گزارش پروژه درس مبانی علم داده

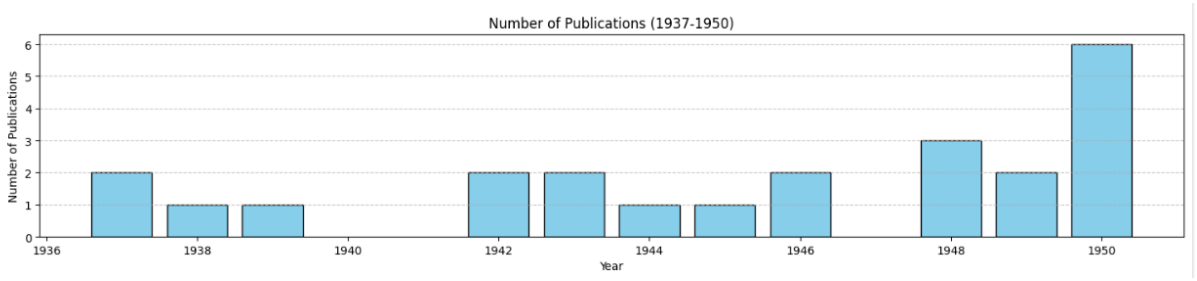
امیرحسین توکلی

۹۹۱۰۹۱۴۴

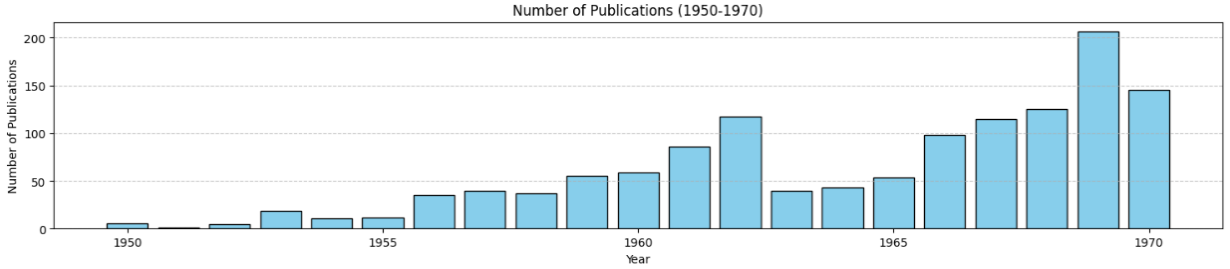
لینک Github:

https://github.com/AmirT000/FDS_project

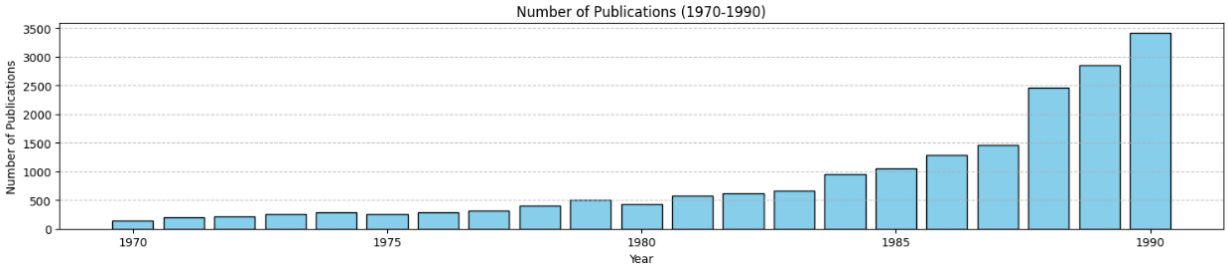
۱.۱.۱ میزان انتشار مقاله به طور چشمگیری افزایش پیدا کرده‌است. تعداد انتشار بین ۱۹۳۷ تا ۱۹۵۰:



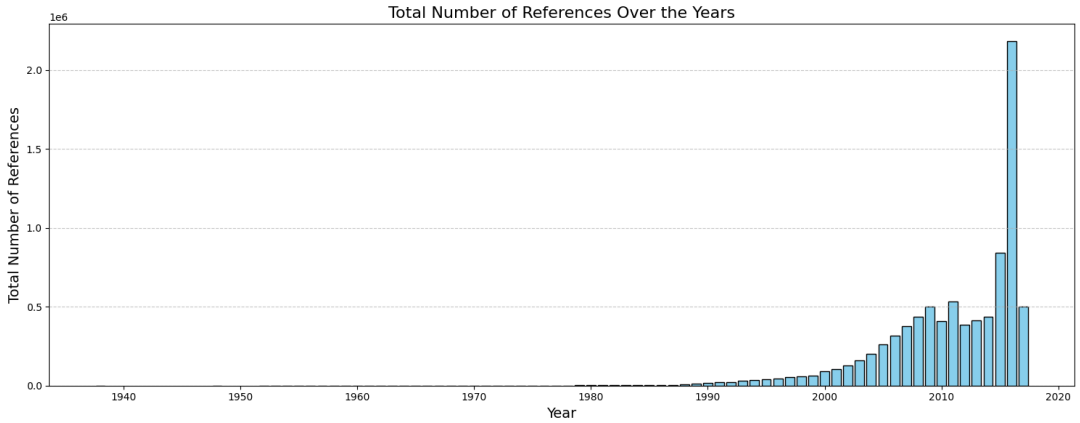
تعداد انتشار بین سال‌های ۱۹۷۰ تا ۱۹۹۰:



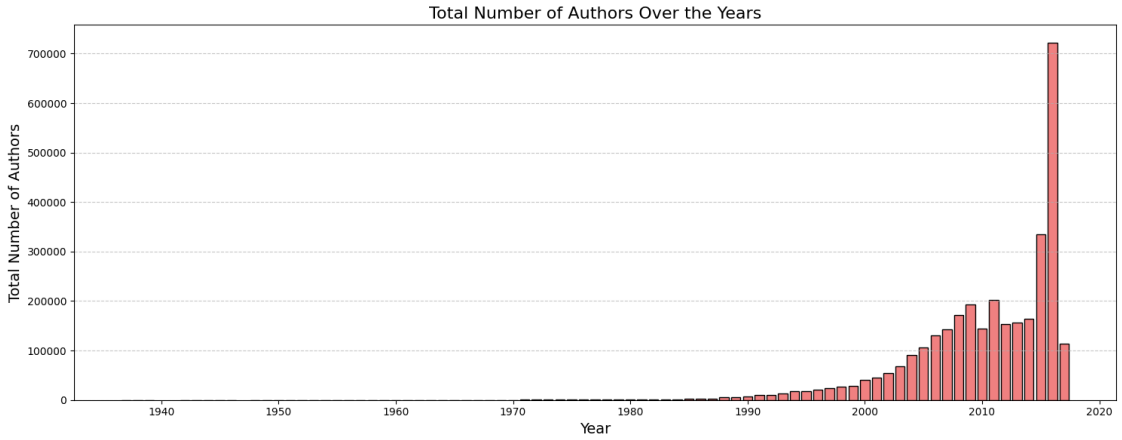
تعداد انتشار بین سال‌های ۱۹۷۰ تا ۱۹۹۰:



۲.۱.۱ تعداد رفرنس‌ها برحسب زمان:



۳.۱.۱ تعداد نویسنده‌ها برحسب زمان شباهت زیادی به نمودار تعداد رفرنس‌ها در زمان دارد:



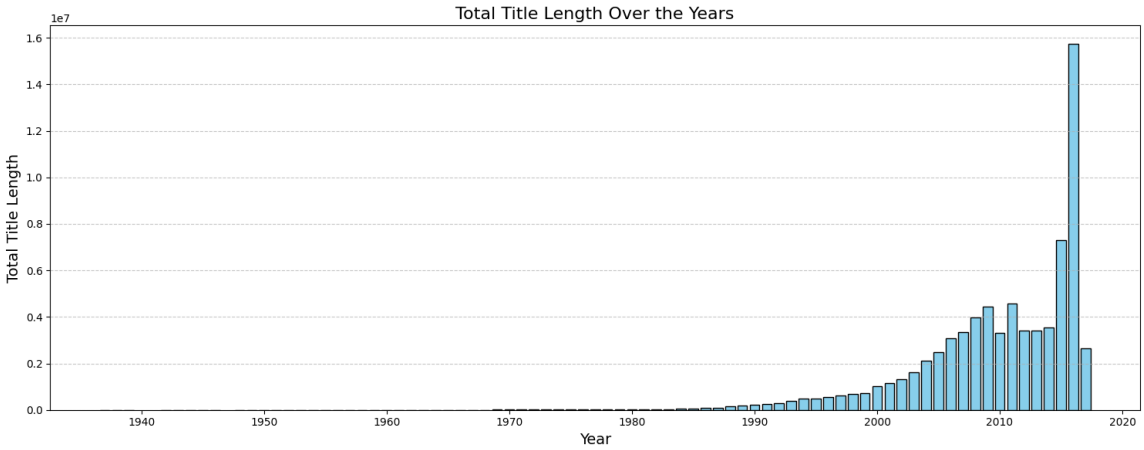
۴.۱.۱ Correlation نویسنده‌ها و رفرنس‌ها:

```
Pearson Correlation Coefficient: 0.0560 (p-value: 0.0000)
Spearman Rank Correlation Coefficient: 0.0872 (p-value: 0.0000)
```

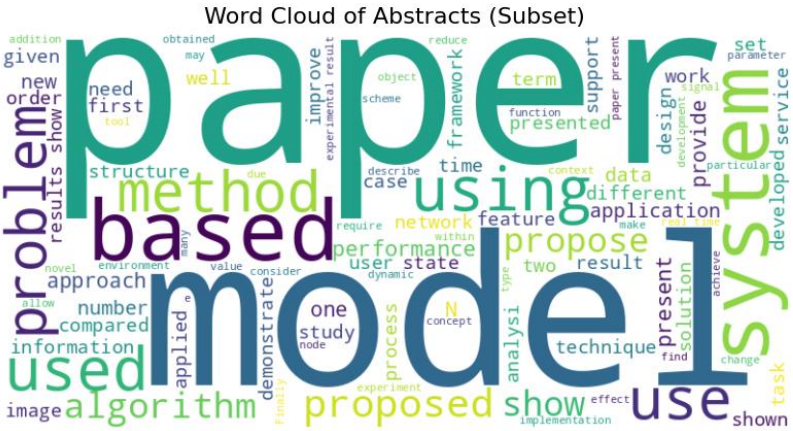
۵.۱.۱ Correlation نویسنده‌ها و تعداد سایتیشن:

```
Pearson Correlation Coefficient: -0.0028 (p-value: 0.0052)
Spearman Rank Correlation Coefficient: -0.0166 (p-value: 0.0000)
```

۶.۱.۱



۷.۱.۱ در این قسمت از یک سمپل رندوم صدهزارتایی استفاده می‌کنیم. Wordcloud با ۱۰۰ کلمه:



۸.۱.۱ Correlation بین طول عنوان مقاله و طول مقاله‌های رفرنس آن:

```
Pearson Correlation: 0.2718 (p=0.0000)
Spearman Correlation: 0.2737 (p=0.0000)
Kendall’s Tau: 0.1871 (p=0.0000)
```

۹.۱.۱ لیست ده نویسنده برتر بر اساس تعداد انتشار:

	Author	Publication Count
0	Wei Wang	950
1	Wei Zhang	657
2	Yang Liu	629
3	Lei Zhang	579
4	Wei Li	559
5	Jun Wang	544
6	Lei Wang	519
7	Lajos Hanzo	458
8	Wei Liu	456
9	Jun Zhang	455

۱۰.۱.۱ لیست ده نویسنده برتر بر اساس تعداد سایتیشن

author	total_citations
David G. Lowe	65344
Hari Balakrishnan	55096
Scott Shenker	54164
Ian F. Akyildiz	53654
Michael I. Jordan	53448
Ion Stoica	52890
Chih-Jen Lin	52302
Takeo Kanade	50743
Deborah Estrin	49925
Vladimir Vapnik	49755

