00 - build_collaboration_df.ipynb

Retrived the dataset containing the **cumulative numer of collaboration** for computer scienze authors in French between **1990 and 2018**.

	ID	1990	1991	1992	1993	1994	1995	1996	1997	1998	...	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
0	8958327900	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0
1	6508297663	0	0	0	0	0	0	0	0	0	...	4	7	7	8	8	8	8	8	8	8
2	7004267341	0	0	0	0	0	0	0	0	0	...	10	10	10	16	16	16	16	16	16	16
3	8642393600	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	7	7	7	7
4	55873955900	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	8	8	8	8
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
232833	6507630481	0	0	0	0	0	0	0	0	0	...	18	18	18	18	18	29	29	29	29	29
232834	24577815500	0	0	0	0	0	0	0	0	0	...	4	4	4	4	6	13	16	16	16	70
232835	57195243976	0	0	0	0	0	0	0	0	0	...	0	3	3	3	3	3	3	3	8	8
232836	35328962100	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	2	2	2	2	3
232837	7403521415	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	29	29	29

232838 rows × 30 columns

The relative csv is located at `myDATA/00-collaboration_df.csv`.

02 - build_publication_df.ipynb

Retrived the dataset containing the **numer of publications** for computer scienze authors in French between **1990 and 2018**.

	ID	1990	1991	1992	1993	1994	1995	1996	1997	1998	...	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
0	7003355588	2	2	2	1	4	0	5	5	0	...	7	4	4	15	11	7	11	9	8	6
1	56522848500	3	0	1	0	2	0	6	1	3	...	3	5	6	1	0	0	1	1	1	4
2	7004165433	5	1	1	2	10	5	6	2	6	...	4	3	11	7	6	10	6	3	3	4
3	6603870889	1	0	2	0	1	2	6	4	2	...	8	10	7	20	16	12	9	10	15	16
4	7005944861	10	10	3	7	8	8	4	15	9	...	9	8	12	10	20	19	17	12	7	5
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
232833	57200496797	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	2
232834	15137130100	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	1
232835	57196721826	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	1
232836	57196401698	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	1
232837	57195980869	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	1

