DECISION MAKING USING INTERNET OF THINGS AND MACHINE LEARNING: A BIBLIOMETRIC APPROACH TO TRACKING MAIN RESEARCH THEMES

INTERNATIONAL CONFERENCE ON DATA ANALYTICS FOR BUSINESS AND INDUSTRY (DATA’20)

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26th – 27th October 2020, Bahrain (online)

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1. INTRODUCTION

CONTEXT

The internet has become an integral part of our life, we connect daily for informational, social, entertainment and even work and economic purposes. Therefore, it is completely normal to connect to the internet; But it is not only people, also these everyday objects or things in our environment who connect to the network to take advantage of its benefits. This next stage in the evolution of the internet, in which connectivity extends to the objects which surround us, is known as the Internet of Things.

OBJECTIVE

The main aim of the present research is to analyze several criteria that are applied in Decision Making using Internet of Things and Machine Learning from 2013 to 2020 using Scopus.

The analysis is developed using VOSviewer.

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2. METHODOLOGY

SOFTWARE TOOL

VOSviewer was employed to develop a conceptual science mapping analysis based on co-words bibliographic networks.

METHODOLOGY STAGES

1. **Performance analysis.** Relative contribution of the research themes to the whole research field: number of published documents, number of citations, and different types of bibliometric indicators (h-index).
2. **Detection of the research themes.** Co-word analysis, followed by a clustering of keywords to topics/themes.
3. **Visualizing research themes and cluster.** Science Map and Cluster Network (occurrences and links). Research themes mapped in a two-dimensional conceptual science map and clustered (Figure 1).

