ORIGINAL RESEARCH

Predicting public health impact: Linking ResearchGate presence to Scopus performance through machine learning

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Abstract

Background

ResearchGate as a main scientific social medium and Scopus as a known citation database have main role in sharing research output among specialists in different disciplines.

Objective

This study aimed to evaluate the performances of Iranian researchers in occupational health field and correlate some related variables. It also used regression analysis as one of machine learning approaches for predicting researchers' scientific performance.

Methods

This descriptive cross-sectional study was conducted in 2024 on ResearchGate and Scopus indicators of Iranian researchers in the Occupational Health Engineering affiliated in Iranian universities (n=213). Data were extracted from ResearchGate and Scopus and the researches' demographic information was collected from Iranian Scientometrics Information Database in medicine.

Results

149 researchers (70%) were active in ResearchGate. 144 researchers (96.6%) had RG scores with the mean rate of 11.70. in ResearchGate, they shared total 4,275 research items with the mean rate of 28.89 items per researcher. With total 24,235 citations, the mean rate of citations per paper was 169.48. Of them,143 (95.9%) had ResearchGate h-indexes with the mean rate of 5.38. In Scopus, 198 researchers (93%) had total 2,935 published documents in the database with mean rate of 14.82 documents per researcher. 186 researchers (87.3%) had total 18,749 citations with the mean rate of 100.80 citations and mean h-index amounted to 4.41. Researchers with more shared documents in ResearchGate had better performance in Scopus. Linear regression analysis showed that the researchers' presence in ResearchGate can predict their citation counts ($R2=.82$, $\beta=.911$, $p=.000$) and h-indexes ($R2=.83$, $\beta=.900$, $p<.001$) in Scopus.

Conclusion

Iranian researchers in the Occupational Health Engineering field fairly use the capacities of ResearchGate for influencing their research output. However, their interactions in social media tools should be encouraged for more reach and influence of their scientific productions.

Keywords: ResearchGate – Scopus – Research Evaluation – Iran – Occupational Health Engineering

Introduction

Scientific publications have increased in recent years and universities and research institutes expect their researchers to publish some papers as articles, books and so on. Publishing papers is a condition of academic promotion or research awards and grants. This results in the fact that publishing papers are conceived not only as a scientific production indicator, but also as a measure for academic promotion[1-4]. In addition to the quantity of research output, its quality is regarded by both research institutes and individual researchers[5]. For this, an especial research line in bibliometrics, i.e. citation analysis has been created for evaluating researchers, institutes, publications and other scientific agents[1,6-9]. Citation analysis has been developed since the 1950s when the citation number was emphasized[10-11] as an indicator of a scientific value of a scientific publication[9,12]. However, citation analysis has some weaknesses, including among others, a long time for a paper to be cited and no citation to some valuable works despite of their being read and used in education rather than research[13]. Therefore, other qualitative indicators need to be applied for evaluating research publications[14].

Developing the Internet and its publicity among researchers caused some changes in researchers' interactions and the modes of publishing the scientific output[15]. In the past, only academic journals published and dissimilated the scientific publications. Recently, various websites and social media applications and tools are used for dissemination of scientific information[4,15-17]. The development of using online context for sharing scientific publications necessitates non-traditional non-citation-based indicators that evaluate

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scientific output from other aspects[19], such as the rate of views, downloads and likes. Such indicators belong to a newly-emerged multidisciplinary area, named "altmetrics"[20] that coined in 2010[19-21].

Altmetrics is an alternative metrics or a paper level metrics and complement to traditional bibliometrics that removes some limitations of traditional citation analyses (19) and provide a real-time instant feedback and influence of a scientific agent[22].

In addition to websites, online social media have been emerged in recent years. ResearchGate is one of them that was designed for researchers[4,15,16]. As a most-liked online social medium, it was initiated in 2006 and expanded during 2009-2017 with some features such as paper uploads, information on citations and h-indexes[18]. Many researchers worldwide have connected the application and it has millions of users[18,23-26]. Setting an appropriate context for researchers' informal and facilitated interactions and providing a measure called RG Score for the scientific interactions are of main reasons for its popularity among researchers[27,28].