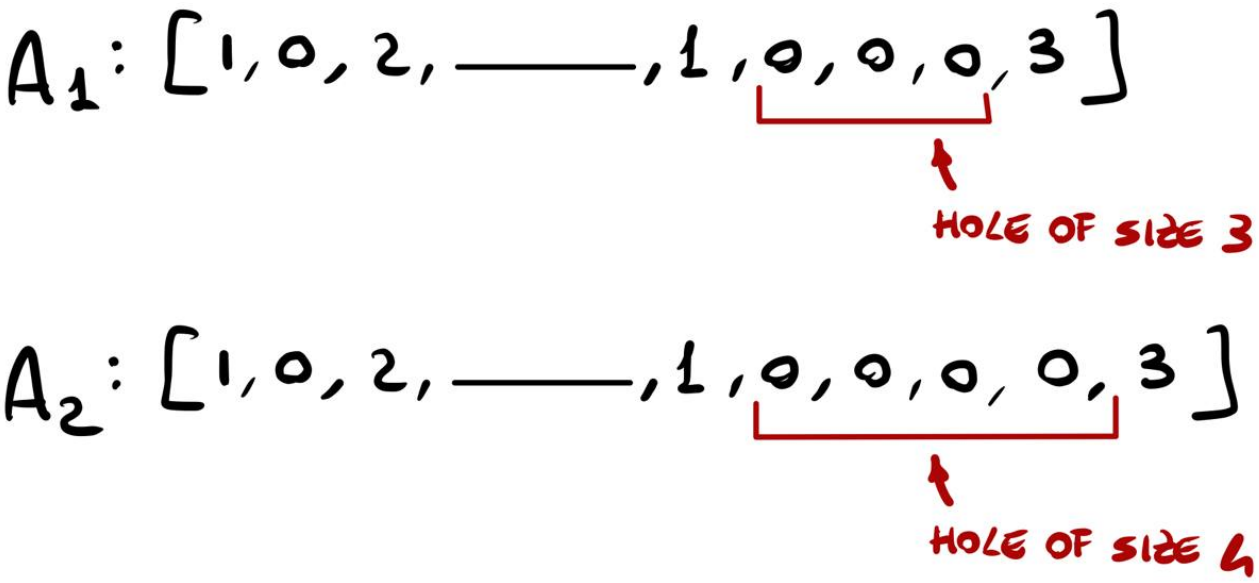
232838 rows × 30 columns

The relative csv is located at `02-publication_df.csv`

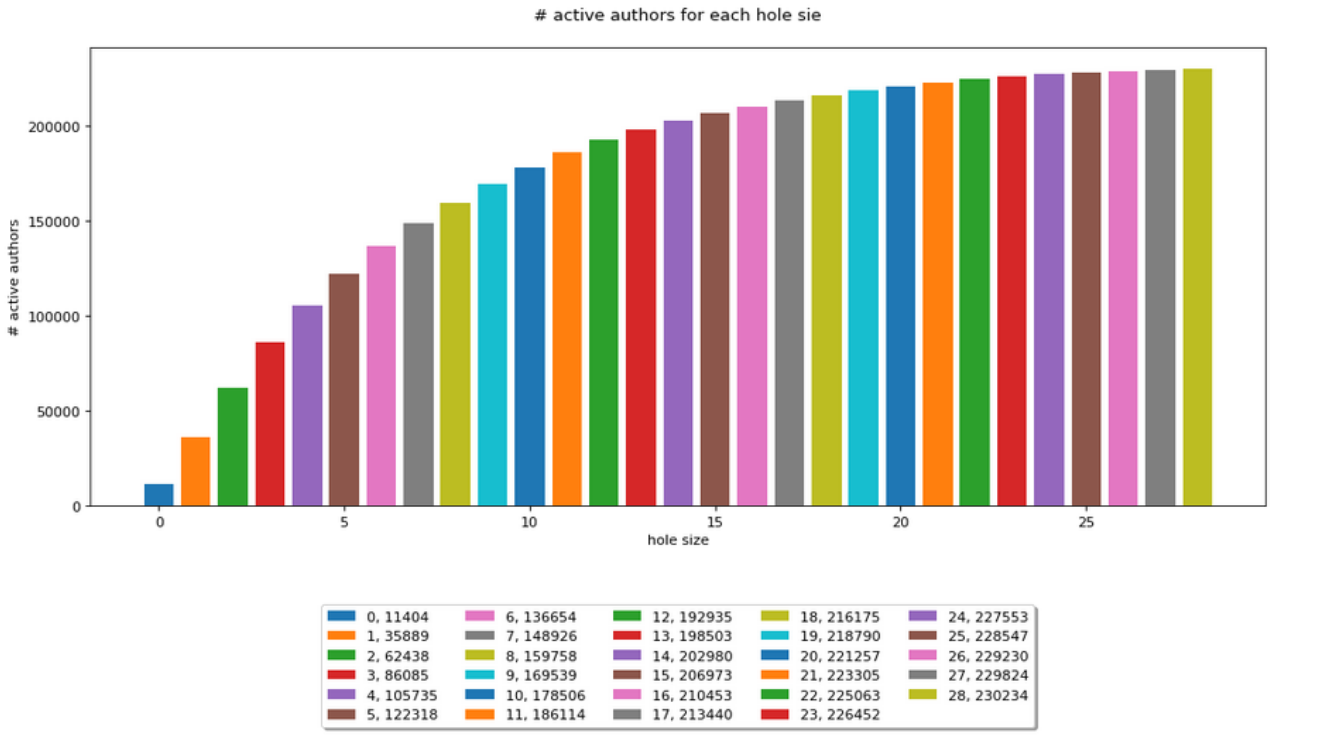
05 - filtering_active_authors.ipynb

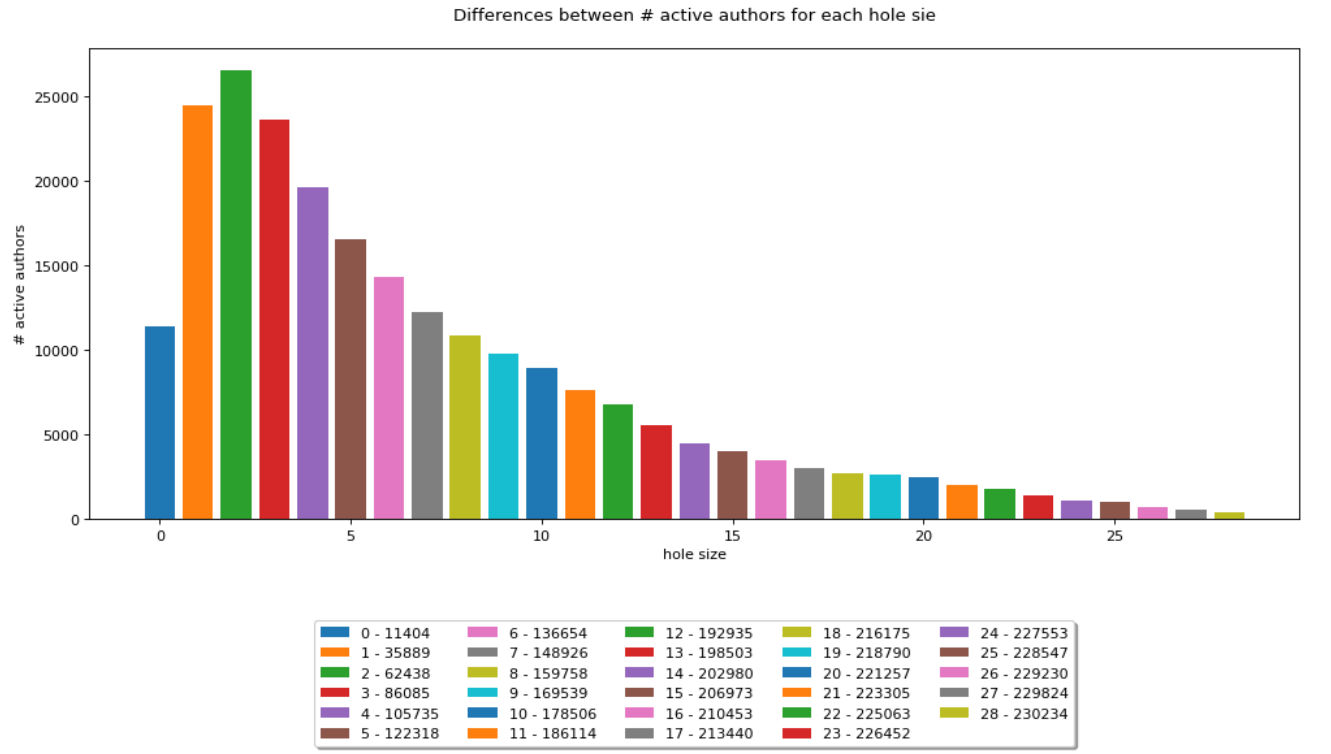
In the associated notebook are filtered out all inactive authors, so a dataset is built for each possible definition of **Inactivity**.

An author is inactive if it has a hole in publications **greater** than a given value.
