Pilot study of science mapping - Web 3.0 & AI

Introduction

This study uses R-package 'Biblioshiny' to conduct a science mapping of Web 3.0 and Artificial Intelligence.

Search criteria:

Database: Web of Science Core Collection

Keywords: ((TS = ("web 3.0" OR "web3" OR "web 3" OR "web3.0") OR TS = ("web 1.0" and "web 2.0") OR TS = ("web 4.0" or "web 5.0") OR TS = ("semantic web" AND ("blockchain" OR "big data" OR "machine learning" OR "artificial intelligence" OR "peer to peer network*" OR "linked data")) OR TS = ("edge computing" AND ("semantic web" OR "decentrali*ed data network*" OR "blockchain")) OR TS = ("blockchain" AND ("artificial intelligence" OR "machine learning") AND "web") OR TS = ("data science" AND ("semantic web" OR "edge computing" OR "blockchain"))) AND TS = ("artificial intelligence" OR "AI"))

Document Types: Articles

Language: English

Publication Years: 2005 - 2024

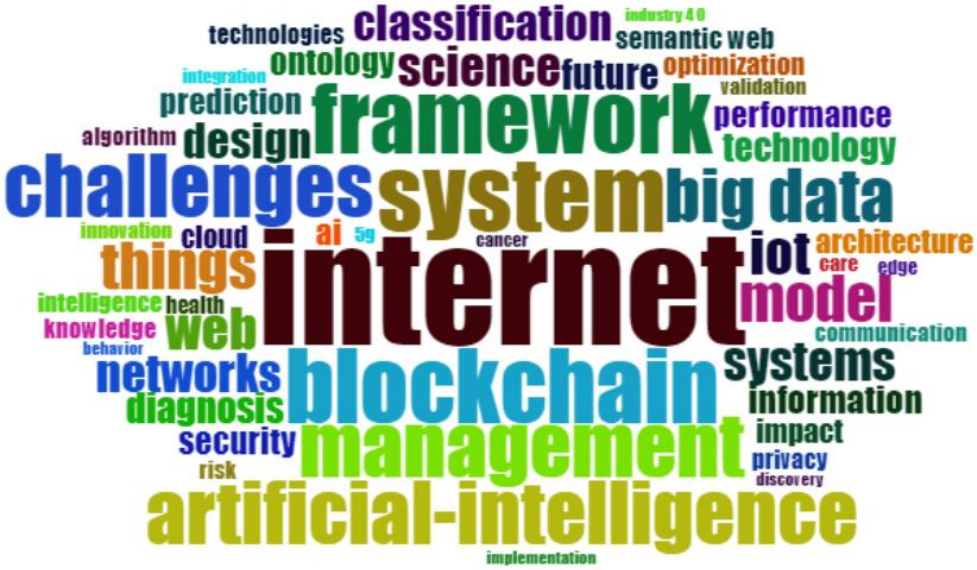
Results: 1125

According to a rigorous process, this part lacks of a further filter by reading abstract to delete the irrelevant articles.

Main Information

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2005:2024
Sources (Journals, Books, etc)	637
Documents	1125
Annual Growth Rate %	15.42
Document Average Age	3.16
Average citations per doc	17.17
References	59660
DOCUMENT CONTENTS	
Keywords Plus (ID)	1825
Author's Keywords (DE)	3884
AUTHORS	
Authors	5297
Authors of single-authored docs	75
AUTHORS COLLABORATION	
Single-authored docs	77
Co-Authors per Doc	5.25
International co-authorships %	34.4

Keyword Plus Analysis



internet	106	prediction	24
system	70	architecture	22
blockchain	68	impact	22
framework	65	cloud	21
management	59	optimization	20
artificial-intelligence	58	semantic web	20
challenges	58	intelligence	18
big data	50	knowledge	18
model	43	privacy	18
things	43	technologies	18
iot	40	algorithm	17
web	39	communication	17
science	36	risk	17
systems	36	health	16
networks	35	care	15
classification	33	innovation	15
design	33	validation	15
diagnosis	28	5g	14
future	28	edge	14
technology	27	cancer	13
information	26	integration	13
ontology	25	behavior	12
security	25	discovery	12
ai	24	implementation	12
performance	24	industry 4 0	12

Coupling

Two articles are said to be bibliographically coupled if at least one cited source appears in the bibliographies or reference lists of both articles (Kessler, 1963).

