

# Analysis of Bibliometric Data of Publications on “*Computational Social Science*” from 1998 to 2018

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The Institute for Analytical Sociology Seminar

Linköping University, Norrköping, Sweden

January 31, 2019

- ▶ 519 publications from 1999 to 2018 retrieved from Scopus under the topics:
  - ▶ *Computational Social Science*
  - ▶ *Computational Sociology*
- ▶ which were sought in:
  - ▶ titles, abstract and keywords
- ▶ including:
  - ▶ 487 coauthors
  - ▶ 1250 individual authors
  - ▶ 1250 author keywords
  - ▶ 2228 Scopus keywords

## SCOPUS Variables

1. PI = Publication ID
2. PY = Publication Year
3. AU = Authors/Coauthors (taken together)
  - ▶ Author = (Individual) Author
  - ▶ Number of Authors
4. TI = Title
5. SO = Source
6. OR1 = Where “Computational Social Science” is found
7. OR2 = Where “Computational Sociology” is found
8. AB = Abstract
9. DE = Author keywords (taken together)
  - ▶ (Distinct) Author Keywords
  - ▶ Number of Author Keywords
10. ID = Database keywords (taken together)
  - ▶ (Distinct) Scopus Keywords
  - ▶ Number of Scopus Keywords
11. TC = Times cited
12. LA = Language
13. OA = Open Access Status (Paywalled, OA)
14. DT = Document Type (Article, Editorial, Letter, News, Conference Paper, Review, Book Chapter)
15. RL = Reference List
  - ▶ Number of References
16. AI = Authors ID

# I. DESCRIPTIVE STATISTICS

PI	PY	AU	TI	SO	OR1	OR2	DE	TC	LA	OA
2-s2.0-0036436447	2002	Saunders-Newton D.	Introduction - Computer-based methods: State of the art	Social Science Computer Review	DE		agent-based modeling; computational modeling; computational social science; decision inference; simulation modeling	0	English	Paywall
2-s2.0-1642370467	2003	Nardi D.	Communication as intelligence: Methods for social exchange using natural language	Proceedings of the International Conference on Artificial Intelligence IC-AI 2003	AB		agents; communications; natural language; social exchange	0	English	Paywall
2-s2.0-3042645898	2003	Kliver J., Stoica C., Schmid J.	Formal models, social theory and computer simulations: Some methodical reflections	JASSS		AB DE	computational sociology; formal models; mathematical sociology; methodical foundations	20	English	Paywall
2-s2.0-77951557685	2003	Naitoh K., Terano T.	Agent-based modeling of corporate behaviors with evolutionary computation	Proceedings of IEEE International Symposium on Computational Intelligence in Business and	AB ID		none	4	English	Paywall

## Publications extracted from the key-topic "Computational Social Science"

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480

PY	OR1	AU	TI	SO
1999	DE	Bainbridge W.S.	International network for Integrated social science	Social Science Computer Review
2000	AB	Gallach D.L.	Classical social processes: Attractor and computational models	Journal of Mathematical Sociology
2001	TI	Castelfranchi C.	The theory of social functions: Challenges for computational social science and multi-agent learning	Cognitive Systems Research
2002	DE	Saunders-Newton D.	Introduction - Computer-based methods: State of the art	Social Science Computer Review
2002	TI	Bankes S., Lempert R., Popper S.	Making computational social science effective: Epistemology, methodology, and technology	Social Science Computer Review
2003	AB ID	Naitoh K., Terano T.	Agent-based modeling of corporate behaviors with evolutionary computation	Proceedings of IEEE International Symposium on Computational Intelligence in Robotics and Automation, CIRA
2003	AB	Nardi D.	Communication as intelligence: Methods for social exchange using natural language	Proceedings of the International Conference on Artificial Intelligence IC-AI 2003
2005	AB	Popp R.L., Yen J.	Emergent Information Technologies and Enabling Policies for Counter-Terrorism	Emergent Information Technologies and Enabling Policies for Counter-Terrorism
2005	AB	David N., Sichman J.S., Coelho H.	The logic of the method of agent-based simulation in the social sciences: Empirical and intentional adequacy of computer programs	JASSS
2005	AB	David N., Sichman J.S., Coelho H.	Intentional adequacy of computer programs as the experimental reference of agent-based social simulation	Proceedings of the International Conference on Autonomous Agents
2005	DE ID	Luke S., Ciolfi-Revilla C., Panait L., Sullivan K., Balan G.	MASON: A Multiagent Simulation Environment	Simulation

## Publications extracted from the key-topic "Computational Sociology"

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40

PY	OR2	AU	TI	SO
2002	TI AB	Macy M.W., Willer R.	From factors to actors: Computational sociology and agent-based modeling	Annual Review of Sociology
2003	AB DE	Kl?ver J., Stoica C., Schmid J.	Formal models, social theory and computer simulations: Some methodical reflections	JASSS
2005	DE	Kl?ver J., Schmid J., Stoica C.	The emergence of social order by processes of typifying: A computational model	Journal of Mathematical Sociology
2005	TI	Hales D., Patarin S.	Computational sociology for systems 'in the wild': The case of BitTorent	IEEE Distributed Systems Online
2007	DE ID	He Z., Yuan L., Zeng G.	A process algebraic approach to modeling collective behaviors in social networks	3rd International Conference on Semantics, Knowledge, and Grid, SKG 2007
2007	DE ID	Narayanan S., Sievers K., Maiorano S.	OCCAM: Ontology-based computational contextual analysis and modeling	Lecture Notes in Computer Science [including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics]
2009	DE ID	Marchione E., Selgado M., Gilbert N.	'What did you say?' Emergent communication in a multi-agent spatial configuration	Conference Proceedings - 6th Conference of the European Social Simulation Association, ESSA 2009
2009	DE ID	Singh V.K., Gupta A.K.	Agent based models of social systems and collective intelligence	2009 International Conference on Intelligent Agent and Multi-Agent Systems, IAMA 2009
2010	DE	Marchione E., Selgado M., Gilbert N.	'What did you say?' Emergent communication in A multi-agent spatial configuration	Advances in Complex Systems
2011	AB ID	Massa P.	Social networks of Wikipedia	HT 2011 - Proceedings of the 22nd ACM Conference on Hypertext and Hypermedia

Publications extracted from both the key-topics "Computational Social Science" and "Computational Sociology"

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PY	OR1	OR2	AU	TI	SO
2013	AB DE ID	AB ID	Meng X., Li Y., Zhu J.J.H.	Social computing in the era of big data: Opportunities and challenges	Jisuanji Yanjiu yu Fazhan/Computer Research and Development
2014	AB ID	DE ID	Aiello L.M., Schifanella R., State B.	Reading the source code of social ties	WebSci 2014 - Proceedings of the 2014 ACM Web Science Conference
2015	AB DE	AB DE	Zhuravleva E.Yu.	Sociology in digital environment: Towards digital social research	Sotsiologicheskie Issledovaniya

## Publications in a particular time

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PY	AU	TI	SO
2003	Naitoh K., Terano T.	Agent-based modeling of corporate behaviors with evolutionary computation	Proceedings of IEEE International Symposium on Computational Intelligence in Robotics and Automation, CIRA
2003	Kı?ver J., Stoica C., Schmid J.	Formal models, social theory and computer simulations: Some methodological reflections	JASSS
2005	David N., Sichman J.S., Coelho H.	The logic of the method of agent-based simulation in the social sciences: Empirical and intentional adequacy of computer programs	JASSS
2005	Popp R.L., Yen J.	Emergent Information Technologies and Enabling Policies for Counter-Terrorism	Emergent Information Technologies and Enabling Policies for Counter-Terrorism
2005	Hales D., Patarin S.	Computational sociology for systems 'in the wild': The case of BitTorrent	IEEE Distributed Systems Online
2005	Kı?ver J., Schmidt J., Stoica C.	The emergence of social order by processes of typifying: A computational model	Journal of Mathematical Sociology
2005	Luke S., Ciolfi-Reville C., Paraiit L., Sullivan K., Balan G.	MASON: A Multiagent Simulation Environment	Simulation
2005	David N., Sichman J.S., Coelho H.	Intentional adequacy of computer programs as the experimental reference of agent-based social simulation	Proceedings of the International Conference on Autonomous Agents
2006	Dibble C.	Chapter 31 Computational Laboratories for Spatial Agent-Based Models	Handbook of Computational Economics
2006	Arms W.Y., Kot B.J., Aya S., Mitchell R., Dmitriev P., Walle L.	Building a research library for the history of the Web	Proceedings of the ACM/IEEE Joint Conference on Digital Libraries
2006	Popp R., Kaiser S.H., Allen D., Ciolfi-Reville C., Carley K.M..	Assessing nation-state instability and failure	IEEE Aerospace Conference Proceedings