An author has a hole in publication if he haven't published for **n consecutive years**.
For example, given an **hole size = 3**, the author A1 is active but A2 is not.



The number of authors kept for each hole size is showed in the following chart, and also their differences in the number of authors:

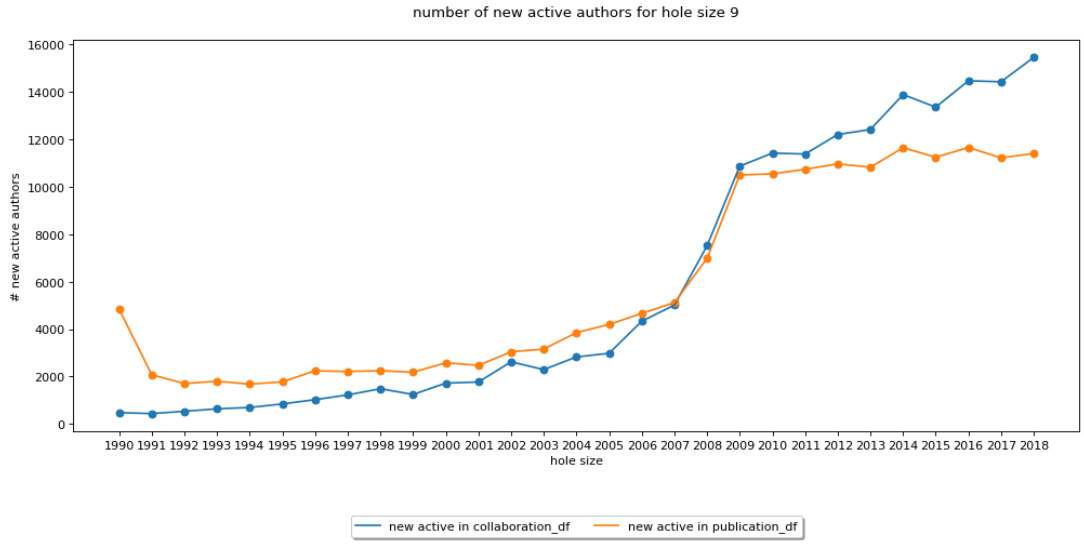




The **output of the code are 28 csv** located in the directory `/myata/05-filtered_by_hole_size/`

