 citations to the International Journal of Sensor Networks (IJSN)



> Thomson Reuters vows to be clearer about how science's most misused metric is calculated.

The addition c^{Richard Van Noorden}
 completed

process was

Why this is happening?

- The IF was historically created to give <u>librarians</u> tools for deciding renewals, yet...
- It is currently more and more used as the gold standard to evaluate the impact of an individual's research activity (for hiring, tenure, promotion, salary increase...).
 - As an example, the Chinese government pays scientists for publication in high IF journals (see http://scholarlykitchen.sspnet.org/2011/04/07/paying-for-impact-does-the-chinese-model-make-sense/)

IF range	(0,1)	[1,3)	[3,5)	[5,10)	>10	Nature/Science
Increase in salary	\$306	\$458	\$611	\$764	\$2139	\$30562



Why this is happening?

- The IF was historically created to give <u>librarians</u> tools for deciding renewals, yet...
- It is currently more and more used as the gold standard to evaluate the impact of an individual's research activity (for hiring, tenure, promotion, salary increase...)
- This use is commonly based on 2 main "assumptions". Assume that J_A has $IF_A \gg IF_B$ of J_B , then
 - 1. Any paper published in J_A has more impact (has received more citations) than any paper published in J_B
 - 2. The review process of J_A is more stringent than the one of J_B

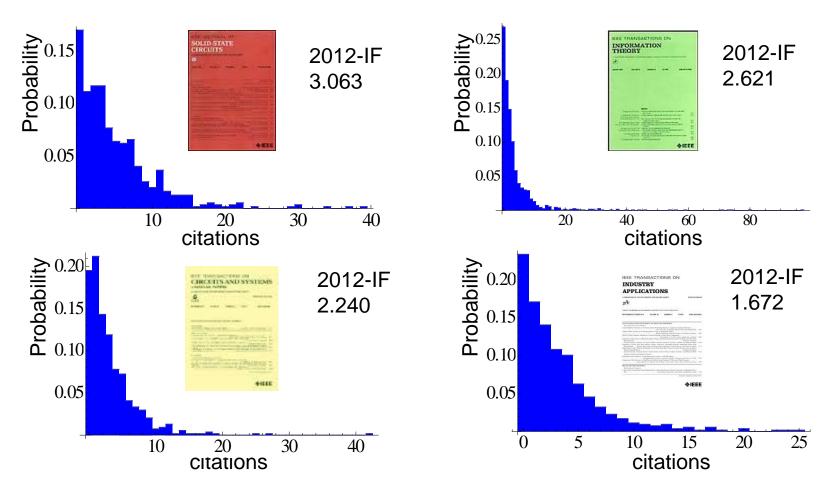
Are these assumptions supported by data?





Some data - I

1. Evaluation of the impact of a single paper in a journal



JSSC, TIT, TCAS-I, and TIA distributions of citations for 2012 to papers of 2011 and 2010 show the same shape: most papers are cited only a few times.or never cited and only very few have high impact

Some data - II

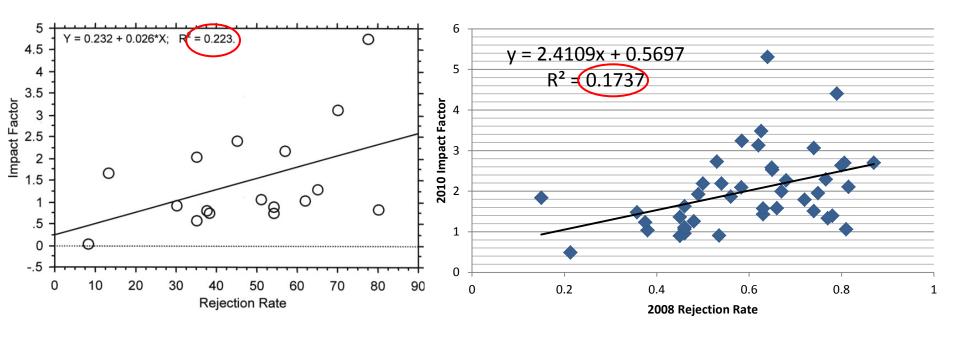
- Important: regardless of IF, most papers in each journal are cited only a few times (if ever) and few papers are cited many times
- Assuming that a randomly chosen paper in JSSC (IF=3.063) is better (has more citations) than one of TCAS-I (IF=2.240) is wrong >36% of the time
- Assuming that a randomly chosen paper in TIT (IF=2.612) is better than one of TIA (IF=1.672) is wrong >43% of the time

journal indicators are average quantities and give therefore **no indication** of the quality of any single published paper