In another study titled Evolution of artificial intelligence in medical sciences: a comprehensive scientometrics analysis Available to Purchase examined the evolution of artificial intelligence in medical sciences. The results showed that the United States, China, and the United Kingdom were recognized as leaders in this field, and universities such as Harvard University and the University of California had the largest contribution to the production of relevant knowledge. In addition, the terms "machine learning" and "deep learning" have been proposed as key concepts in this field[29].

In spite of other similar popular social media for scientific activities such as Mendely that has been designed for reference management[30], ResearchGate shares researchers' ideas, opinions and publications[18,31] and makes them to be compared by measuring the rates of their altmetric indicators such as citations, downloads, readerships, etc. as manifestations of their interactions and activities within it[4, 15, 16, 18, 32].

Several studies confirmed the correlation between web-based altmetric indicators and traditional citation-based ones[22]. In case of ResearchGate, these studies reported helpful results. Some studies considered RG scores and other ResearchGate measures and their possible correlations[18, 28,33-41]. Researchers' using rates of ResearchGate were studied in several studies[18,42-43]. Some studies compared bibliometric and altmetric indicators in different databases, including both Scopus and ResearchGate[44,45] and only in ResearchGate4[6, 47]. In a qualitative study, researchers' expectations from ResearchGate were investigated[48].

In addition, machine learning algorithms and methods for predicting researchers' scientific performance have been developed in recent years. One approach is to use regression analysis for prediction. Regression analysis is one of techniques widely used in machine learning[49,50]. This study used regression analysis for predicting Iranian researchers' citation counts and h-indexes in Scopus based on their performance in ResarchGate.

Similar to other medical specialists and in addition to sharing their experiences in educational field, Iranian researchers in the Occupational Health Engineering field contribute to the scientific production in the field. Regarding the importance of evaluating the scientific output in the field from a bibliometric and/or altmetric perspectives as well as few studies in this regard, this study aimed to evaluate the research performance of these researchers and correlate some demographic variables and Scopus-related bibliometric/ResearchGate-related altmetric indicators.

Materials and Methods

Study design

This descriptive cross-sectional study was conducted in December 2024. As the study had no human subjects, it had no need to be evaluated by the Institutional Review Board. In addition, an ethics approval code (IR.UMSHA.REC.1399.1031) was issued by the Ethics Committee of Hamadan University of Medical Sciences.

Study population

Research population included all Iranian researchers in Occupational Health Engineering field presence and active in Scopus and ResearchGate (213 faculty members). All of these researchers were included in the study without sampling. The names of the researchers were extracted from the Iranian Scientometrics Information Database (Ministry of Health & Medical Education, Deputy of Research & Technology, Scientific Publications and Information Development Center: https://isid.research.ac.ir/).

Database selection and indicators used

Two well-known databases were used for data extraction: Scopus as a main wide-expanded indexing/abstracting database and ResearchGate as a main popular scientific social medium, as well as a for-profit, social media–like scientific networking and collaboration website. Bibliometric indicators (such as paper numbers, citation counts and h-indexes) were extracted from Scopus and altmetrics data (including RG Scores, total research interests, citations, recommendations, reads, followings, followers, research items, projects, questions, answers, and h-indexes) were collected from profiles of the individual subjects in December 2024.

Statistical analysis

Descriptive data were prepared as the tabular format. Indicators were entered in Microsoft Excel 2016. For studying the correlations between the Scopus-extracted bibliometric and ResearchGate-extracted altmetric indicators and subjects' demographic information, analytical statistics techniques in SPSS version 22, such as ANOVA, t-test and Pearson's and Spearman's correlations and linear regression analysis were applied. Linear regression is one of the most basic and widely used supervised machine learning algorithms (48, 49). Three characteristics can be considered as the reasons for choosing linear regression for the data collected in this study: 1- simplicity and high interpretability 2- having very high predictive power and 3- strong estimates of statistical significance.

Definition of specialized terms

Total Research Interest: A composite, dynamic score that ResearchGate calculates based on how much other users have engaged with your profile content (such as reading articles, downloading, citing, recommending, and following). This score indicates the overall "attractiveness" and "impact" of your research work in the scientific community, and is updated with each new interaction.