مشاهده می‌کنیم که این دو لیست اشتراکی باهم ندارند

۱۱.۱.۱ ده مقاله برتر بر اساس تعداد رفرنس‌ها

title	num_references
Comprehensive frequency-dependent substrate no...	759
Time in Qualitative Simulation.	561
Bibliography on cyclostationarity	412
Fifty Years of MIMO Detection: The Road to Lar...	396
An Exploration of Enterprise Architecture Rese...	394
Structure and dynamics of molecular networks: ...	386
The NP-completeness column: An ongoing guide	363
Digital geometry	361
Deep Learning: Methods and Applications	343
Review: learning bayesian networks: Approaches...	326

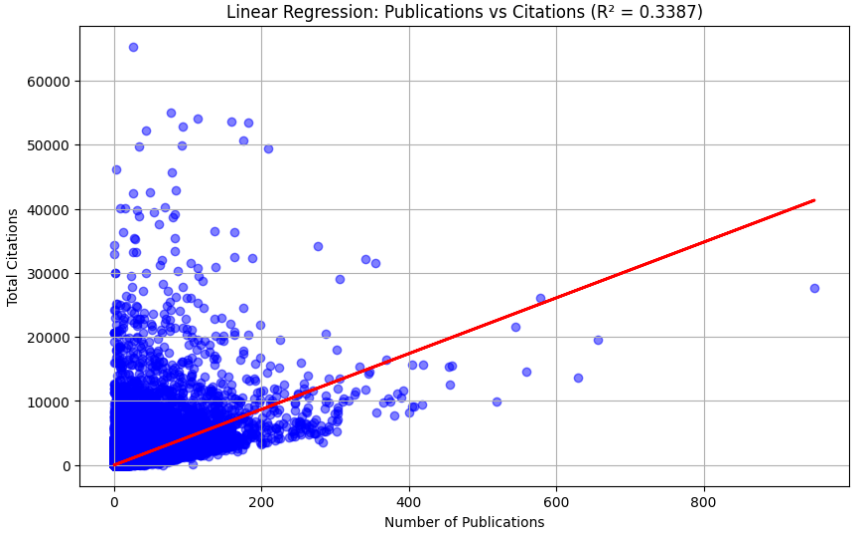
۱۲.۱.۱ ده مقاله برتر بر اساس تعداد سایتیشن

title	n_citation
Distinctive Image Features from Scale-Invarian...	42508
Bowling alone: the collapse and revival of Ame...	34288
LIBSVM: A library for support vector machines	33016
Random Forests	28679
Support-Vector Networks	26114
MapReduce: simplified data processing on large...	24381
A fast and elitist multiobjective genetic algo...	24245
A theory for multiresolution signal decomposit...	24182
ImageNet Classification with Deep Convolutiona...	22884
Histograms of oriented gradients for human det...	22795

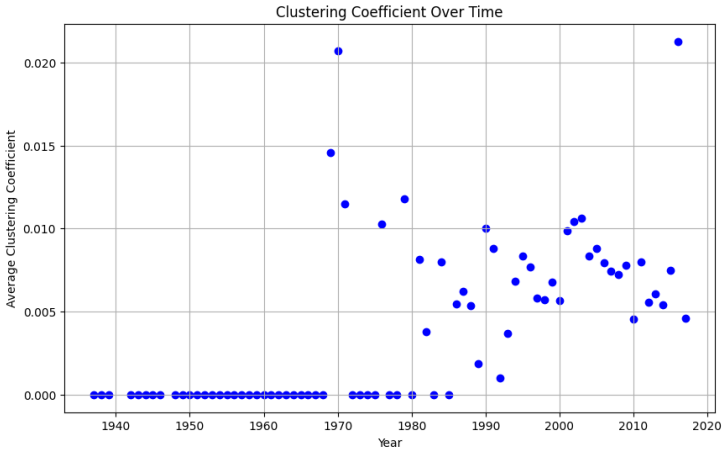
مشاهده می‌کنیم که این دو لیست هم اشتراکی با یکدیگر ندارند

۱۳.۱.۱ نمودار تعداد سایتیشن و انتشار نویسنده‌ها را رسم کرده و Linear Regression انجام می‌دهیم.