2. METHODOLOGY

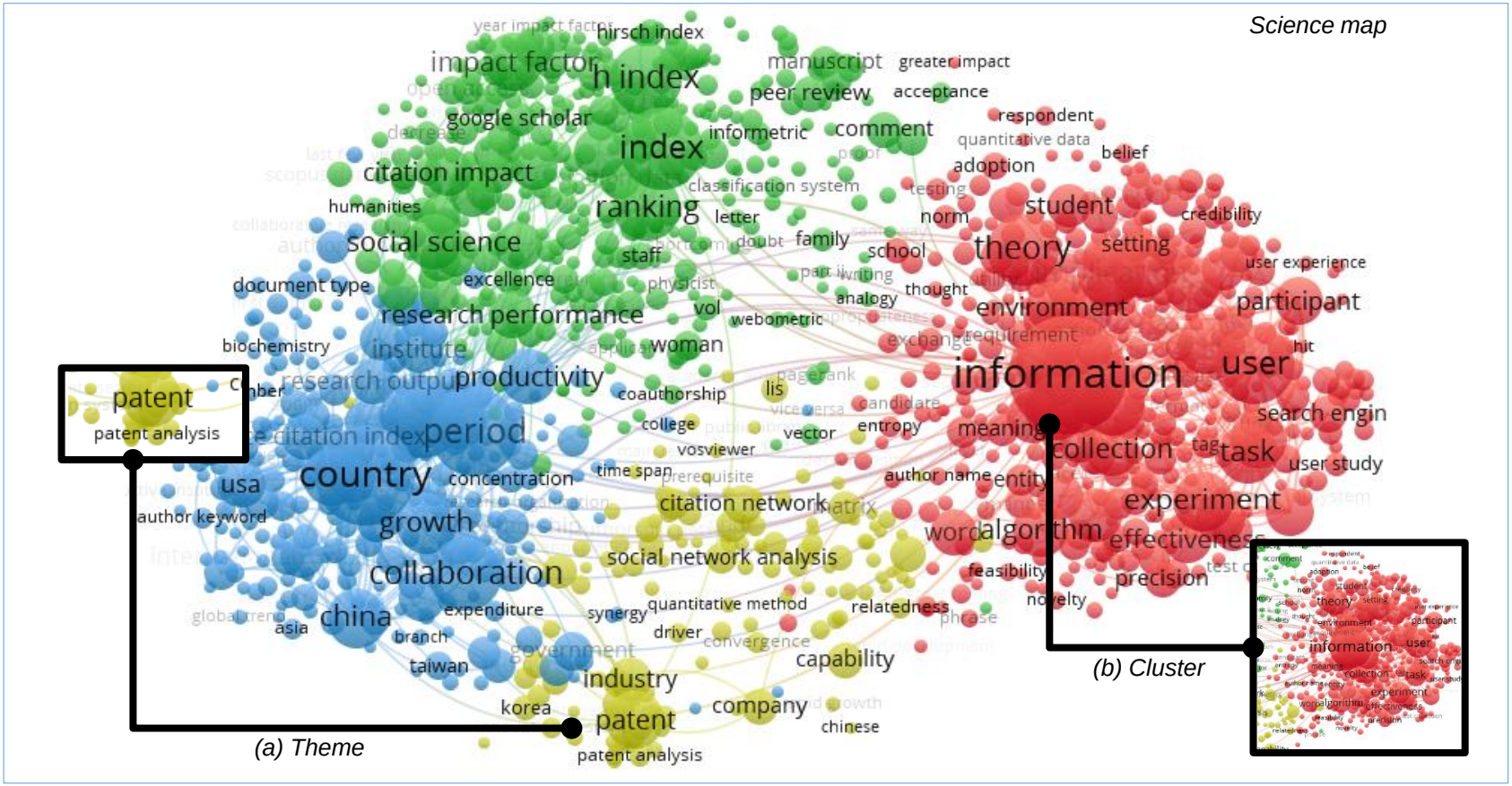

Figure 1: Science Map. (a) Research theme and (b) Cluster

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3. DATASET

CORPUS AND DATABASE

Articles, Review and Proceeding papers related to (i) Decision, (ii) Internet of Things and (iii) Machine Learning published from 2013 to 2020 in Scopus.

QUERY

TITLE-ABS-KEY ("decision") AND TITLE-ABS-KEY("internet of th*") AND TITLE-ABS-KEY("machine lear*").*

TIME PERIOD

The corpus was evaluated in a single period from 2013 to 2020.

CORPUS SIZE

- 703 documents (articles), 3,472 cites and 13,964 keywords (citations count up to 7th September 2020).
- 2013: 2 documents, 76 cites and 38 keywords.
- 2014: 2 documents, 18 cites and 44 keywords.
- 2015: 12 documents, 187 cites and 191 keywords.
- 2016: 18 documents, 128 cites and 403 keywords.
- 2017: 53 documents, 653 cites and 1,134 keywords.
- 2018: 131 documents, 1,279 cites and 2,965 keywords.
- 2019: 314 documents, 1,060 cites and 5,927 keywords.
- 2020: 171 documents, 161 cites and 3,262 keywords. (* on going)