## Publications by a particular author

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8

Author	PY	AU	TI	SO
Lazer D.	2009	Lazer D., Pentland A., Adamic L., Aral S., Berab?si A.-L., Brewer D., Christakis N., Contractor N., Fowler J., Gutmann M., Jebara T., King G., Macy M., Roy D., Van Astyne M.	Social science: Computational social science	Science
Lazer D.	2013	Lin Y.-R., Margolin D., Keegan B., Lazer D.	Voices of victory: A computational focus group framework for tracking opinion shift in real time	WWW 2013 - Proceedings of the 22nd International Conference on World Wide Web
Lazer D.	2015	Toole J.L., Lin Y.-R., Muehlegger E., Shoag D., Gon?lez M.C., Lazer D.	Tracking employment shocks using mobile phone data	Journal of the Royal Society Interface
Lazer D.	2016	Lazer D., Tsur O., Eliaissi-Rad T.	Understanding offline political systems by mining online political data	WSDM 2016 - Proceedings of the 9th ACM International Conference on Web Search and Data Mining
Lazer D.	2017	Lazer D., Radford J.	Data ex machina: Introduction to big data	Annual Review of Sociology
Lazer D.	2018	Radford J., Horgan I., Lazer D.	Baselines for demographic inference on a new gold standard twitter corpus	Proceedings - 2017 IEEE International Conference on Big Data, Big Data 2017
Lazer D.	2018	Whitbeck J., Joseph K., Lazer D.	The social silos of journalism? Twitter, news media and partisan segregation	New Media and Society
Lazer D.	2018	Riedl C., Bjelland J., Canright G., Iqbal A., Eng? Monsen K., Qureshi T., Sunds?y P.R., Lazer D.	Product diffusion through on-demand information-seeking behaviour	Journal of the Royal Society Interface

## Publications with abstracts containing particular words

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PY	AU	TI	SO
2002	Macy M.W., Willer R.	From factors to actors: Computational sociology and agent-based modeling	Annual Review of Sociology
2007	He Z., Yuan L., Zeng G.	A process algebraic approach to modeling collective behaviors in social networks	3rd International Conference on Semantics, Knowledge, and Grid, SKG 2007
2010	Cloffri-Revilla C.	Computational social science	Wiley Interdisciplinary Reviews: Computational Statistics
2011	Santos E.E., Santos Jr. E., Wilkinson J.T., Korah J., Kim K., Li D., Yu F.	Modeling complex social scenarios using culturally infused social networks	Conference Proceedings - IEEE International Conference on Systems, Man and Cybernetics
2011	Kum H.-C., Ahalt S.	Decoupled data for privacy preserving record linkage with error management	Proceedings - 2011 IEEE International Conference on Privacy, Security, Risk and Trust and IEEE International Conference on Social Computing, PASSAT/SocialCom 2011
2011	Cebrian M., Pentland A.	Engineering trade-offs in social organization: The beginnings of a computational social science	IEEE Instrumentation and Measurement Magazine
2011	Wyatt D., Choudhury T., Bilmes J., Kitts J.A.	Inferring colocation and conversation networks from privacy-sensitive audio with implications for computational social science	ACM Transactions on Intelligent Systems and Technology
2011	Kamvar S.D., Harris J.	We feel fine and searching the emotional web	Proceedings of the 4th ACM International Conference on Web Search and Data Mining, WSDM 2011
2011	[No author name available]	Social Informatics - Third International Conference, SocInfo 2011, Proceedings	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)
2012	Alam S.J., Gefter A.	Networks in agent-based social simulation	Agent-Based Models of Geographical Systems
2012	Wang F., Tong H., Yu P., Aggarwal C.	Guest editorial: Special issue on data mining technologies for computational social science	Data Mining and Knowledge Discovery

#### Counts of 6 basic variables



### Summary of basic statistics of 14 categorical variables

columns	count	unique	top	freq
PI	519	519	2-e2.0-84951873358	1
AU	519	487	[No author name available]	9
TI	519	514	Computational social science	2
SO	519	332	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	26
OR1	519	15	DE	109
OR2	519	11		479
AB	519	507	[No abstract available]	12
DE	519	414	None	98
ID	519	323	None	197
LA	519	8	English	506
OA	519	2	Paywalled	411
DT	519	8	Article	258
RL	519	487	None	33
AI	519	487	9999999999	9

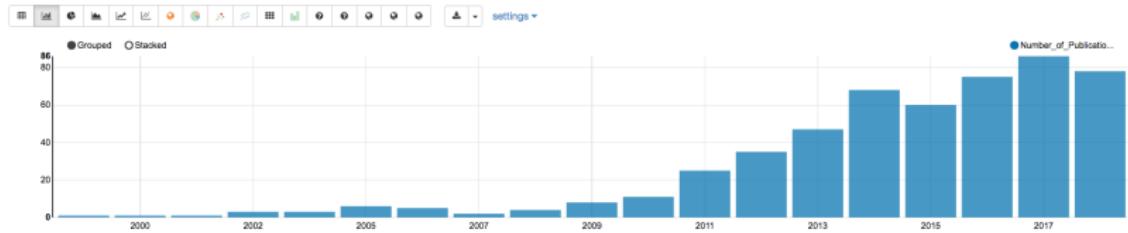
## Summary of basic statistics of 6 continuous variables

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columns	count	mean	std	min	25%	50%	75%	max
PY	519	2014.5028901734104	3.2501100856733935	1999	2013	2015	2017	2018
TC	519	17.258188824662813	78.76710946940385	0	0	3	11.5	1348
Number_of_Authors	519	3.2177263989171483	2.85573220309882715	1	1	3	4	29
Number_of_Author_Keywords	519	4.410404624277457	2.7147473040351695	0	3	5	6	16
Number_of_Scopus_Keywords	519	9.208092485549132	9.097872593997108	0	0	10	14	44
Number_of_References	519	42.445086705202314	36.42425326362622	1	16	34	55	223

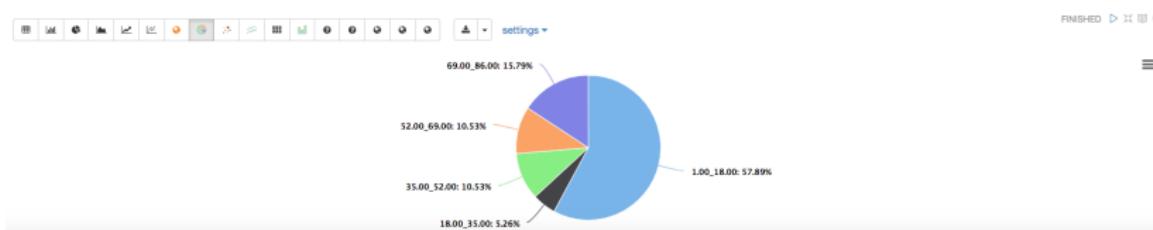
### Barplot of Number of Publications per Year

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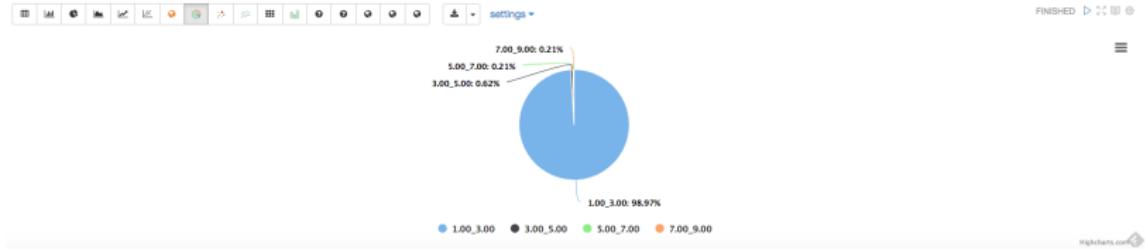
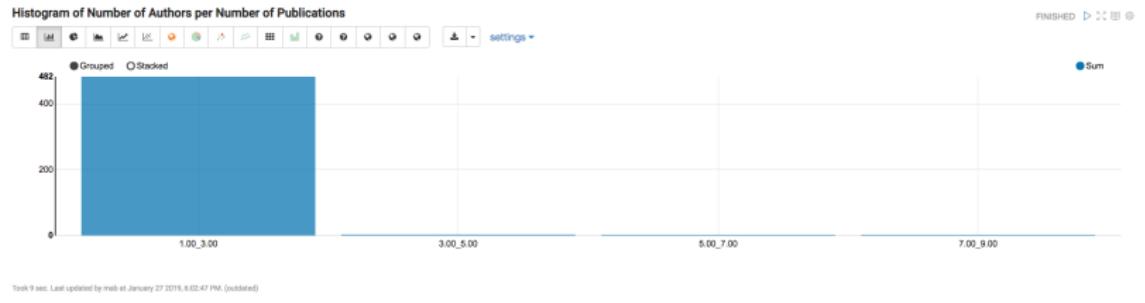


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## Authors/co-authors with at least 2 publications