مشخص است که خطای زیادی دارد و نمی‌توان پیشبینی کرد



۱.۲.۱ میانگین clustering coefficient شبکه سایتیشن برحسب سال:

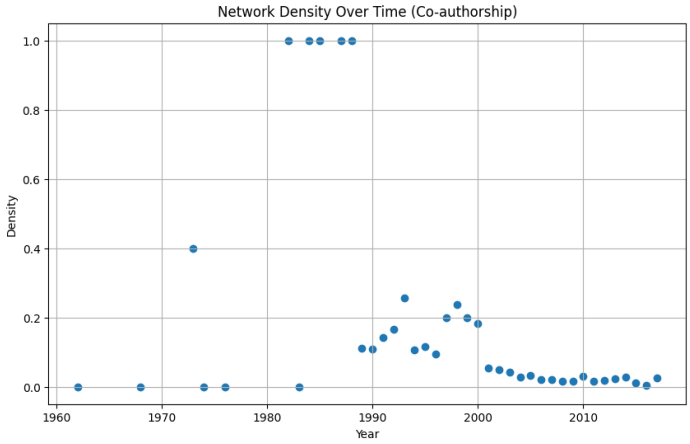


قطر گراف و ۱۰ مقاله موثر:

```
Average Path Length (SCC): 11.288044063779358
Diameter (SCC): 29

Top 10 Influential Papers (based on PageRank):
1. Paper ID: 6a6b9aa6-683f-4c7c-b06e-9c3018d10fd3, PageRank Score: 0.0002234734396393853
2. Paper ID: c1b6b493-01ef-420f-be44-7bacfe34e846, PageRank Score: 0.0001912816104852823 2
3. Paper ID: b944f77f-113b-4a02-ae5e-d4a124b8fd5b, PageRank Score: 0.0001797947828583623 8
4. Paper ID: f6bd8b64-684d-429a-aab5-8ff3a2c23cd6, PageRank Score: 0.0001383960381178899 4
5. Paper ID: 2659531e-eb9d-4dd5-b46f-10f66a4819c6, PageRank Score: 0.0001158042247349584 6
6. Paper ID: 748a2ab3-8b5f-4d0a-9e2d-af685089843a, PageRank Score: 0.0001056798464242466 1
7. Paper ID: e0f3a738-4ab2-40d1-ba44-506d81c1d230, PageRank Score: 9.731396921113041e-05
8. Paper ID: 8026f56a-a93e-4933-8ead-c9aa9e3f0498, PageRank Score: 9.394110306534417e-05
9. Paper ID: 7ccbdf09-a84e-4ad2-ab20-cb28b6c41155, PageRank Score: 9.327124792219694e-05
10. Paper ID: d3e00e7e-1c64-4d7a-b2b2-1ad98ba4c706, PageRank Score: 9.26653538193433e-05
```

۲.۲.۱ از هزار سمپل رندوم برای ساخت گراف استفاده کردیم. چگالی شبکه Co-authorship برحسب سال:



ده نویسنده تاثیرگذار:

Top 10 Influential Authors by Degree Centrality:

	Author	Degree	Betweenness	Closeness
2691	Evgeni M. Zdobnov	0.008991	0.0	0.008991
2675	Laurent Falquet	0.008991	0.0	0.008991
2688	Marco Pagni	0.008991	0.0	0.008991
2687	Tom Oinn	0.008991	0.0	0.008991
2686	Nicola Mulder	0.008991	0.0	0.008991
2685	Beate Marx	0.008991	0.0	0.008991
2684	Rodrigo Lopez	0.008991	0.0	0.008991
2683	Youla Karavidopoulou	0.008991	0.0	0.008991
2682	Alexander Kanapin	0.008991	0.0	0.008991
2681	Daniel Kahn	0.008991	0.0	0.008991