Some data - III

- Indication of the selectivity of a journal: if the IF of a journal is large, is the review process "very strict"?
- This is <u>not supported by data</u> (at least if one assumes valid the equation "strict review process = high rejection rate"): the correlation coefficient is on the order of 0.2



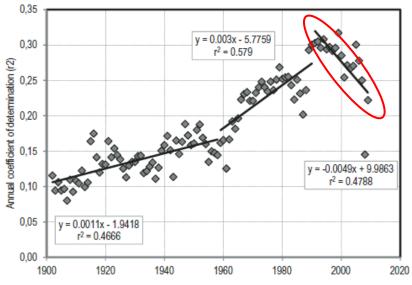
A. Kurmin, T. Krimis, "Exploring the Relationship Between Impact Factor and Manuscript Rejection Rates in Radiologic Journals, Acad Radiol 2006; 13:77–83

43 IEEE titles, Rejection Rate obtained by internal reports

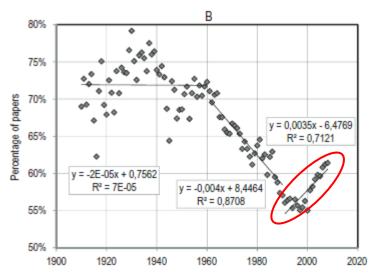


Some data IV

- Assumption: the IF of a journal is large, papers published there are highly cited, if I publish there my paper has an higher probability to be highly cited
- This is <u>not supported by data</u> (neither in terms of correlation nor of probability) [G. A. Lozano et al., "The Weakening Relationship Between the Impact Factor and Papers' Citations in the Digital Age", J. American Society for Information Science and Technology, 63(11):2140–2145, 2012]



"Correlation coefficient" between IF in year of publication and citation rate in the following 2 years



Percentage of papers which are in the top 5% of the distribution citation in a given year which were NOT published in a journal in the top 5% of the IF ranking

Why this is happening?

 While the IF was historically created to help <u>librarians</u>, it is <u>misused</u> to evaluate <u>individual's research activity</u> (for hiring, tenure, promotion...)

The unintended use of the IF <u>made it the target and not the</u> <u>measure</u> and created incentive for its manipulation

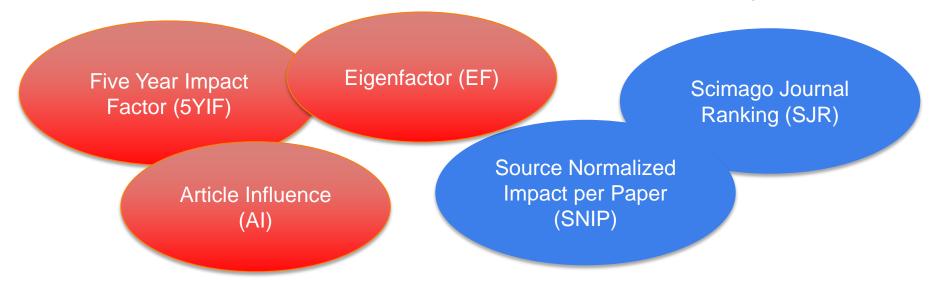
According to the 2013 Nature article of Richard Van Noorden the EiCs of the 4 journals involved in a citation cartel created it because

"In Brazil, an agency in the education ministry, called CAPES, evaluates graduate programmes in part by the impact factors of the journals in which students publish research"



Other measures to solve IF issues for Journal evaluation

Several "successful" new indicators: 5 in either WoS or Scopus



- *Increase the citation window*: 3 or 5 years
- Introduce subject field normalization: explicit (SNIP) or implicit (EF, AI, SJR)
- Exclude all (or most) self-cites: eliminate the inflation issue (EF, AI, SJR)
- Only count "equivalent scientific" documents both at numerator and denominator: eliminate another cause of inflation (EF, AI, SJR, SNIP)