DOCUMENTS AND CITATIONS BY YEAR

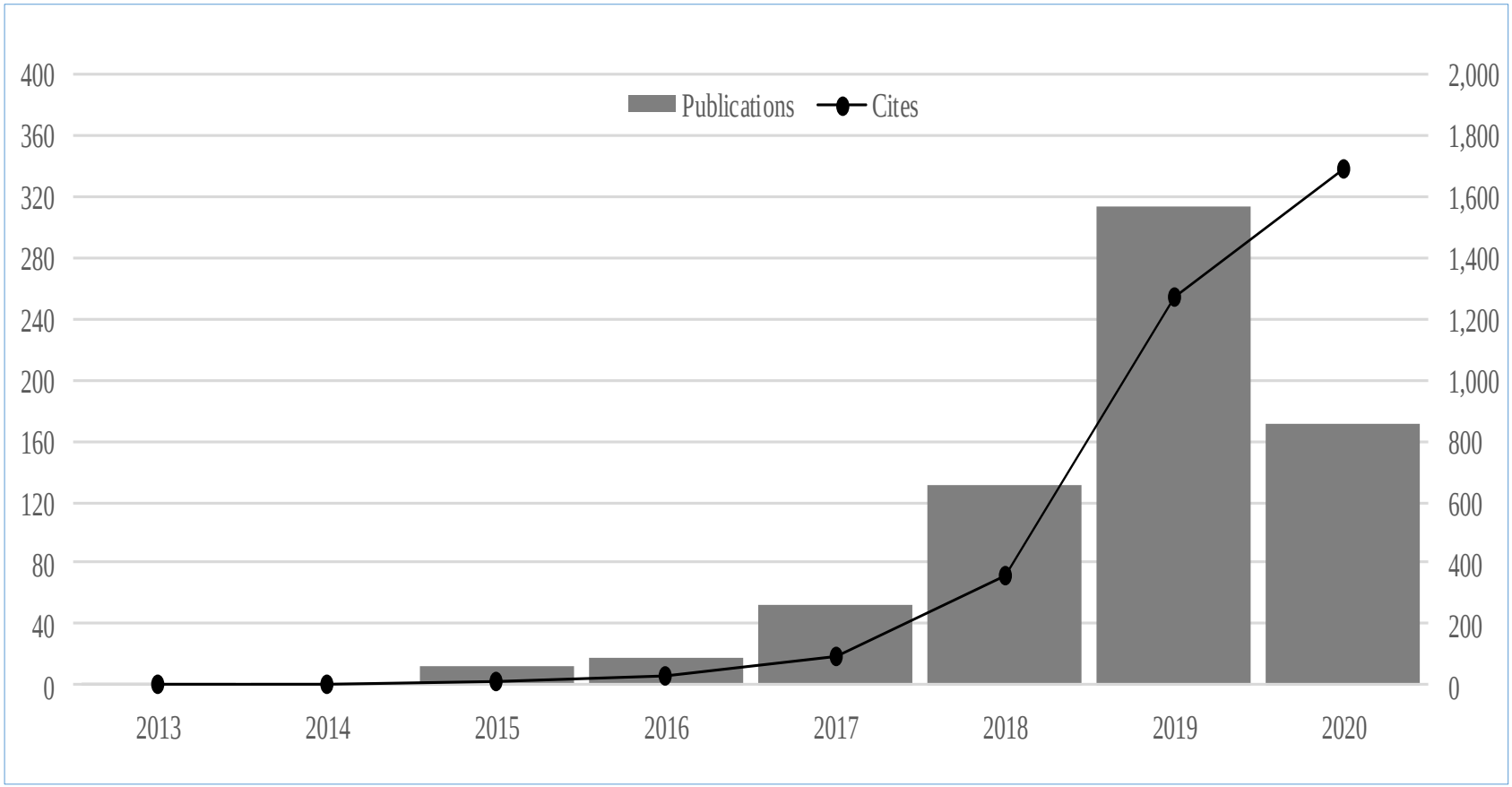

Figure 2: Distribution of publications and cites

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4. CONCEPTUAL ANALYSIS

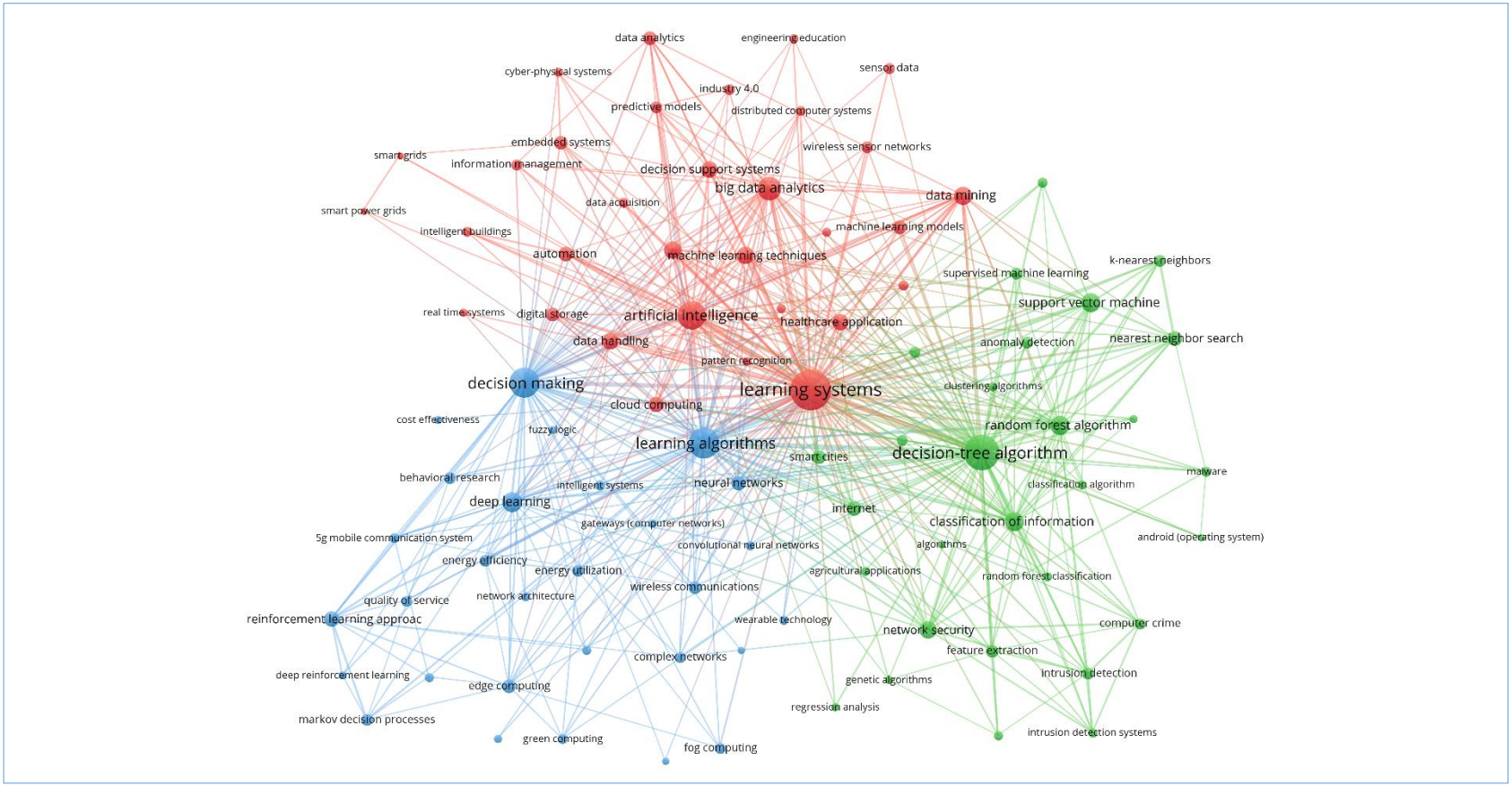

Figure 3. Network visualization map of Decision Making using Internet of Things and Machine Learning

4. CONCEPTUAL ANALYSIS

Cluster	Themes (the most productive)	Weight	Total link strength	Occurrences
Learning and Decision Support Systems (32 themes)	learning systems	89	1,962	349
	artificial intelligence	87	942	165
	big data analytics	86	638	118
	data mining	81	454	72
	machine learning techniques	80	387	63
	forecasting	74	364	61
	healthcare application	72	305	55
	data handling	74	318	54
	decision support systems	71	280	54
	cloud computing	68	282	48
Decision Algorithms (29 themes)	decision-tree algorithm	87	1,477	254
	random forest algorithm	80	518	78
	classification of information	80	522	75
	support vector machine	73	469	73
	network security	72	388	63
	internet	70	251	47
	nearest neighbor search	69	361	45
	smart cities	70	225	42
	feature extraction	66	258	36
	intrusion detection	51	229	32
Learning Algorithms (29 themes)	learning algorithms	89	1148	192
	decision making	87	907	181
	deep learning	82	436	81
	reinforcement learning approach	48	241	52
	neural networks	78	311	46
	edge computing	61	213	39
	wireless communications	75	231	36
	behavioral research	61	180	31
	energy utilization	67	209	31
	energy efficiency	60	185	30

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CONCLUSIONS

SUMMMARY

- An amount of 703 documents (articles) were retrieved from the Scopus. This articles achieved 3,472 cites and 13,964 keywords.

- The corpus was evaluated in a single eight-years period.
  - 2013: 2 documents, 76 cites and 38 keywords.
  - 2014: 2 documents, 18 cites and 44 keywords.
  - 2015: 12 documents, 187 cites and 191 keywords.