A coupling network can be obtained using the general formulation:

$$\boldsymbol{B = A \; x \; A^T}$$

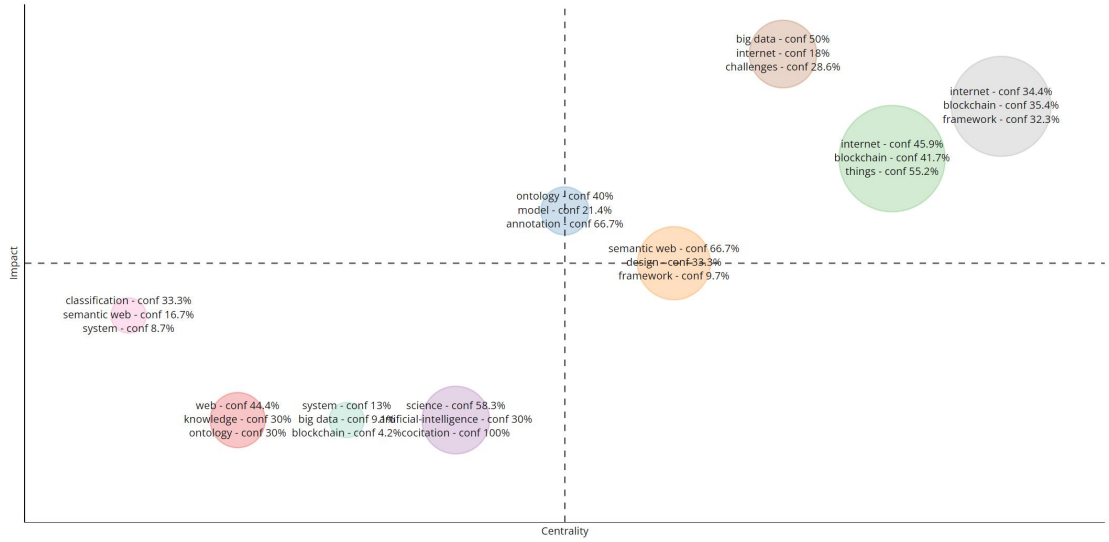
where A is a bipartite network.

Element $\boldsymbol{b_{ij}}$ indicates how many bibliographic couplings exist between manuscripts $\boldsymbol{i}$ and $\boldsymbol{j}$. In other words, $\boldsymbol{b_{ij}}$ gives the number of paths of length 2, via which one moves from $\boldsymbol{i}$ along the arrow and then to $\boldsymbol{j}$ in the opposite direction.

$\boldsymbol{B}$ is a symmetrical matrix $\boldsymbol{B=B^T}$.

The strength of the coupling of two articles, $\boldsymbol{i}$ and $\boldsymbol{j}$ is defined simply by the number of references that the articles have in common, as given by the element $\boldsymbol{b_{ij}}$ of matrix $\boldsymbol{B}$. [1]

Figure : coupling network



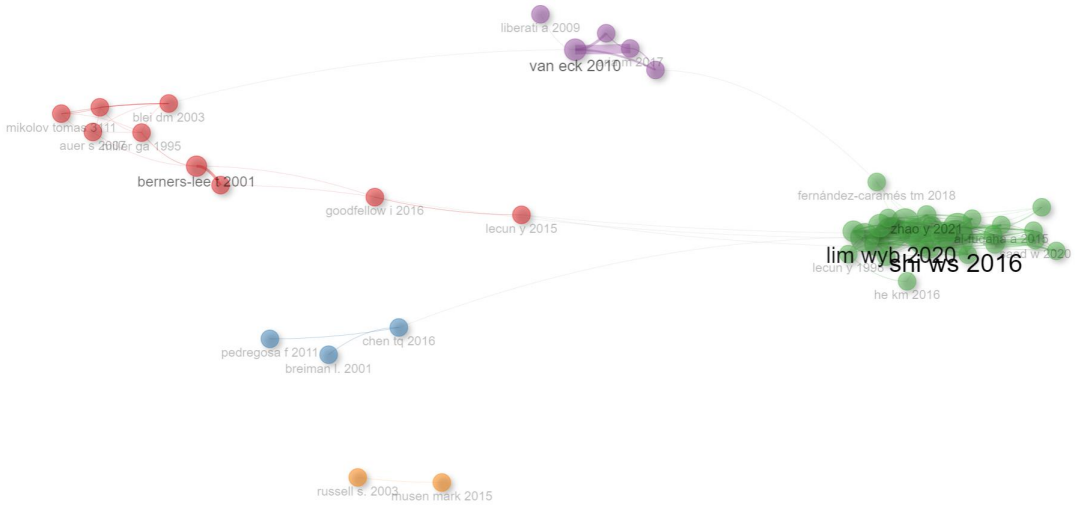
Co-citation network

We talk about co-citation of two articles when both are cited in a third article. Thus, co-citation can be seen as the counterpart of bibliographic coupling. A co-citation network can be obtained using the general formulation:

$$\boldsymbol{C = A^T \times A}$$

where A is a bipartite network.