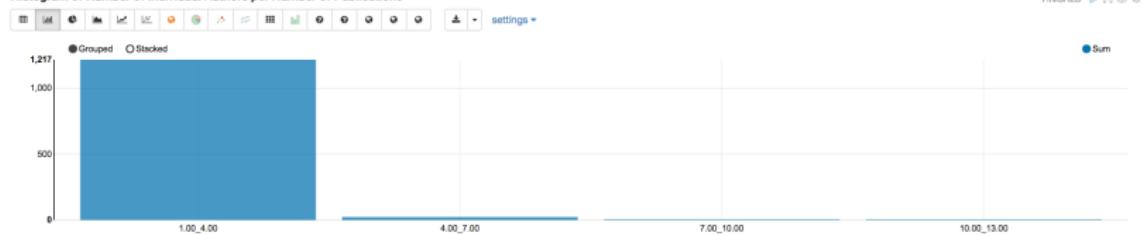
AU	Number_of_Publications
Cioffi-Revilla C.	5
Bail C.A.	3
Heeren A., McNally R.J.	3
Mohanty H.	3
Wallach H.	2
Squazzoni F.	2
Ferrara E.	2
Marchione E., Salgado M., Gilbert N.	2
David N., Sichman J.S., Coelho H.	2
Jungherr A., J?rgens P.	2
Mukkamala R.R., Hussain A., Vatrapu R.	2
Parunak H.V., Belding T.C., Hilscher R., Brueckner S.	2
Ch'ng E.	2
Hussain A., Vatrapu R.	2
Weber I., Popescu A.-M., Pennacchiotti M.	2
Cioffi-Revilla C., Rouleau M.	2
Davis C.A., Ciampaglia G.L., Aiello L.M., Chung K., Conover M.D., Ferrara E., Flaminini A., Fox G.C., Gao X., Gon?alves B., Grabowicz P.A., Hong K., Hui P.-M., McCaulay S., McKelvey K., Meiss M.R., Patil S., Kankanamalage C.P., Pentchev V., Qiu J., Ratkiewicz J., Rudnick A., Serrette B., Shiralkar P., Varol O., Weng L., Wu T.-L., Younge A.J., Menczer F.	2
Duong D.V.	2



## Individual Authors with at least 5 publications

Author	Number_of_Publications
Cioffi-Revilla C.	13
Moat H.S.	11
Preis T.	11
Vatrapu R.	10
Hussain A.	9
Lazer D.	8
Jungherr A.	7
J?rgens P.	7
Pentland A.	7
Ferrara E.	6
Kosinski M.	6
Mukkamala R.R.	6
Pentland A.S.	6
Stanley H.E.	6
Weber I.	5
Conte R.	5
Gilbert N.	5
Flesch B.	5
Fleischmann K.R.	5

### Histogram of Number of Individual Authors per Number of Publications



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## Wordcloud of Individual Authors



## Sources with at least 5 publications

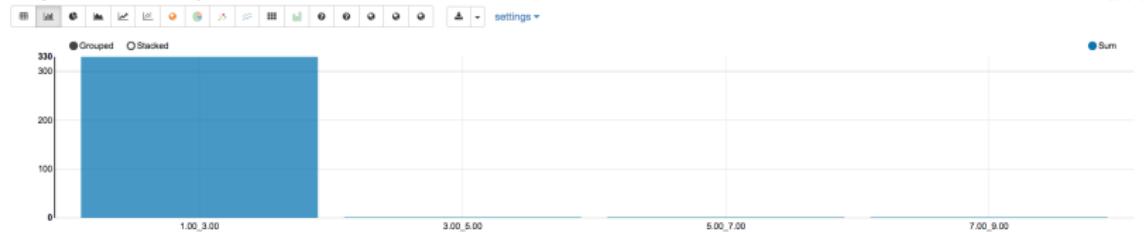


A toolbar with various icons for filtering and sorting data, including a magnifying glass, a bar chart, a pie chart, a scatter plot, a histogram, a grid, a heatmap, a scatter matrix, a network graph, a tree diagram, a funnel, a search icon, and a refresh icon.

settings ▾

SO	Number_of_Publications
Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	26
Proceedings of the National Academy of Sciences of the United States of America	15
Social Science Computer Review	14
ACM International Conference Proceeding Series	12
EPJ Data Science	11
Royal Society Open Science	9
PLoS ONE	7
Conference on Human Factors in Computing Systems - Proceedings	6
Annals of the American Academy of Political and Social Science	5
JASSS	5
IEEE Intelligent Systems	5

### Histogram of Number of Sources per Number of Publications



## Wordcloud of Sources

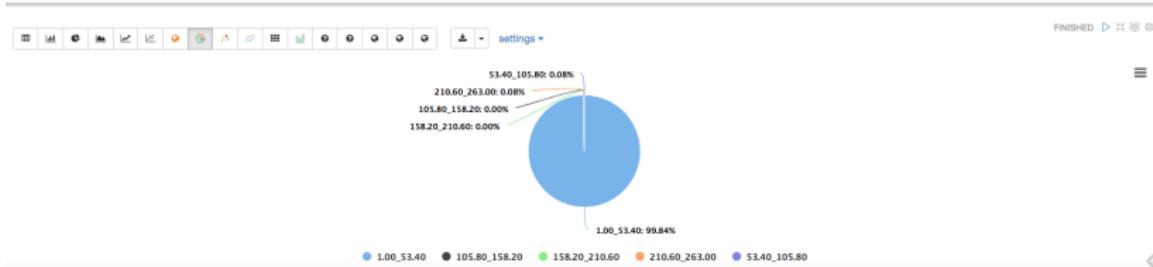


## Author Keywords within at least 10 publications

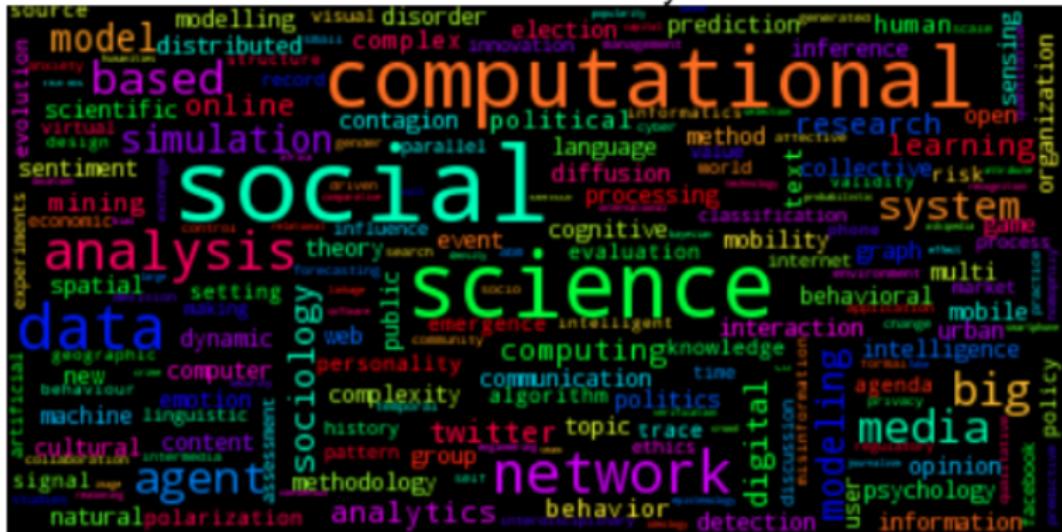
Author_Keyword	Number_of_Publications
computational social science	263
big data	53
social media	51
twitter	36
computational sociology	28
social networks	27
social network analysis	20
data science	19
social simulation	16
computational social sciences	15
sentiment analysis	14
machine learning	14
complex systems	14
social computing	13
agent-based modeling	13
network analysis	13
natural language processing	12
simulation	10



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## Wordcloud of Author Keywords

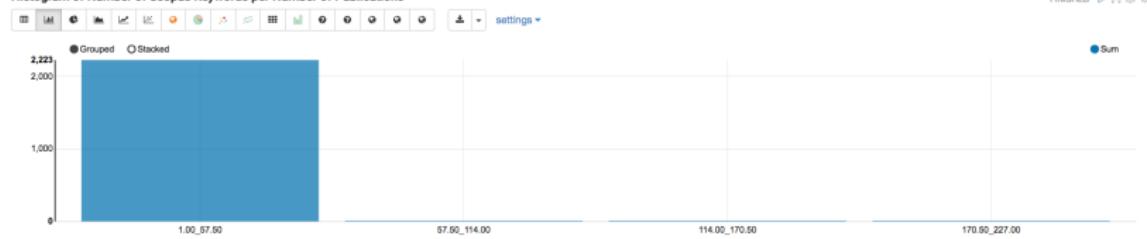


## Scopus Keywords within at least 20 publications

The table displays the top 20 Scopus keywords based on the number of publications:

Scopus_Keyword	Number_of_Publications
computational social science	227
social sciences	117
social networking (online)	102
behavioral research	87
social media	49
human	41
social sciences computing	40
article	34
big data	34
computation theory	31
data mining	31
humans	30
artificial intelligence	29
computational methods	28
internet	27
sociology	24
computer simulation	24
twitter	23
complex networks	20
agent-based model	20