Reads: The number of times ResearchGate users have read

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or downloaded your research work (articles, book chapters, data, code, etc.). This metric is one of the most important altmetric indicators for measuring the "reach" and "real use" of your work, and shows how many people have actually read your content.

Projects: A section of the profile where researchers can describe their current or past research projects, introduce team members, post progress updates, and even upload related files. This feature is designed for collaboration, attracting collaborators, and showcasing ongoing research activities .

Results

Researchers' demographic information

Out of 213 researchers, the majority of them were male (80.3%) and had a PhD degree (67.1%). Of them, 39.9%, 32.9%, 20.7% and 6.6% were assistant professor, instructor, associate professor and full professor, respectively.

Researchers' performance in ResearchGate

Table 1 shows the measures of 12 ResearchGate–related indicators of the researchers. 149 researchers (70%) were active in ResearchGate. 144 researchers (96.6%) had RG scores with the mean rate of 11.70. All, but one researchers shared total 4,275 research items with the mean rate of 28.89 items per researcher. With total 24,235 citations, the mean rate of citations per paper was 169.48. In addition, 143 researchers (95.9%) had h-indexes with the mean rate of 5.38. The lowest-ranked indicators in absorbing researchers' contribution were the Questions and Answers sections with having 14 (9%) and 22 (14.8%) contributors, respectively.

Researchers' performance in Scopus

Table 2 shows means of three Scopus-extracted indicators of the studied researchers. 198 researchers (93%) had total 2,935 published documents in the database with mean rate of 14.82 documents per researcher. 186 researchers (87.3%) had total 18,749 citations with the mean rate of 100.80 citations and mean h-index amounted to 4.41.

Relationship between researchers' demographic variables and their performance in ResearchGate and Scopus

Table 3 depicts the test results of relationship between researchers' demographic variables and their ResearchGate and Scopus indicators. Considering the gender, there was a significant difference between men and women in "Reads" in ResearchGate and h-index in Scopus (p=.049, p=.036, respectively). However, in educational degree and academic rank, the differences were significant in all variables, except for RG scores and RG h-indexes (p<.001).

Relationship between researchers' performance indicators in ResearchGate and Scopus

As Table 4 shows, there were moderate positive correlations among the indicators of the two databases. However, the correlations of "Research items" in ResseachGate with the three Scopus indicators were strong. In other words, researchers with more shared documents in ResearchGate had better performance in Scopus. However, the relationship between RG score and Scopus indicators were weak.

Table 1. ResearchGate-related indicators of Iranian researchers in Occupational Health Engineering field (N=149)

Indicator	Number of researchers	Max.	Min.	Mean	Total
RG Score	144	1.16	34.71	11.70	1684.53
Total Research Interest	149	0.20	1479.00	128.42	19134.50
Citations	143	1	2346	169.48	24235
Recommendation	132	1	119	12.92	1706
Reads	149	12	36325	4395.63	654949
Following	144	1	291	43.40	6250
Followers	149	1	351	48.31	7198
Research items	148	1	230	28.89	4275
Projects	90	1	15	2.74	247
Questions	14	1	15	3.57	50
Answers	22	1	23	4.86	107
H-index	143	1	26	5.38	769

Table 2. Scopus-extracted indicators means of Iranian researchers in Occupational Health Engineering field (N=213)

Indicators	Number of researchers	Min.	Max.	Mean	Total
Documents	198	1	110	14.82	2935
Citations	186	1	1175	100.80	18749
H-index	186	1	20	4.41	820

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Table 3. Results of relationship between researchers' demographic variables and their ResearchGate and Scopus indicators

t		Gender		Educational Degree		Academic Rank	
		p	Mann-Whitney U	p	Kruskal-Wallis X^2	p	
ResearchGate	RG Score	1.095	.275	4571	.058	3.579	.311
	RG h-index	.607	.545	4868	.450	2.477	.480
	Total Research Interest	.538	.591	3123	.000**	56.752	.000**
	Citations	.749	.455	2092	.000**	43.277	.000**
	Recommendations	.960	.338	2416	.000**	22.037	.000**
	Reads	1.976	.049*	3205	.000**	54.282	.000**
	Following	.556	.579	2166	.000**	52.203	.000**
	Followers	.533	.595	2286	.000**	52.203	.000**
	Research items	.833	.406	1837	.000**	69.824	.000**
	Project	.757	.450	1935	.000**	65.099	.000**
	Question	1.676	0.095	1889	.000**	64.700	.000**
	Answer	2.083	0.380	1875	.000**	68.822	.000**
Scopus	Document	1.585	0.115	1161	.000**	126.875	.000**
	Citation	1.286	0.200	1260	.000**	116.332	.000**
	h-index	2.114	0.036*	1269	.000**	118.785	.000**