Like matrix $\boldsymbol{B}$, matrix $\boldsymbol{C}$ is also symmetric. The main diagonal of $\boldsymbol{C}$ contains the number of cases in which a reference is cited in our data frame. In other words, the diagonal element $\boldsymbol{c_i}$ is the number of local citations of the reference $\boldsymbol{i}$.



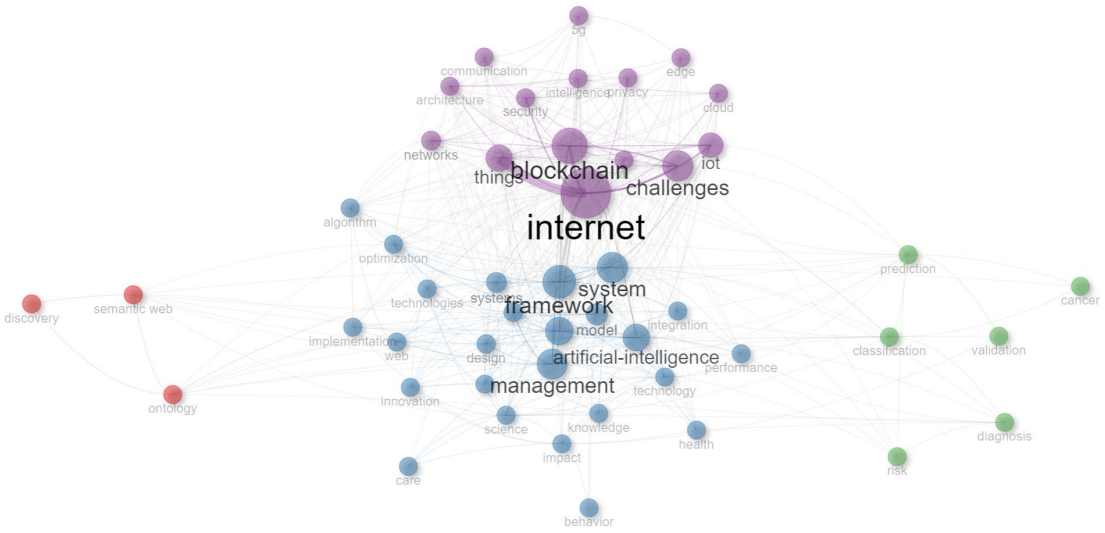
Node	Cluster	Betweenness	Closeness	PageRank
berners-lee t 2001	1	125	0.001964637	0.027731104
gruber tr 1993	1	0	0.001801802	0.018727352
lecun y 2015	1	17.09349837	0.002427184	0.009083078
blei dm 2003	1	56	0.001628664	0.022158595
auer s 2007	1	26.8	0.001587302	0.019931158
mikolov tomas 3111	1	0	0.001315789	0.019892294
miller ga 1995	1	40.2	0.001587302	0.021656253
pennington jeffrey. 2014	1	0	0.001315789	0.0216079
goodfellow i 2016	1	173.8	0.002590674	0.016324155
pedregosa f 2011	2	0	0.001623377	0.013996237
chen tq 2016	2	85	0.002493766	0.027117798
breiman l. 2001	2	0	0.001623377	0.013996237
shi ws 2016	3	176.3980992	0.002941176	0.042333972
lim wyb 2020	3	38.11026241	0.002557545	0.039197646
lu yl 2020	3	75.76951403	0.002702703	0.033192821
mcmahan hb 2017	3	5.365822498	0.002336449	0.025011156
yang rz 2019	3	20.16185978	0.00248139	0.036840373
wang xf 2019	3	290.1459498	0.002762431	0.036611167
yang q 2019	3	9.306350438	0.00248139	0.033198352
kang jw 2019	3	4.59437283	0.002409639	0.023391548
nguyen dc 2021	3	4.510401434	0.002380952	0.026735243
zhou z 2019	3	9.320255343	0.00245098	0.027792929
deng sg 2020	3	24.11363301	0.002518892	0.02403479
letaief kb 2019	3	4.959556699	0.002309469	0.020432705
wang xf 2020	3	13.2994845	0.002544529	0.031829633
lu yl 2021	3	1.806105279	0.002298851	0.020925681
saad w 2020	3	0.750712598	0.002222222	0.014893531
wang sq 2019	3	1.562327667	0.002336449	0.024119331