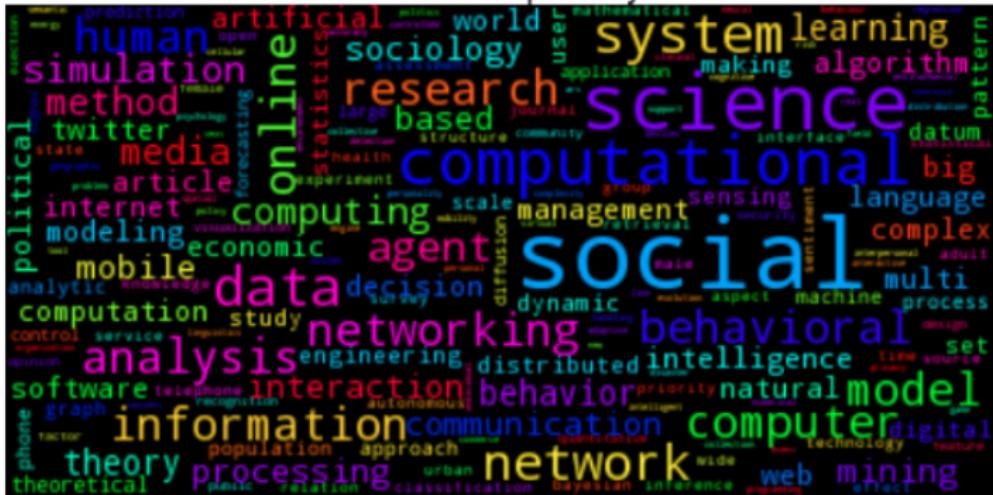
### Histogram of Number of Scopus Keywords per Number of Publications



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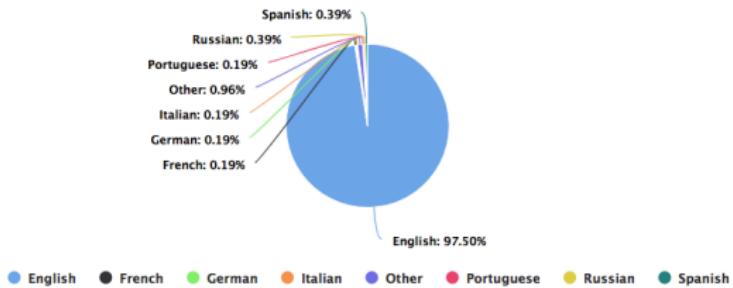


## Wordcloud of Scopus Keywords



## Languages per Number of Publications

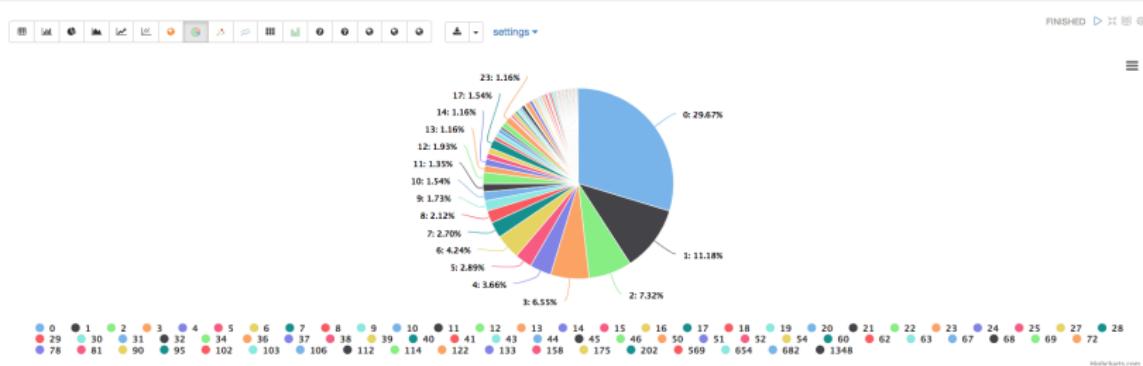
LA	Number_of_Publications
English	506
Other	5
Russian	2
Spanish	2
Italian	1
French	1
Portuguese	1
German	1



### **1.7 Times Cited**

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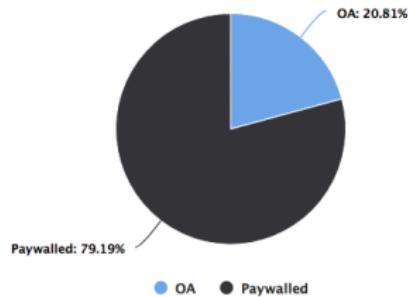


## 1.8 Open Access Type

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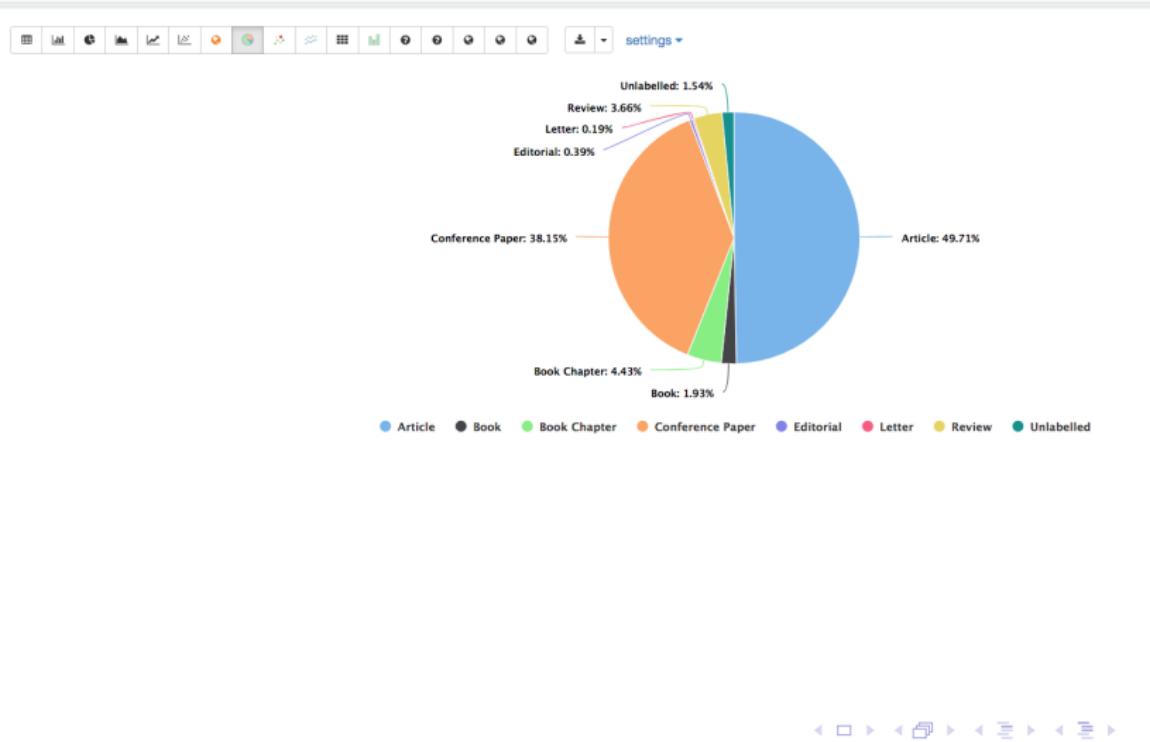


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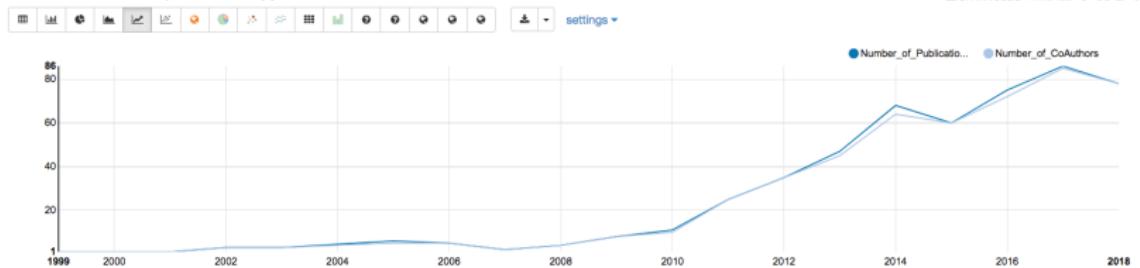
## 1.9 Document Type

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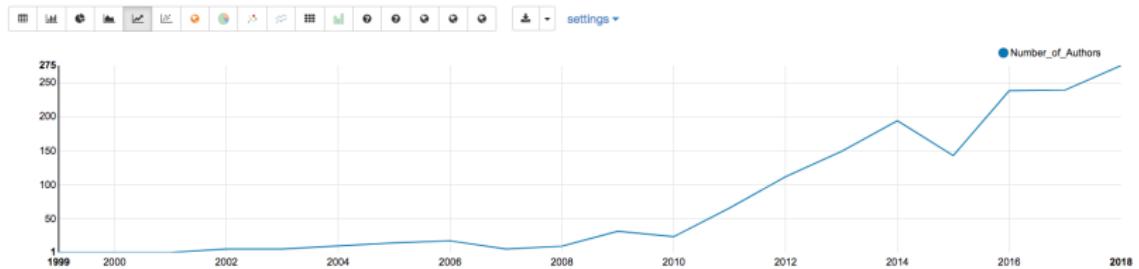
# II. TIMESERIES

