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Short Communication
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Using Author Weighted Scheme to Show the Most Cited Scholars on Google Maps

*Tsair-Wei Chien[1], Hsien-Yi Wang[2] and Willy Chou[3,4]**

[1]Department of Medical Research, Chi-Mei Medical Center, Taiwan

[2]Department of Sport Management, Chia Nan University of Pharmacy and Science, Taiwan

[3]Department of Physical Medicine and Rehabilitation, Chi Mei Medical Center, Taiwan

[4]Department of Recreation and Health-Care Management, Institute of Recreation, Taiwan

Abstract

Objective: To quantify author credits and compute the Individual Research Achievements (IRA), the most cited authors are required to present on Google Maps for comparison.

Methods: By searching the PubMed database (Pubmed.com), we used the keyword "PloS One" [Journal] and downloaded 27,042 articles published in 2015. A total of 106,910 articles were cited in Pubmed Central. The Author Weighted Scheme (AWS) was applied to compute personal IRA. A visual dashboard for the most-cited authors was shown on Google Maps.

Results: The author Lori Newman (Switzerland) ranks the highest Author Impact Factor (AIF=160.71 with one paper (PMID: 26646541, 2015) cited 100 times and another two cited 54 and 75 times, respectively, until 2018.

Conclusion: The AWS algorithm used for quantifying author credits can be applied to other scientific disciplines in measuring author IRA in the discernable future.

Keywords: Pubmed central; Authorship-weighted scheme; Individual research achievements; Author impact factor; Google maps

Introduction

Each year in June, we see millions of scholars paying close attentions to the Journal Citation Reports (JCR) locating Journal Impact Factors (JIF). However, no such personal Author Impact Factors (AIF) were applied to individual scholars [1], even those indices of h-index [2], g-index [3], and x-index [4] have been used for measuring author-level metrics based on both publications and citations of a scientist or scholar.

One of their shortcomings is the assumption of equal credits for all coauthors in an article [5,6]. Many AIF concepts have already proposed before [7,8], but we have not seen any successfully demonstrating illustrations for quantifying coauthor contributions in scientific disciplines.

Methods

We applied an Author Weighted Scheme (AWS) based on Rasch rating Scale Model (RSM) as Equation (1) compared to another algorithm based on graded response model as Equation (2) and Equation (3) [7,9,10]. With which, computing Individual Research Achievement (IRA) can be realized due to author credits fairly weighted and measured.

$$W_{ij} = \frac{\exp(\gamma_{ij})}{\sum_{j=0}^{m}\exp(\gamma_{ij})} = \frac{2.72^{\wedge}\gamma_{ij}}{\sum_{j=0}^{m}2.72^{\wedge}\gamma_{ij}} \quad (1)$$

$$W_{ij} = p_{ij} - p_{ij+1} \quad (2)$$

$$P_{ij} = \frac{\exp[Da_j(\theta-\delta_i)]}{1+\exp[Da_j(\theta-\delta_i)]} \approx \frac{\exp[(\theta-\delta_i)]}{1+\exp[(\theta-\delta_i)]} \quad (3)$$

The sum of authorships equals 1 for each paper. The weights for each author are shown in Table 1 on the first scenario when the powers (theta) for the ordered author name (i) and the article (j) are assigned from m to 0, where the author number is m+1. More importance is given to the

***Correspondence:**
Willy Chou, Department of Physical Medicine and Rehabilitation, Chi-Mei Medical Center, 901 Chung Hwa Road, Yung Kung Dist, Tainan 710, Taiwan, Tel: 88662812811;
E-mail: ufan0101@ms22.hinet.net

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Table 1: Coauthor weighted credits across types of the designated model.

Model type		Rasch model			GR model			GR-adj model		
Author number	1	2	3	4	2	3	4	2	3	4
Threshold	0	1	2	3	1	2	3	1	2	3
First author	1	0.73	0.67	0.64	0.73	0.73	0.73	0.73	0.69	0.68
Corresponding author		0.27	0.24	0.24	0.27	0.15	0.15	0.27	0.17	0.17
Second author			0.09	0.09		0.12	0.07		0.14	0.09
Third author				0.03			0.05			0.06
Difficulty adj								0.2	0.25	0.3

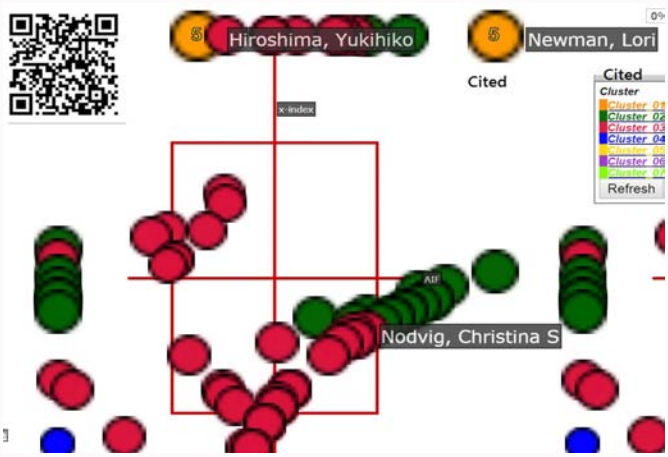

Figure 1: The most cited authors dispersed on Google Maps for comparison.

first (=exp(m), primary) and the last (=exp(m-1) corresponding or supervisory) authors, while we assume that the others (the middle authors) have made smaller contributions.

In Equation (2) and Equation (3), we set parameters of threshold difficulty (called delta) from 1 to m in an integer order. For instance, if threshold difficulties are from 1 to 2 when three authors exist, the respective probabilities are 0.27 and 0.12 according to Equation (3). The weights for each author are 0.73, 0.15 and 0.12, according to Equation (2), see Table 1 on the middle scenario.

$$P_{ij} \approx \frac{\exp[(0-(\delta_i - Adj))]}{1+\exp[(0-(\delta_i - Adj))]} \quad (4)$$

If the adjustment difficulties(e.g., 0.2,0.25, 0.3, etc.) are assigned to Equation (4), the weights for each author are 0.69, 0.17 and 0.14, see Table 1 on the right-hand side scenario, which might be almost equivalent to the results from Rasch model in Table 1 on the first scenario if the adjustment parameters are applied.

By searching the PubMed database (Pubmed.org), we used the keywords "PloS One" [Journal] on October 7, 2018, and downloaded 27,042 articles published in 2015. All citing articles were matched to the cited ones in Pubmed Central (PMC). Authors' IRA can be obtained by using the AWS algorithm. Detailed information is suggested to see the video at https://youtu.be/CJJ-uV8fYls.

Results

The author Lori Newman (Switzerland) ranked the highest (i.e., χ=7.95, AIF=160.71, cited=139) with one paper (PMID: 26646541, 2015) cited 100 times and another two cited 54 and 75 times until 2018 [11]. Another author Yukihiko Hiroshima (Japan) gained a total citation of 111 times in seven articles in 2015. Interested authors are suggested to scan the QR-code in Figure 1 to examine the author's publication outputs in PMC by clicking the specific author bobble.

Discussion

We used the extended Rasch RSM as an algorithm for computing the contribution weights for each author and performed a sensitivity analysis by the number of coauthors in Table 1 in comparison to the graded response model. Through which, the AIF can be computed and applied to compare the IRA among scientists. As such, the AIF computed by the Rasch based AWS plays an important role for scholars, like Thomson Reuters annually releases JIF for the indexed journals, in the discernible future.

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