  - 2016: 18 documents, 128 cites and 403 keywords.
  - 2017: 53 documents, 653 cites and 1,134 keywords.
  - 2018: 131 documents, 1,279 cites and 2,965 keywords.
  - 2019: 314 documents, 1,060 cites and 5,927 keywords.
  - 2020: 171 documents, 161 cites and 3,262 keywords. (* on going)

- The impact achieved is summarized in the following indicators:
  - Average citations per publication: 4.94
  - h-index: 27 publications

CONCLUSIONS

MAIN CONCLUSION

- In terms of bibliometric performance, the dimension of literature related to Decision Making using Internet of Things and Machine Learning showed a noteworthy increase in the last years (2013–2019).
- The most productive countries are: India, United States of America, China, United Kingdom, Canada, Spain, France, Germany, mainly.
- The main themes covered by these cluster are: Learning Systems, Data Mining, Big Data Analytics, Decision-tree Algorithm, Classification Of Information, Support Vector Machine, Machine Learning Techniques, Artificial Intelligence, Network Security, Learning Algorithms, Deep Learning, Reinforcement Learning Approach and Neural Networks.

FUTURE WORKS

- A global analysis could be carried out taking into account a wider time span and enriching the query with more search terms. Second, the evolution of the research themes could be studied across the consecutive time periods for the main sectors in other knowledge areas.

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THANK YOU

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Acknowledgments: The authors acknowledge the support by the CONACYT-Consejo Nacional de Ciencia y Tecnología (Mexico) and DGRI-Dirección General de Relaciones Exteriores (Mexico) to carry out this study. Additionally, this work has been supported by the Spanish Ministry of Science and Innovation under grant with reference PID2019-105381GA-I00 (iScience).

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