۵ کامیونیتی به طور مثال:

```
Example of Author Communities (Showing 5 authors from each community):
Community 0: ['Maria G. Koziri', 'Panos Papadopoulos', 'Nikos Tziritas', 'Antonios N. Dadaliaris', 'Thanasis Loukopoulos'] ...
Community 1: ['Luís Fernando Orleans', 'Geraldo Zimbrão'] ...
Community 2: ['Artur Zawadzki', 'Marek Gorgon'] ...
Community 3: ['Yadong Wang', 'Jiankang Wu', 'Ashraf A. Kassim'] ...
Community 4: ['Arber Murturi', 'Burak Kantarci', 'Sema Oktug'] ...
```

۳.۲.۱

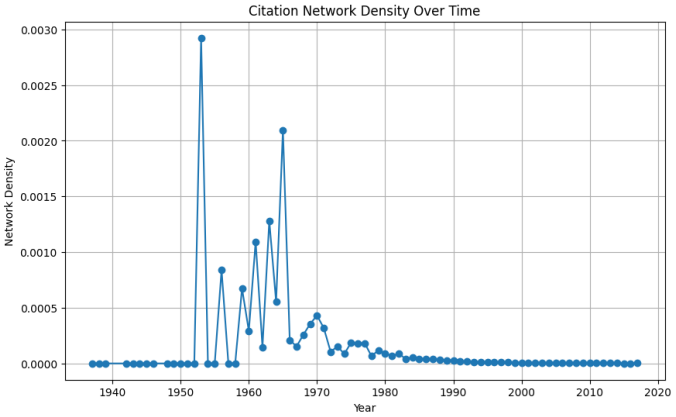
```
Top Interdisciplinary Clusters:
Community 1: 1070 venues → ['IEEE Computer Graphics and Applications', 'international conference in central europe on computer graphics and visualization', 'IE
Community 3: 987 venues → [nan, 'international conference on management of data', 'very large data bases', 'international conference on data engineering', 'Com
Community 0: 853 venues → ['international symposium on computers and communications', 'IEEE Communications Letters', 'IEEE Journal on Selected Areas in Communi
Community 2: 468 venues → ['IEEE Transactions on Information Theory', 'foundations of computer science', 'ACM Communications in Computer Algebra', 'ACM Sigsam
Community 4: 384 venues → ['programming language design and implementation', 'symposium on principles of programming languages', 'compiler construction', 'conf
```

```
Top Influential Venues (Degree Centrality):
nan: 0.8227
Communications of The ACM: 0.5078
Lecture Notes in Computer Science: 0.4786
IEEE Transactions on Pattern Analysis and Machine Intelligence: 0.438
IEEE Transactions on Information Theory: 0.4289
systems man and cybernetics: 0.4246
IEEE Transactions on Knowledge and Data Engineering: 0.4241
ACM Computing Surveys: 0.4103
neural information processing systems: 0.4097
IEEE Computer: 0.4018
```

```
Top Influential Venues (PageRank):
nan: 0.0076
IEEE Transactions on Information Theory: 0.0030
Communications of The ACM: 0.0029
Lecture Notes in Computer Science: 0.0028
IEEE Transactions on Pattern Analysis and Machine Intelligence: 0.0027
systems man and cybernetics: 0.0025
neural information processing systems: 0.0025
IEEE Transactions on Knowledge and Data Engineering: 0.0024
IEEE Computer: 0.0023
ACM Computing Surveys: 0.0023
```

```
2013: 27121 new venue connections
   Examples: [('computer software and applications conference', 'usenix security symposium'), ('International Journal of Network Security', 'international symp
2014: 27172 new venue connections
   Examples: [('Bulletin of The European Association for Theoretical Computer Science', 'principles of knowledge representation and reasoning'), ('Constraints
2015: 49880 new venue connections
   Examples: [('IEEE Wireless Communications', 'Journal of Computer Applications in Technology'), ('Computers & Graphics', 'international conference in central
2016: 96649 new venue connections
   Examples: [('ACM Transactions on Mathematical Software', 'IEEE Transactions on Image Processing'), ('computer software and applications conference', 'usenix
2017: 16645 new venue connections
   Examples: [('ACM Journal on Emerging Technologies in Computing Systems', 'high performance computing and communications'), ('IEEE Communications Magazine',
```