### Number of Publications (and Coauthors) per Year



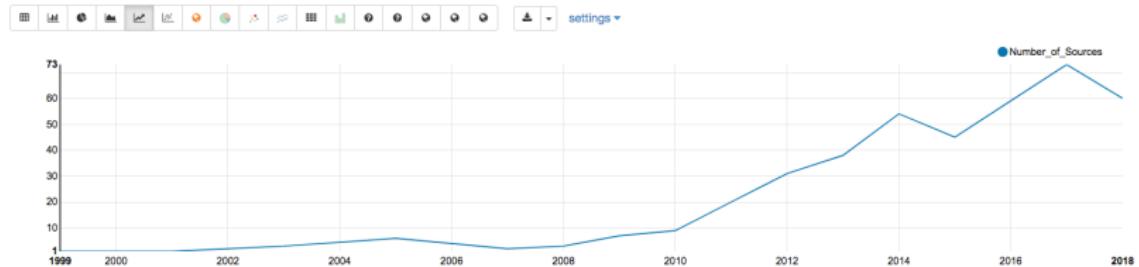
### Number of Individual Authors per Year

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### Number of Sources per Year

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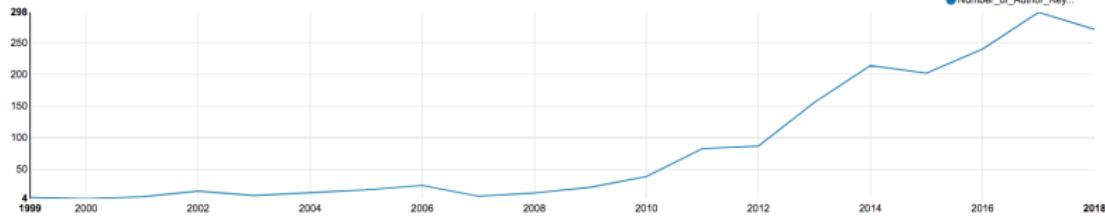
## Number of Author Keywords per Year

```
%sql  
select PY as year, count(distinct Author_Keyword) as Number_of_Author_Keywords  
from fpdfs  
group by PY
```



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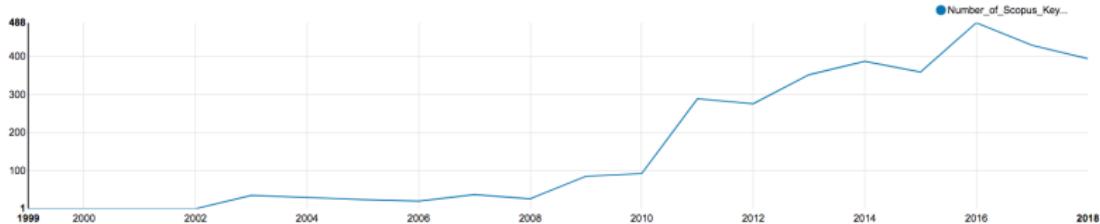
### Number of Scopus Keywords per Year

