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Short Communication

Citation impact analysis of top ranked computer science journals and their rankings

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ABSTRACT

Citation based approaches, such as the impact factor and *h*-index, have been used to measure the influence or impact of journals for journal rankings. A survey of the related literature for different disciplines shows that the level of correlation between these citation based approaches is domain dependent. We analyze the correlation between the impact factors and *h*-indices of the top ranked computer science journals for five different subjects. Our results show that the correlation between these citation based approaches is very low. Since using a different approach can result in different journal rankings, we further combine the different results and then re-rank the journals using a combination method. These new ranking results can be used as a reference for researchers to choose their publication outlets.

1. Introduction

Journal publication is very important and is the major activity for scientists and researchers. In addition, it can be regarded as a required criterion for evaluating the research performance of a scientist. Consequently, journal rankings are usually a major indicator for researchers to choose suitable publication outlets.

There are several possible approaches to ranking journals, which can be classified into qualitative and quantitative based methods. The qualitative type of method is usually based on surveys which record the perceptions of respondents, such as described by Mylonopoulos and Theoharakis (2001) and Peffers and Tang (2003).

On the other hand, the quantitative type of method is simply based on the journal's impact factor, which is a metric to measure the influence or impact of journals in various subject areas. In particular, the impact factor of a journal is calculated by the average number of citations to recent articles published in that journal (Garfield, 2006).

This kind of citation analysis is considered the most objective methodology for assessing journal quality and ranking (Katerattanakul, Han, & Hong, 2003). The Web of Knowledge is an academic citation indexing and search service that covers the sciences, social sciences, arts and humanities for the purpose of impact factor references.

Additionally, the *h*-index has been recently proposed to measure both the productivity and impact of the published work of a scientist or scholar (Hirsch, 2005). It is based on a set of the scientist's most often cited papers and the number of citations that they have received in other publications. Similarly, it can be used to assess the journal's quality and impact (Harzing & van der Wal, 2009; Mingers, Macri, & Petrovici, 2012).

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Vanclay (2008) showed there to be a high correlation between the *h*-index and impact factor, after ranking 180 forestry journals by the *h*-index. Similarly, Hodge and Lacasse (2011), Hunt, Cleary, and Walter (2010), and Han Yu, and Wang (2010) found that there to be a strong positive relationship between the journal impact factor and *h*-index in the domains of social work, psychiatry, and reproductive biology, respectively.

However, the correlation between the impact factor ad *h*-index is not strong for the artificial intelligence journals, with some journals with a modest or low impact factor having a high *h*-index (Zhang, 2012). Therefore, some studies suggest that the impact factor and *h*-index are completely complementary when evaluating journals of the same scientific discipline (Bador & Lafouge, 2010).

The aim of this paper is to use the quantitative based methods including impact factor and *h*-index for correlation coefficient analysis between various top ranked computer science journals on different subjects. The Web of Knowledge classifies the computer science discipline into seven different subjects, which are artificial intelligence, cybernetics, hardware & architecture, information systems, interdisciplinary applications, software engineering, and theory & methods.

In addition, since the two quantitative (citation) based methods could result in two different ranking results for each specific subject, we re-ranked the journals by combining different ranking results based on a score based approach (CombSUM), which has been widely used in multiple evidence combinations for information retrieval (Nuray & Can, 2006).

The rest of this paper is organized as follows. Section 2 describes the methodology and data used. Section 3 presents and discusses the results. Finally, in Section 4 some conclusions are offered.

2. Methodology and data

In this study, the top ranked journals are defined as those having the top 20% of impact factors in each subject. For example, there are 111 journals on the subject of artificial intelligence, with 22.2 in the top 20%. Therefore, the top 20 journals are considered. Since there are relatively few journals for some subjects, such as cybernetics with 20 and hardware & architecture with 50, we only consider five subjects, which are artificial intelligence, information systems, interdisciplinary applications, software engineering, and theory & methods.

In addition, 2009, 2010, and 2011 impact factors of each journal and their corresponding 5-year impact factors are collected respectively. In other words, each journal contains three impact factors and three 5-year impact factors for 2009, 2010, and 2011 respectively. Note that, the 5-year impact factor for 2009 of a journal is the average impact factor from 2005 to 2009. On the other hand, three *h*-indices of each journal in 2009, 2010, and 2011 are also examined in order to analyze the correlation between the impact factor and *h*-index of each journal. That is, to calculate the *h*-indices of 2009, 2010, and 2011, they are based on the articles published in 2009, 2010, and 2011 respectively. In particular, the Publish or Perish software http://www.harzing.com/pop.htm#download (calculation date: between 2013/5/1 and 2013/5/7) is used to calculate the *h*-index of each journal (Harzing, 2010). The Pearson product-moment correlation coefficient is also used for correlation coefficient analysis.

It should be noted that in literature the correlation coefficient analysis between journals' impact factors and *h*-indices are somewhat different in terms of the year distributions of journals' impact factors and *h*-indices and the disciplines examined. Table 1 shows the comparative result including our method.

The CombSUM combination method is applied as the score based method for combining different journal rankings. With this method the score of each journal is the fused result of the sum of the scores obtained from individual ranking results. That is, each journal must be mapped to a value *s* (score) that is normalized throughout all ranking methods. CombSUM uses the following formula to calculate the score of journal *j* over *n* systems:

$$\text{Sum\_score}(j) = \sum_{j=1}^{n} s_j \tag{1}$$

Table 1
Comparisons of related works.

Work	Impact factor	*h*-Index	Disciplines
Bador and Lafouge (2010)	2006	2006	Pharmacology and pharmacy; psychiatry
Han et al. (2010)	2008; 2004–2008	2001–2008	Biology
Hodge and Lacasse (2011)	2003–2007	2003–2007	Social work
Hunt et al. (2010)	1995–1999; 2000–2005	1995–1999; 2000–2005	Psychiatric
Vanclay (2008)	2006	2000–2007	Forestry
Zhang (2012)	2009	2004–2008	Artificial intelligence
Our method	(1) 2009; 2005–2009 (2) 2010; 2006–2010 (3) 2011; 2007–2011	(1) 2009 (2) 2010 (3) 2011	Computer science (five different categories)