he km 2016	3	0	0.001818182	0.005555897
abbas n 2018	3	1.829458184	0.002061856	0.01791584
al-fuqaha a 2015	3	4.637060125	0.002272727	0.016708047
lecun y 1998	3	6.599780595	0.002173913	0.012483872
xiong zh 2018	3	0.54089522	0.002	0.013304947
zhao y 2021	3	42.15632476	0.002597403	0.024220302
dai hn 2019	3	1.448911608	0.002141328	0.018552296
khan wz 2019	3	0.907814137	0.002012072	0.013521145
abadi m 2016	3	0.597263679	0.002183406	0.013236621
atzori l 2010	3	0	0.001886792	0.00733213
bonomi f. 2012	3	0.214285714	0.001934236	0.009862102
fern 谩 ndez-caram 茅 s tm 2018	3	205	0.002262443	0.005728634
van eck 2010	4	139.8965517	0.001697793	0.04014363
aria m 2017	4	9.103448276	0.001587302	0.028869167
chen cm 2006	4	0	0.001251564	0.016275918
donthu n 2021	4	181	0.002145923	0.01537877
liberati a 2009	4	0	0.001243781	0.005594453
musen mark 2015	5	0	0.2	0.021276596
russell s. 2003	5	0	0.2	0.021276596

Co-occurrence network

The aim of the co-word analysis is to map the conceptual structure of a framework using the word co-occurrences in a bibliographic collection.

The analysis can be performed through dimensionality reduction techniques such as Multidimensional Scaling (MDS), Correspondence Analysis (CA) or Multiple Correspondence Analysis (MCA).



Node	Cluster	Betweenness	Closeness	PageRank
ontology	1	34.78753437	0.011627907	0.013178735
semantic web	1	13.41641381	0.011363636	0.010409138
discovery	1	0	0.007751938	0.005375689
system	2	116.0547359	0.016393443	0.042471907
framework	2	58.91860053	0.016129032	0.048192141
management	2	80.60170916	0.016393443	0.044946756
artificial-intelligence	2	58.3827872	0.014285714	0.034514111
big data	2	30.97252155	0.015384615	0.039624075
model	2	28.20682371	0.01369863	0.025330371
web	2	1.603879544	0.011627907	0.011069079
science	2	23.42758748	0.013333333	0.020800606
systems	2	6.866248706	0.013513514	0.022549093
design	2	8.619384608	0.013513514	0.020946001
future	2	11.82716544	0.013513514	0.024928754
technology	2	7.376982454	0.012658228	0.015995841
information	2	8.560919087	0.0125	0.015472413
performance	2	1.66017597	0.011494253	0.010329602
impact	2	15.40205356	0.011764706	0.013997269
optimization	2	3.479211716	0.012658228	0.017463432
knowledge	2	1.268914339	0.011111111	0.008737774
technologies	2	2.442570142	0.012195122	0.014584854
algorithm	2	4.693785425	0.0125	0.01455235
health	2	1.068188751	0.011235955	0.008283412
care	2	0.01038961	0.010638298	0.006161172
innovation	2	1.114337456	0.011363636	0.012263123
integration	2	0.990870356	0.011764706	0.012185069
behavior	2	0.113924051	0.010204082	0.005373131
implementation	2	0.487673464	0.011235955	0.00852897
classification	3	8.562688342	0.011764706	0.012961603
diagnosis	3	3.279404044	0.011111111	0.010016196
prediction	3	20.75842631	0.012048193	0.015805798
risk	3	0.754882548	0.010638298	0.007067471
validation	3	0.304491726	0.009433962	0.005649187
cancer	3	0	0.00952381	0.005609298
internet	4	148.8941463	0.016949153	0.076387318
blockchain	4	43.449049	0.015151515	0.053307776
challenges	4	29.92006389	0.014925373	0.043587562
things	4	10.74689283	0.014084507	0.036942625
iot	4	12.40463399	0.01369863	0.034121694
networks	4	4.445716351	0.013513514	0.021445454
security	4	2.029592541	0.012658228	0.023509137
ai	4	8.887677415	0.0125	0.019815322

architecture	4	3.557749597	0.013157895	0.021263385
cloud	4	0.371827152	0.012048193	0.015111896
intelligence	4	0.926643166	0.012195122	0.014184623
privacy	4	0.643091343	0.0125	0.018125673
communication	4	1.056674479	0.011764706	0.014165999
5g	4	0.205995065	0.010869565	0.010612172
edge	4	0.444965541	0.011494253	0.012044944

Reference

[1] URL: https://www.bibliometrix.org/vignettes/Introduction_to_bibliometrix.html