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from fpdfs  
group by PY
```

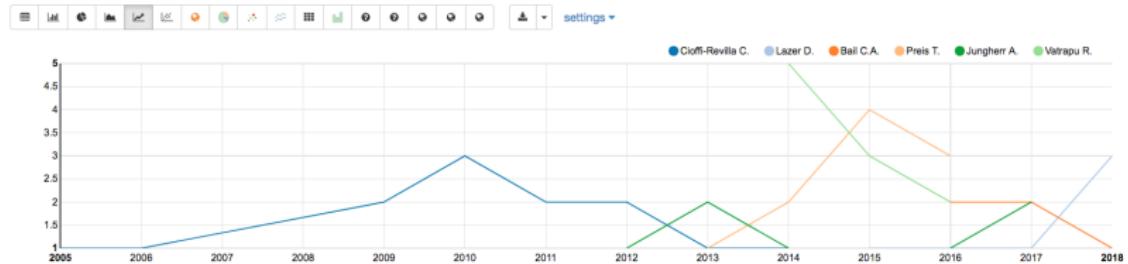


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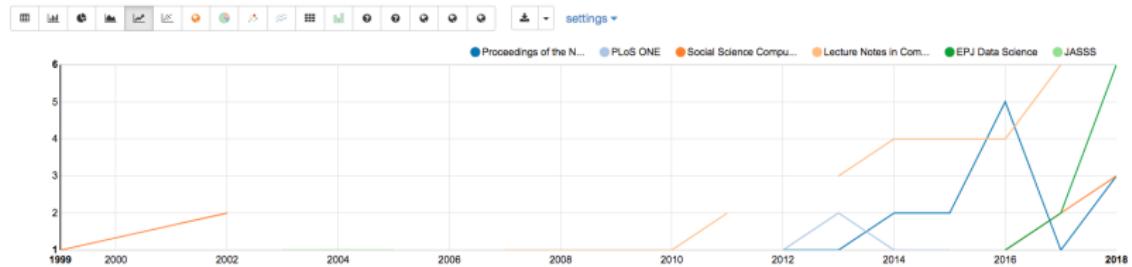
### Number of Publications per Year by Particular Authors

■ SPARK JOBS FINISHED ▶ ⏪ ⏴ ⏵ ⏹



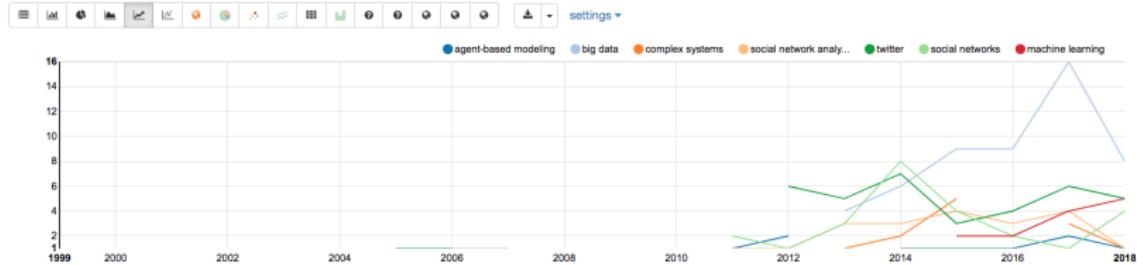
#### **Number of Publications per Year in Particular Sources**

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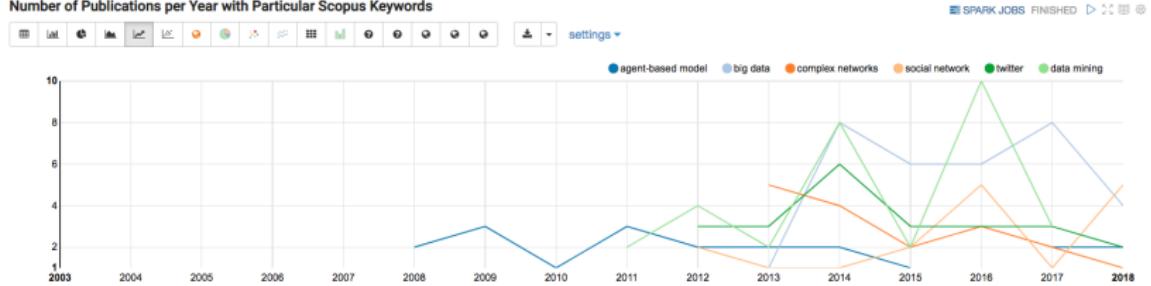


### Number of Publications per Year with Particular Author Keywords

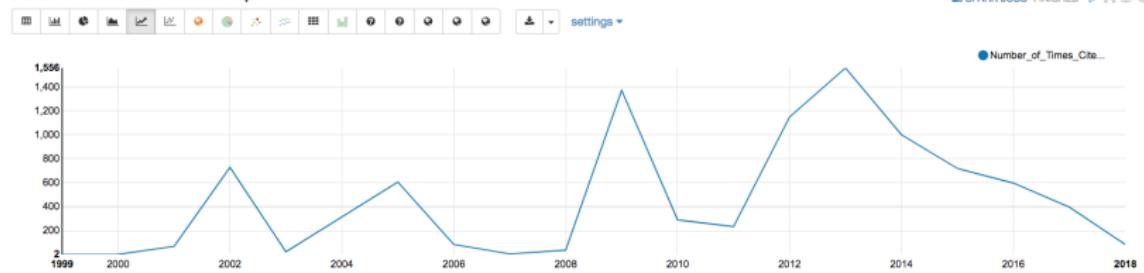
■ SPARK JOBS FINISHED ▶ ⏪ ⏴ ⏵ ⏹



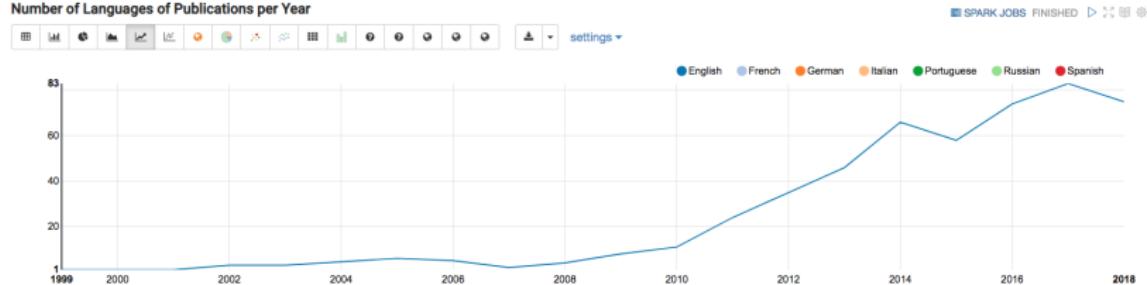
### Number of Publications per Year with Particular Scopus Keywords



### Number of Citations of Publications per Year

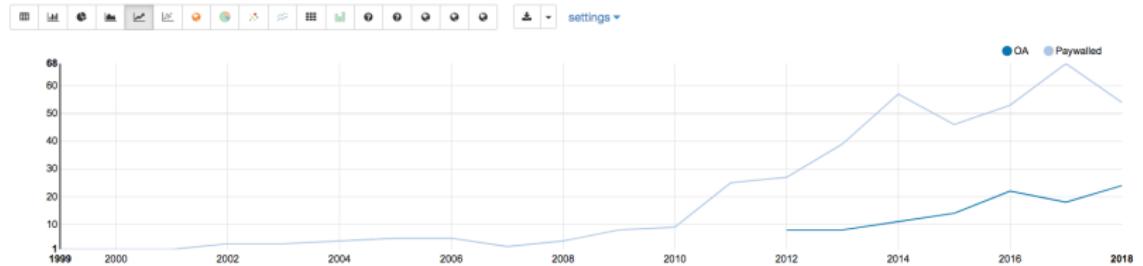


### Number of Languages of Publications per Year

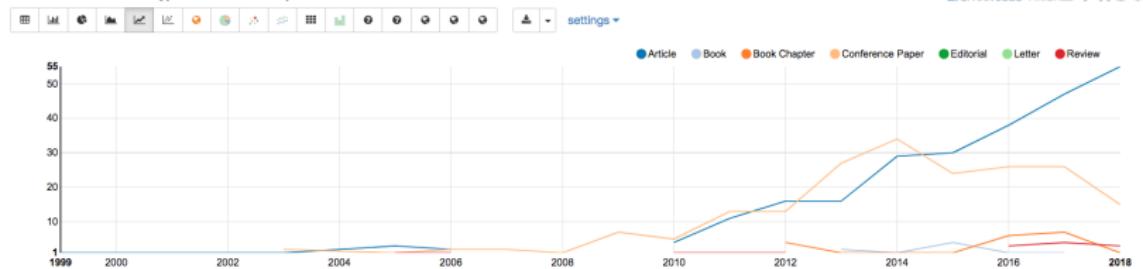


### Number of Open Access Type of Publications per Year

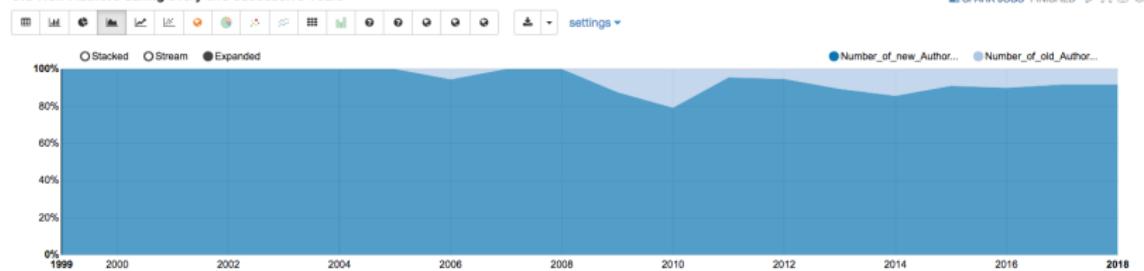
SPARK JOBS FINISHED ▶ 1/1



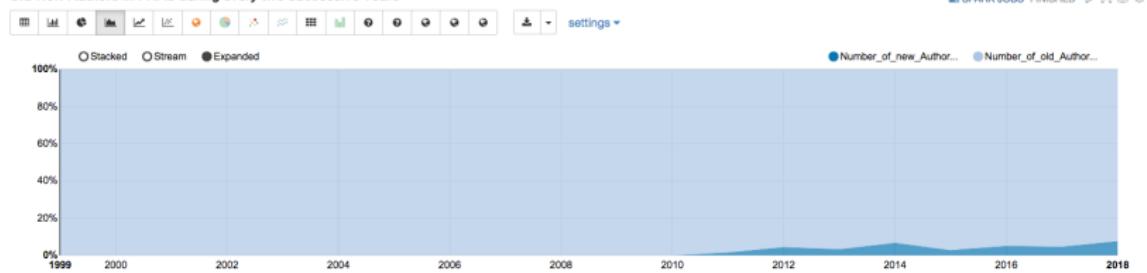
### Number of Document Type of Publications per Year



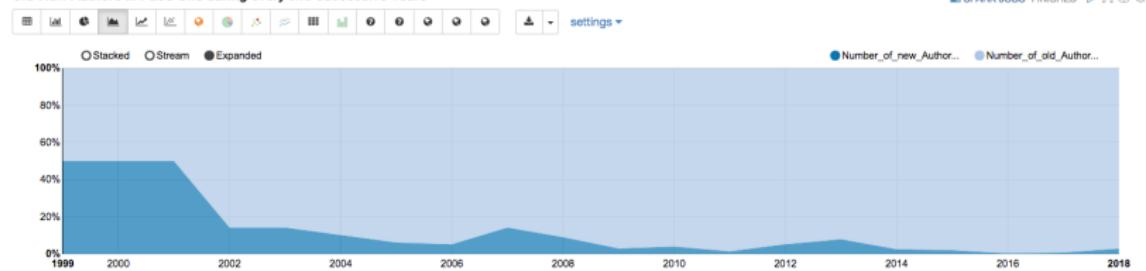
### Old-New Authors during every two successive Years



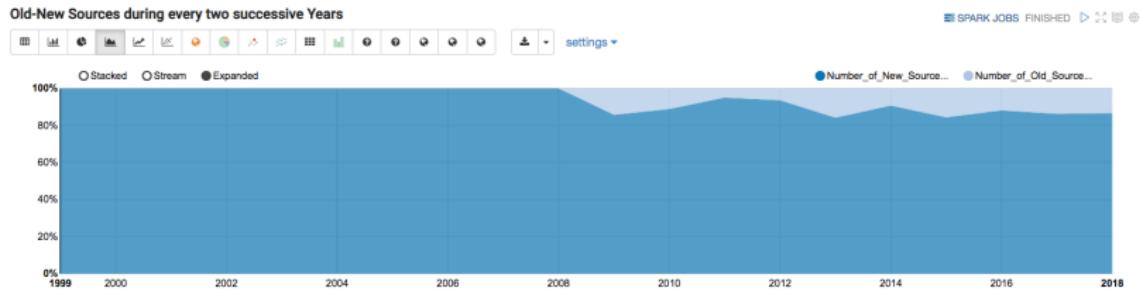
### Old-New Authors in PNAS during every two successive Years



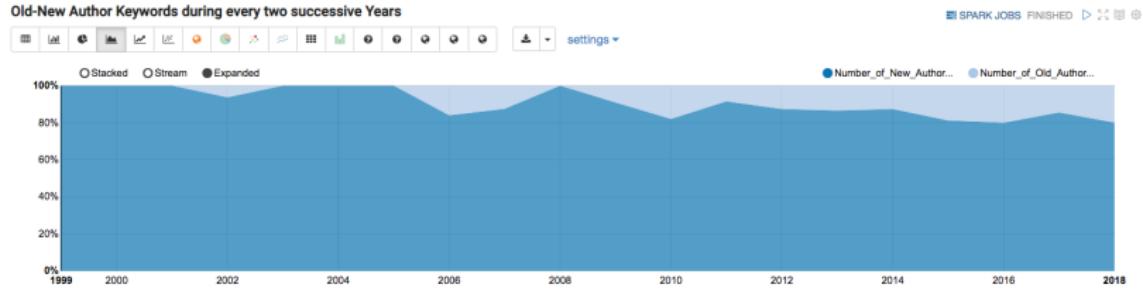
### Old-New Authors in PLoS One during every two successive Years



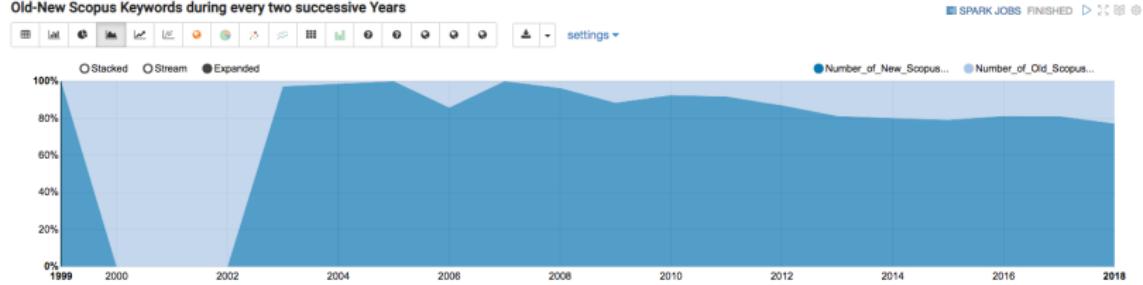
### Old-New Sources during every two successive Years



### Old-New Author Keywords during every two successive Years



### Old-New Scopus Keywords during every two successive Years

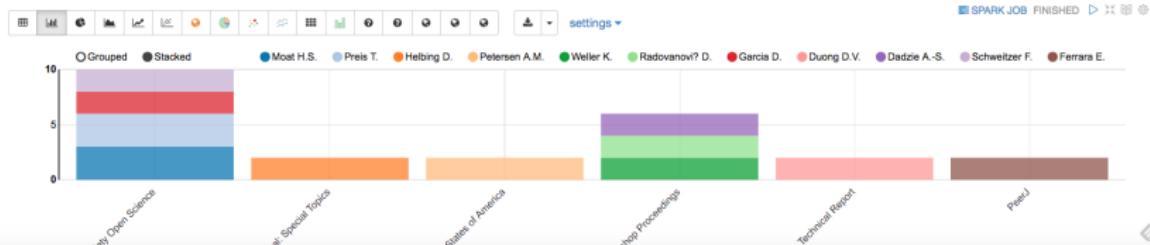