۴.۲.۱ چگالی شبکه سایتیشن برحسب سال:



ده مقاله برتر:

```
Top 10 Bursting Papers (Highest Citation Growth):
Paper ID: b944f77f-113b-4a02-ae5e-d4a124b8fd5b, Citations: 5841
Paper ID: c1b6b493-01ef-420f-be44-7bacfe34e846, Citations: 5057
Paper ID: 6a6b9aa6-683f-4c7c-b06e-9c3018d10fd3, Citations: 3288
Paper ID: dd83785a-dd19-41e3-9b25-ebabbd48d336, Citations: 3279
Paper ID: e2f7a74a-8430-4463-94ce-fe85dfd309f9, Citations: 3242
Paper ID: f6bd8b64-684d-429a-aab5-8ff3a2c23cd6, Citations: 3235
Paper ID: 50dd56db-151d-4d62-8576-65f0ef6f381b, Citations: 2281
Paper ID: 8026f56a-a93e-4933-8ead-c9aa9e3f0498, Citations: 2279
Paper ID: 748a2ab3-8b5f-4d0a-9e2d-af685089843a, Citations: 2259
Paper ID: ebfca554-7a3c-4597-954b-07336a2e3030, Citations: 2238
```

۱.۲ ابتدا روی هزار سمپل رندوم، سه متود Louvain، spectral و hierarchical را تست کرده و clustering coefficient را برای هر کدام محاسبه می‌کنیم. Hierarchical بهترین نتیجه را می‌دهد:

```
Graph created with 3004 nodes and 4866 edges.
Louvain Method: Communities: {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 1
/usr/local/lib/python3.11/dist-packages/sklearn/manifold/_spectral_embedd
  warnings.warn(
Spectral Clustering: Communities: {0, 1, 2, 3, 4}
<ipython-input-5-93e79364cae3>:69: ClusterWarning: The symmetric non-nega
  Z = sch.linkage(distance_matrix, method='ward')
Hierarchical Clustering: Communities: {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,
Louvain Method Clustering Coefficients: 0.6702794077223301
Spectral Clustering Coefficients: 0.5785880424917773
Hierarchical Clustering Coefficients: 0.9769357495881383
Best clustering method: Hierarchical with coefficient 0.9769357495881383
```

سپس این متود را روی کل داده‌ها ترین می‌کنیم. به علت تعداد زیاد داده‌ها رم و زمان زیادی مصرف می‌شود پس یک سمپل ۵۰۰۰ تایی به عنوان کل در نظر میگیریم:

```
Number of communities found using Hierarchical Clustering: 3598
Community 1: ['Ewan Birney', 'Henning Hermjakob']... (2 members)
Community 2: ['Gautier Koscielny', 'Peter An', 'Denise R. Carvalho-Silva', 'Jenni
Community 3: ['Dale Greenley', 'J. Bauman', 'D. Chang', 'Dennis Chen', 'R. Elteja
Community 4: ['Rolf Apweiler', 'Terri K. Attwood', 'Amos Marc Bairoch', 'Alex Bat
Community 5: ['Philipp Bucher']... (1 members)
Community 6: ['Salman Habib', 'R. Roser', 'T. LeCompte', 'Zach Marshall', 'A. W.
Community 7: ['Markus Grebenstein', 'Alin Albu-Schäffer', 'Thomas Bahls', 'Maxime
Community 8: ['Aashish Manglik', 'Henry Lin', 'Dipendra K. Aryal', 'John D. McCor
Community 9: ['Gianfranco Fornaro', 'Stefano Tebaldini', 'Stefano Perna', "Mauro
Community 10: ['Jaymin Upadhyay', 'Gautam Pendse', 'Julie W. Anderson', 'Adam J.
Community 11: ['Cheryl H. Porter', 'Chris Villalobos', 'Dean P. Holzworth', 'Roge
Community 12: ['John B. Carter', 'Wilson C. Hsieh', 'Lixin Zhang', 'Erik Brunvand
Community 13: ['Mark R. Swanson']... (1 members)
Community 14: ['Lambert Schaelicke']... (1 members)
```