Table 4. Spearman Correlation coefficients between ResearchGate indicators and Scopus indicators

	Scopus-indexed document	Scopus citation count	Scopus h index
RG Score	.083	.121	.103
RG h-index	.008	.01	.017
Total Research Interest	.529	.527	.518
Citations_RG	.659	.627	.630
Recommendations	.522	.522	.512
Reads	.318	.306	.310
Following	.606	.586	.584
Followers	.592	.576	.591
Research items	.778	.698	.702
Project	.667	.668	.665
Question	.665	.686	.682
Answer	.632	.674	.655

Table 5. Linear regression analysis for testing the effect of performance in ResearchGate on citation counts in Scopus

	Unstandardized coefficients		Standardized coefficients	t	p	95% CI for B
	B	Standard error	Beta	8.049	.000	
(Constant)	4.910	.610		32.033	.000	[4.61, 5.21]
Scopus Citation	.101	.003	.911			[-10.90, 20.72]

Table 6. Linear regression analysis for testing the effect of performance in ResearchGate on h-index rates in Scopus

	Unstandardized coefficients		Standardized Coefficients	t	p	95% CI for B
	B	Standard error	Beta	5.112	.000	
(Constant)	2.963	.390		24.901	.001	[-7.12, 13.05]
h-index	.091	.001	.900			[2.73, 3.20]

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Predicting researchers' citation counts and h-indexes in Scopus based on their performance in ResearchGate

Linear regression analysis (Table 5) showed that the researchers' presence in ResearchGate (based on their shared document numbers) can predict their citation counts (R2=.82, F (1,211) = 1026.089, β=.911, p=.000).

Again, linear regression analysis (Table 6) showed that the researchers' presence in ResearchGate (based on their shared document numbers) can predict their h-indexes (R2=.83, F (1,184) = 121.90, β=.900, p<.001).

Discussion and Conclusion

With an ever-increasing growth of scientific publications, their evaluation becomes a necessary indicator. Since the evaluation of research output is at work in evaluating researchers, we evaluated the presence and performance of Iranian researchers in Occupational Health Engineering field in ResearchGate, as a scientific social medium and Scopus as an indexing/abstracting database. The findings showed that the majority of them are present in ResearchGate and have an RG score. The similar results were reported in a previous study[51]. The high presence of these researchers in ResearchGate can be a sign of their wide range interaction with the public and other specialists in the field.

The studied researchers have been active in ResearchGate. All researchers had at least a scientific item in ResearchGate. The total number and the mean rate of shared items are in an appropriate level. This is true in case of citation counts and the mean rate of h-indexes. As the Question and the Answer sections of ResearchGate indicate the interaction and feedback rate in research collaboration[52] and the studied researcher had low contribution in these sections, it is needed that the interaction between researchers and their followers are emphasized in the platform.

As we found, regarding Scopus indicators, the researchers had better performance in publishing cited papers, receiving citations and achieving h-indexes. Scopus is an abstract and citation database consisting of peer-reviewed scientific content and manifest best-quality papers worldwide[53]. Iranian researchers in the Occupational Health Engineering had better profiles in this known database.

As we found significant different reading behavior of researcher men and women in ResearchGate and significantly different h-index rates in the two groups in Scopus, some further research needs to be conducted for deeply investigating the possible reasons behind. This is the case in other indicators of educational degree and academic rank having significant differences.

The results of this study are fully consistent with national [51,43,55,56] and international[18,28,35] studies and even provide higher predictive power (R^2=0.82–0.83 versus 0.67–0.73 in previous studies). The strongest predictor in all studies, including the present study, is the "number of research items" on ResearchGate, which indicates that the simplest action for Iranian researchers to increase their international scientific impact is to regularly upload full-text works to this platform.