### **Maximum Years of Continuity in Publications**

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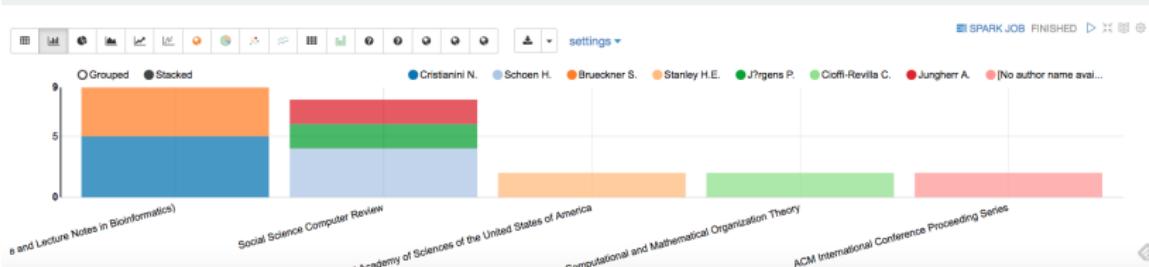


## Maximum Years of Lapse in Publications

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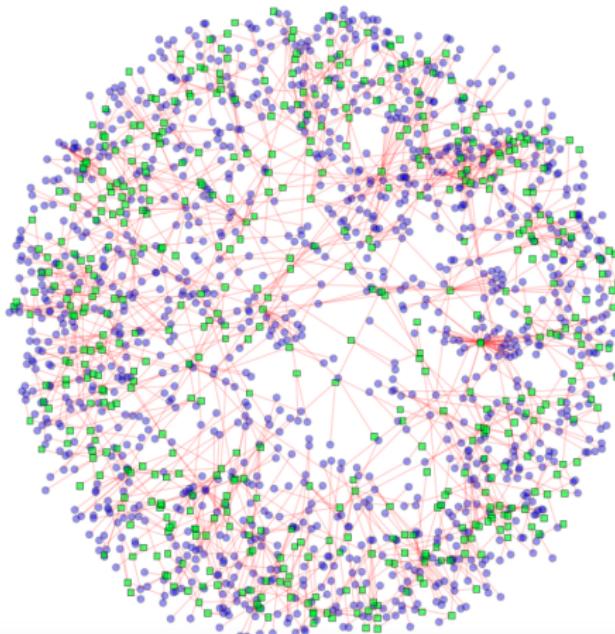


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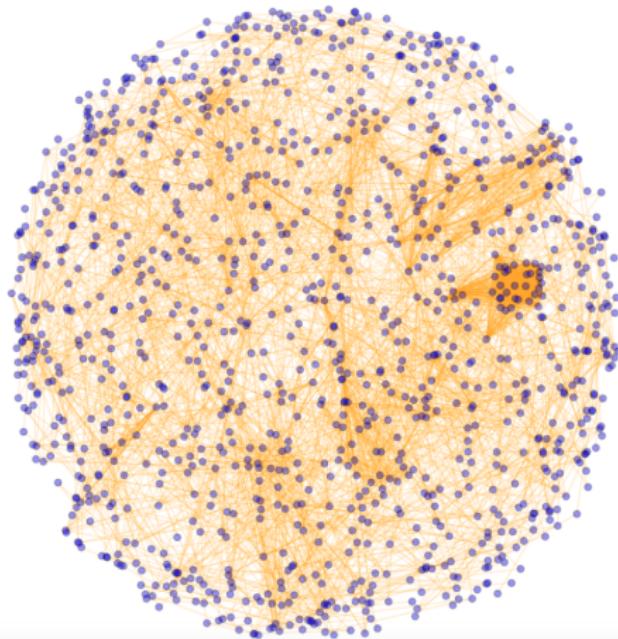


# III. NETWORKS

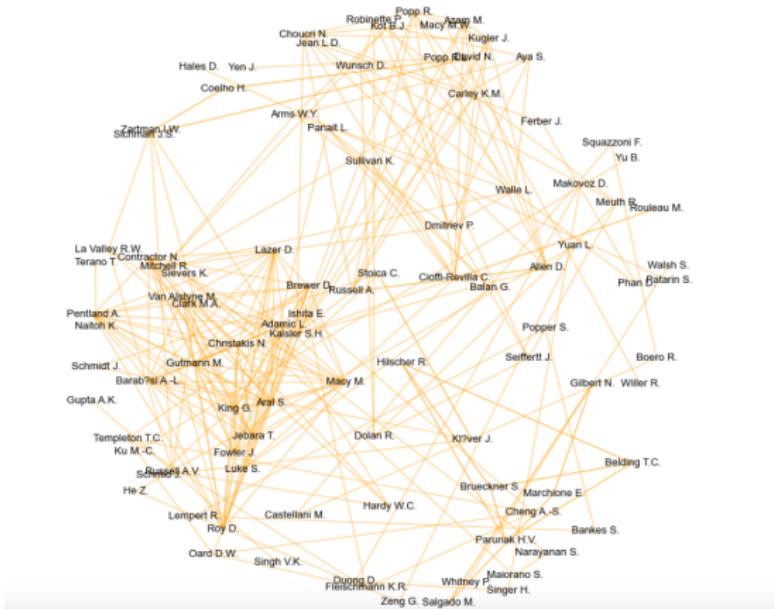
The CSS bipartite multigraph of authors-publications  
for the period from 1999 to 2018 (N = 519 publications)



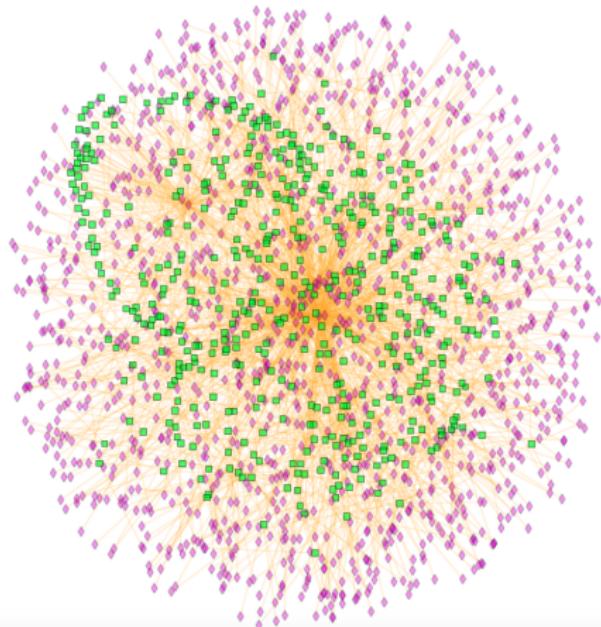
The CSS coauthorship multigraph  
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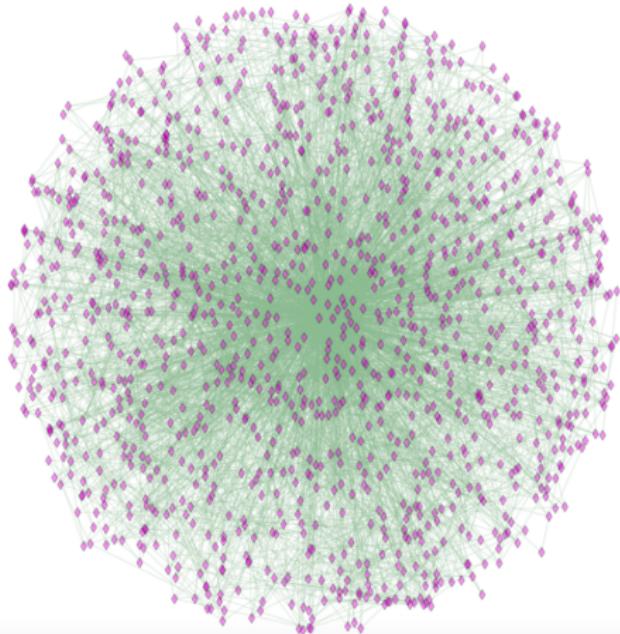
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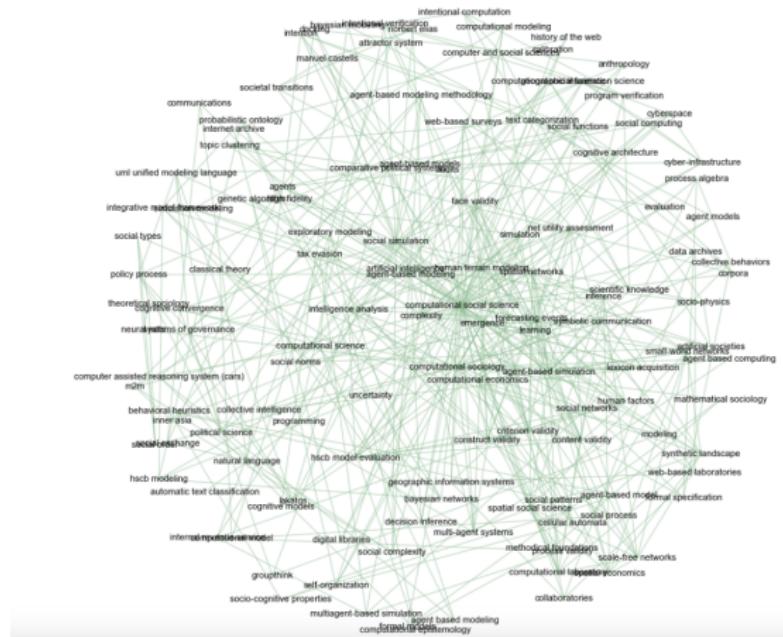
The CSS bipartite multigraph of author\_keywords-publications  
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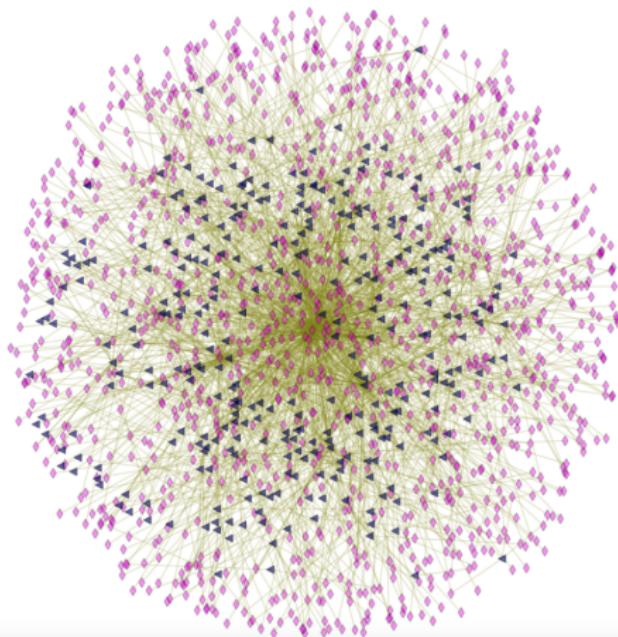
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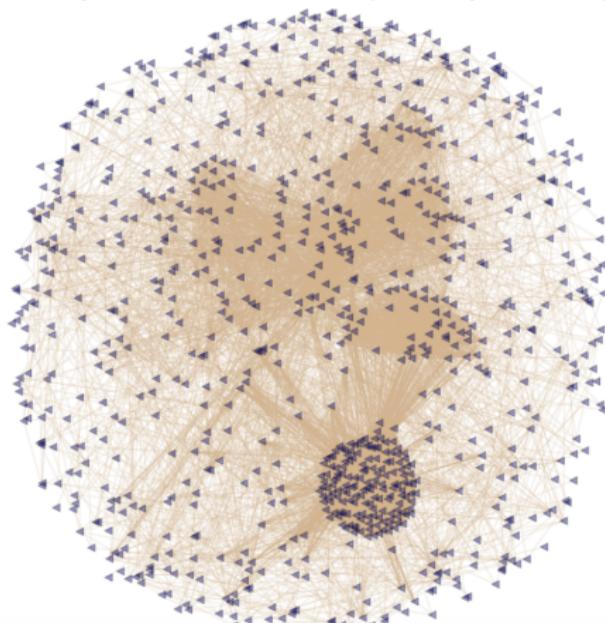
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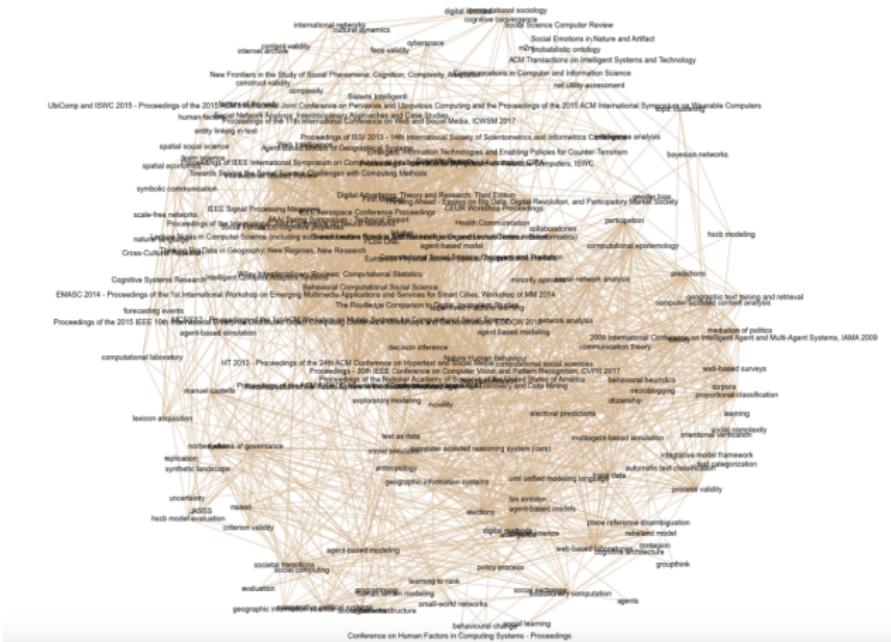
The CSS bipartite multigraph of author\_keywords-sources  
for the period from 1999 to 2018 (N = 519 publications)



The CSS overlapping sources multigraph  
for the period from 1999 to 2018 (N = 519 publications)



The CSS overlapping sources multigraph  
for the period from 1999 to 2010 (N = 519 publications)