Popularity vs Prestige

- An important distinction is between indicators measuring popularity or prestige
- Popularity indicators: are based on an algebraic formula and count citations directly <u>independently of their</u> <u>source</u> (IF, 5YIF, SNIP)
- Prestige indicators: are based on an recursive formula and weight the influence of citations <u>depending on their</u> <u>source</u> (EF, AI, SJR)

They evaluate different aspects of **Journal Impact**



At the very minimum, one needs to use **both** popularity (ex. IF, 5YIF) and prestige (ex. AI, SJR) indicators

Addressing the issues: the rest of the landscape

In approving the statement IEEE joins several other research agencies and professional organizations in the area of Physics, Medical Sciences, Biology,













Council of Canadian Academies
Conseil des académies canadiennes



Some Don'ts (1/3)

- Journal Bibliometrics indicators have been designed to evaluate journal impact but cannot be employed as a single measure of the quality of single papers or to evaluate the quality of a scientists.
 - This is particularly problematic for the IF but applies to all journal indicators

Examples:

- a. Do not rank faculty candidates using the IF of the journal they publish in
- 2. The application of **aggregation or filter operations** to Journal or Individual Bibliometric indicators makes their use to rank scientists even a **worse abuse**
 - Examples:
 - a. Do not use the *sum of publication IFs* or use the *average of publication IFs* to rank candidates
 - b. Do not apply a threshold to IF to make a particular publication count for raises (say first quarter in a specific subject category of JCR)

Some Do's

- Journal Bibliometric indicators exist, each aiming to measure the journal scientific impact and they measure it in different ways
 - One cannot use a single indicator (neither IF, nor any other) to measure journal impact. At the very least, one needs to use
 - a. One popularity indicator (e.g. the IF, or the 5YIF)
 - b. One prestige indicator (e.g. the AI)
 - Use of multiple indicators provides a much more accurate evaluation of a journal's impact and can also <u>make evident existing anomalies</u>
- Individual Bibliometric indicators are statistical quantities and if the faculties/candidates have a sufficiently large publication output, citation analysis can be used (with caution) as an additional source of information for evaluation
 - Examples:
 - a. Different career progression dynamics may (will) exist
 - b. Benchmarking is fundamental especially for multidisciplinary research
 - c. Read the contribution and apply your own judgment!!

For more info

DOI: 10.1109/ACCESS.2013.2261115

Some Information to EiCs, PC and PRAC members about current bibliometric measures

Gianluca Setti, Stephen Yurkovich, Jacek Zurada

July 9, 2012

EigenFactor and Article Influence in a nutshell

As it will be clarified in the following, Impact Factor (IF), EigenFactor (EF), and Article Influence (AI) extract information from the collection of citations of a given set of journals, each in a different way, with the aim of measuring the quality and influence of each publication. More specifically:

- All and IF are a measure of quality per-article, whereas EF measures the quality of the overall journal. As such, the latter tends to be larger for journals publishing many articles per year.
- EF and AI weight citations in a different way depending on the reputation of the source; on the contrary the
 IF considers a citation coming from the Proceedings of the IEEE and one coming from a low quality journal
 at the same level.



Received April 5, 2013, accepted April 27, 2013, published May 10, 2013.

Digital Object Identifier 10.1109/ACCESS.2013.2261115

Bibliometric Indicators: Why Do We Need More Than One?

GIANLUCA SETTI, (Fellow, IEEE)

Department of Engineering (ENDIF), University of Ferrara, Ferrara 44100, Italy, and also with the Advanced Research Center on Electronic Systems University of Bologna, Bologna 40125, Italy (gianluca.setti@unife.it)

ABSTRACT This paper provides an overview of the main features of several bibliometric indicators which were proposed in the last few decades. Their pros and cons are highlighted and compared with the features of the well-known impact factor (IF) to show how alternative metrics are specifically designed to address the flaws that the IF was shown to have, especially in the last few years. We also report the results of recent studies in the bibliometric literature showing how the scientific impact of journals as evaluated by bibliometrics is a very complicated matter and it is completely unrealistic to try to capture it by any single indicator, such as the IF or any other. As such, we conclude that the adoption of more metrics, with complementary features, to assess journal quality would be very beneficial as it would both offer a more comprehensive and balanced view of each journal in the space of scholarly publications, as well as eliminate the pressure on individuals and their incentive to do metric manipulation which is an unintended result of the current (mis)use of the IF as the gold standard for publication quality.

Email: gianluca.setti@unife.it