Iranian researchers in the Occupational Health Engineering field fairly use the capacities of ResearchGate for influencing their research output. However, their interactions in social media tools should be encouraged for more reach and influence. It is needed that the activities of researchers in other social media tools and applications are investigated in future studies. Using prediction approaches well-known in machine learning can facilitate and be helpful for predicting researchers' scientific indicators as we used regression analysis in this study as one of these techniques. It is recommended that Iranian scholars in the field consider using ResearchGate to increase their online international contributions and consequent international scientific influence.

Despite the high predictive power of the univariate linear regression model, future studies can use nonlinear and multivariate machine learning models to further improve the prediction accuracy. Algorithms such as Random Forest, Gradient Boosting (XGBoost), Artificial Neural Networks (ANN), and Support Vector Machines (SVR) are able to identify complex and nonlinear relationships between multiple ResearchGate variables (such as Reads, Citations, Followers, Recommendations, and Projects) and Scopus indices. Also, the use of feature selection techniques and feature importance analysis can determine which combination of ResearchGate activities has the greatest impact on Scopus h-index and citations. These models are expected to achieve R^2 above 0.90 and prediction error below 10% with larger data sets (multi-disciplinary or multi-country), providing a practical tool for university science promotion policy-making.

Limitations

One of the important limitations of this study is the possible bias due to inactive or missing profiles on ResearchGate. Of the 213 researchers surveyed, 30% (64) had no activity on ResearchGate and were excluded from the correlation and regression analyses. This exclusion could lead to selection bias, as researchers active on social networks are usually more scientifically active and have higher Scopus indices. As a result, the predictive power of the model (R^2=0.82–0.83) may be lower in the general population of Iranian researchers. Also, some researchers may have profiles but make them private or use pseudonyms, which leads to under-reporting of ResearchGate data. Future studies using imputation methods (replacing missing data) or propensity score matching are recommended to adjust for this bias and improve the generalizability of the results.

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Conflicts of Interests

The authors declare that there is no conflict of interest.

References

1.Vincent A, Ross D. On evaluation of faculty research impact of citation analysis. Journal of Applied Business Research (JABR). 2000;16(2).

2.Mazloomymahmoodabad SS, Asadian A, Sotoudeh A. Research Barriers from the Boy Students' Viewpoint of Shahid Sadoughi University of Medical Sciences. Development Strategies in Medical Education. 2017;4(2):39-49.

3.Motealehi A, Vafaeenasab M, Jafari H, Safari M, Zare A, Roshanian E. Research Barriers from the Viewpoints of Staff of Shahid Sadoughi University of Medical Sciences in. 2020.

4.Asnafi AR, Rahmani M. Utilizing ResearchGate social network by Iranian engineering. Library Philosophy and Practice (e-journal).

2017;1585.

5.Mansourian M, Nematbakhsh M. Reseach outcomes evaluation for university academic members:One suggestion for research grant. Iranian Journal of Medical Education. 2017;17(0):239-41. eng.

6.Clarke R. A Citation Analysis of Australian Information Systems Researchers: Towards a New ERA? Australasian Journal of Information Systems. 2009;15(2).

7.Azari-Hamidian. Scientific Research Output of Faculty Members of Guilan University of Medical Sciences using the Hirsch Index (h Index) and m Parameter by the End of 2012. Journal of Guilan University of Medical Sciences. 2013;22(86):12-23. eng.

8.Almeida-Filho N, Kawachi I, Filho AP, Dachs JNW. Research on health inequalities in Latin America and the Caribbean: bibliometric analysis (1971–2000) and descriptive content analysis (1971–1995). American Journal of Public Health. 2003;93(12):2037-43.

9.Priem J, Hemminger BH. Scientometrics 2.0: New metrics of scholarly impact on the social Web. First monday. 2010.

10.Wei M, Chakoli AN. Evaluating the relationship between the academic and social impact of open access books based on citation behaviors and social media attention. Scientometrics. 2020:1-20.

11.Garfield E. Citation indexes for science. Science. 1955;122(3159):108-11.

12.Hicks D, Melkers J. Bibliometrics as a tool for research evaluation. Handbook on the theory and practice of program evaluation: Edward Elgar Publishing; 2013.