## **From Gabriel Tarde...**

*"The public journals will become socially what our sense organs are vitally. Every printing office will become a mere central station for different bureaus of statistics just as the ear-drum is a bundle of acoustic nerves, or as the retina is a bundle of special nerves each of which registers its characteristic impression on the brain. At present Statistics is a kind of embryonic eye, like that of the lower animals which see just enough to recognise the approach of foe or prey."*

— Gabriel Tarde, *The Laws of Imitation* (1890, p. 136)

## Gabriel Tarde's idea of **vibrant mobility**

*"If Statistics continues to progress as it has done for several years, if the information which it gives us continues to gain in accuracy, in dispatch, in bulk, and in regularity, a time may come when upon the accomplishment of every social event a figure will at once issue forth automatically, so to speak, to take its place on the statistical registers that will be continuously communicated to the public and spread abroad pictorially by the daily press. Then, at every step, at every glance cast upon poster or newspaper, we shall be assailed, as it were, with statistical facts, with precise and condensed knowledge of all the peculiarities of actual social conditions, of commercial gains or losses, of the rise or falling off of certain political parties, of the progress or decay of a certain doctrine, etc., in exactly the same way as we are assailed when we open our eyes by the vibrations of the ether which tell us of the approach or withdrawal of such and such a so-called body and of many other things of a similar nature."*

— Gabriel Tarde, *The Laws of Imitation* (1890)