13.Mohammadi E, Thelwall M, Haustein S, Larivière V. Who reads research articles? An altmetrics analysis of M endeley user categories. Journal of the Association for Information Science and Technology. 2015;66(9):1832-46.

14. O'Brien K. ResearchGate. Journal of the Medical Library Association: JMLA. 2019 Apr;107(2):284-285.

15.Asnafi AR. Presence of the Iranian Library and the Information Science departments in ResearchGate. DESIDOC Journal of Library & Information Technology. 2017;37(4):259-63.

16.Singson M, Amees M. Use of ResearchGate by the Research Scholars of Pondicherry University: A Study. DESIDOC Journal of Library & Information Technology. 2017;37(5).

17.Thelwall M, Kousha K. A cademia. edu: Social network or A cademic Network? Journal of the Association for information Science and technology. 2014;65(4):721-31.

18.Thelwall M, Kousha K. ResearchGate versus Google Scholar: Which finds more early citations? Scientometrics. 2017;112(2):1125-31.

19.Barnes C. The use of altmetrics as a tool for measuring research impact. Australian academic & research libraries. 2015;46(2):121-34.

20.Priem J, Taraborelli D, Groth P, Neylon C. Altmetrics: A manifesto. 2010.

21.Vaughan L, Shaw D. Web citation data for impact assessment: A comparison of four science disciplines. Journal of the American Society for Information Science and Technology. 2005;56(10):1075-87.

22.Priem J, Piwowar H, Hemminger B, editors. Altmetrics in the wild: An exploratory study of impact metrics based on social media. Metrics 2011: Symposium on Informetric and Scientometric Research New Orleans, USA; 2011.

23.Van Noorden R. Online collaboration: Scientists and the social network. Nature news. 2014;512(7513):126.

24.Borrego Á. Institutional repositories versus ResearchGate: The depositing habits of Spanish researchers. Learned publishing. 2017;30(3):185-92.

25.Deng S, Tong J, Fu S, editors. Interaction on an academic social networking sites: A study of ResearchGate Q&A on library and information science. Proceedings of the 18th ACM/IEEE on joint conference on digital libraries; 2018.

26.Jamali HR. Copyright compliance and infringement in ResearchGate full-text journal articles. Scientometrics. 2017;112(1):241-54.

27.Copiello S, Bonifaci P. A few remarks on ResearchGate score and academic reputation. Scientometrics. 2018;114(1):301-6.

28.Copiello S, Bonifaci P. ResearchGate Score, full-text research items, and full-text reads: a follow-up study. Scientometrics. 2019;119(2):1255-62.

29- Kashani M, Dastani M. Evolution of artificial intelligence in medical sciences: a comprehensive scientometrics analysis. Global Knowledge, Memory and Communication. 2025 Mar 27.

30.Jeng W, He D, Jiang J. User participation in an academic social networking service: A survey of open group users on M endeley. Journal of the Association for Information Science and Technology. 2015;66(5):890-904.

31.Alheyasat O. Examination expertise sharing in academic social networks using graphs: The case of ResearchGate. Contemporary Engineering Sciences. 2015;8(1-4):137-51.

32.Batooli Z. ResearchGate features for researchers. Science and Technology Discourse. 2013;1(2):59-68.

33.Míguez-González MI, Puentes-Rivera I, Dafonte-Gómez A. Academic social networks and communication researchers from universities in the North of Portugal: An analysis of academia. edu and ResearchGate. Media and Metamedia Management: Springer; 2017. p. 405-11.

34.Iglesias-García M, González-Díaz C, Codina L. A Study of Student and University Teaching Staff Presence on ResearchGate and Academia. edu in Spain. Media and Metamedia Management: Springer; 2017. p. 509-15.

35.Yan W, Zhang Y, Bromfield W. Analyzing the follower–followee ratio to determine user characteristics and institutional participation differences among research universities on ResearchGate. Scientometrics. 2018;115(1):299-316.

36.Abdulhayoglu MA, Thijs B. Use of ResearchGate and Google CSE for author name disambiguation. Scientometrics. 2017;111(3):1965-85.

37.Copiello S. Research Interest: another undisclosed (and redundant) algorithm by ResearchGate. Scientometrics. 2019;120(1):351-60.

38.Li L, He D, Zhang C, editors. Evaluating academic answer quality: a pilot study on researchgate Q&A. International Conference on HCI in Business, Government, and Organizations; 2016: Springer.

39.Laakso M, Polonioli A. Open access in ethics research: an analysis of open access availability and author self-archiving behaviour in light of journal copyright restrictions. Scientometrics. 2018;116(1):291-317.

40.Chawla D. Publishers take ResearchGate to court, alleging massive copyright infringement. Science. 2017.

41.Orduna-Malea E, Martín-Martín A, Thelwall M, López-Cózar ED. Do ResearchGate Scores create ghost academic reputations? Scientometrics. 2017;112(1):443-60.

42.Mason S. Adoption and usage of Academic Social Networks: a Japan case study. Scientometrics. 2020;122(3):1751-67.

43.Siamaki S, Geraei E, Zare-Farashbandi F. A survey on the presence of Isfahan University of Medical Sciences researchers in rsearchgate network: An altmetrics study. Health Information Management. 2016 Dec 21;13(5):341-6.

44.Jabur NH. Altmetrics as alternative tool for measuring the impact of scholarly documents based on readers attention: A Comparative Study. Qualitative and Quantitative Methods in Libraries. 2017;5(2):335-46.

45.Batooli Z. The relationship between Web of Science and ResearchGATE Indicators of Iranian researchers' Top Papers. Iranian Journal of Information Processing Management. 2017;33(1):163-86.

https://dx.doi.org/10.4314/mmj.v37i4.10

46.Ali MY, Richardson J. Pakistani LIS scholars' altmetrics in ResearchGate. Program. 2017.

47.Naderbeigi F, Isfandyari-Moghaddam A. Researchers' Scientific performance in ResearchGate: The Case of a Technology University. Library Philosophy & Practice. 2018.

48.Rahmani M, Noroozi Chakoli A, Asnafi A. Expectations of engineering researchers in University of Tehran from ResearchGate as an academic social network. Iranian Journal of Information Processing Management. 2018;33(2).

49.Maulud D, Abdulazeez AM. A review on linear regression comprehensive in machine learning. Journal of applied science and technology trends. 2020 Dec 31;1(2):140-7.

50. Alanazi HO, Abdullah AH, Qureshi KN. A critical review for developing accurate and dynamic predictive models using machine learning methods in medicine and health care. Journal of medical systems. 2017 Apr;41(4):69.

51.Ghorbani N, Momeni M, Ghorbani R, Babalhavaeji F. A study on the presence of Iranian researchers in academic social networks: A case study on the faculty members of Semnan university of medical Sciences, Iran. Health Information Management. 2018 Feb 20;14(6):260-6.

52. Deng S, Tong J, Lin Y, Li H, Liu Y. Motivating scholars' responses in academic social networking sites: An empirical study on ResearchGate Q&A behavior. Information Processing & Management. 2019 Nov 1;56(6):102082.

53. Baas J, Schotten M, Plume A, Côté G, Karimi R. Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. Quantitative science studies. 2020 Feb 1;1(1):377-86.

54. Batooli Z, Ravandi SN, Bidgoli MS. Evaluation of scientific outputs of Kashan University of Medical Sciences in Scopus citation database based on Scopus, ResearchGate, and Mendeley scientometric measures. Electronic physician. 2016 Feb;8(2):2048-2056.

55.Ansari M, Fallah M, Noruzi A, Rasolabadi M. Comparing the presence of researchers of medical universities of western provinces of iran on researchgate and scopus. Webology. 2019 Dec 25;16(2):257-74.

56. Valizadeh-Haghi S, Nasibi-Sis H, Shekofteh M, Rahmatizadeh S. ResearchGate Metrics' Behavior and Its Correlation with RG Score and Scopus Indicators. Information Technology and Libraries. 2022 Mar 21;41(1). DOI: https://doi.org/10.6017/ital.v41i1.14033.

57. Nemati-Anaraki L, Razmgir M, Moradzadeh M. Scientific impact of Iran University of medical sciences researchers in ResearchGate, Google scholar, and Scopus: An altmetrics study. Medical Journal of the Islamic Republic of Iran. 2020;34:142.