The distribution of new collaborators and new publicators for each year and hole size is located at `myDATA/05-filtered_by_hole_size`, it's shape is like:

```
============================================================ HOLE SIZE 9 ============================================================
```




```
collaboration_df {'1990': '475', '1991': '435', '1992': '531', '1993': '636', '1994': '692', '1995': '843', '1996': '1023', '1997': '1223', '1998': '1483', '1
999': '1242', '2000': '1720', '2001': '1767', '2002': '2617', '2003': '2290', '2004': '2824', '2005': '2978', '2006': '4331', '2007': '5010', '2008': '7514',
'2009': '10871', '2010': '11422', '2011': '11382', '2012': '12206', '2013': '12417', '2014': '13888', '2015': '13360', '2016': '14470', '2017': '14430', '2018
': '15459'}

publication_df {'1990': '4844', '1991': '2072', '1992': '1702', '1993': '1799', '1994': '1678', '1995': '1774', '1996': '2242', '1997': '2211', '1998': '2246
', '1999': '2179', '2000': '2577', '2001': '2467', '2002': '3040', '2003': '3157', '2004': '3849', '2005': '4195', '2006': '4660', '2007': '5116', '2008': '69
82', '2009': '10500', '2010': '10543', '2011': '10737', '2012': '10967', '2013': '10826', '2014': '11649', '2015': '11246', '2016': '11657', '2017': '11220',
'2018': '11404'}
```

08 - starting_pubblication_year.ipynb / 09 - ending_pubblication_year.ipynb

There are built two version of the **collabaration dataset** containing respectively a column with the **starting publication year** and the **ending publication year** for each author.

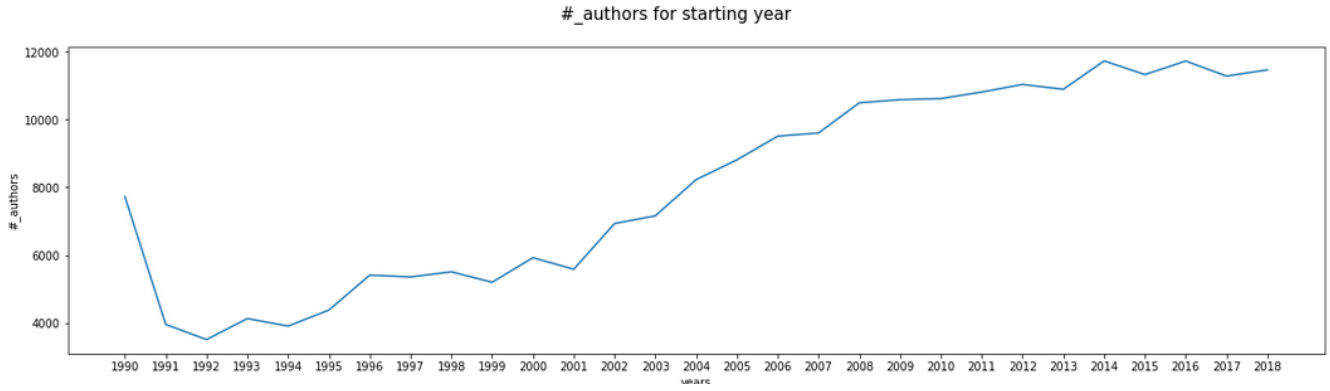
starting year

Located at → `myDATA/00-collaboration_df_with_starting_years.csv`.

	ID	1990	1991	1992	1993	1994	1995	1996	1997	1998	...	2010	2011	2012	2013	2014	2015	2016	2017	2018	start_year
0	8958327900	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	2000
1	6508297663	0	0	0	0	0	0	0	0	0	...	7	7	8	8	8	8	8	8	8	1995
2	7004267341	0	0	0	0	0	0	0	0	0	...	10	10	16	16	16	16	16	16	16	2008
3	8642393600	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	7	7	7	7	2015
4	55873955900	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	8	8	8	8	2014
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
232833	6507630481	0	0	0	0	0	0	0	0	0	...	18	18	18	18	29	29	29	29	29	2002
232834	24577815500	0	0	0	0	0	0	0	0	0	...	4	4	4	6	13	16	16	16	70	2003
232835	57195243976	0	0	0	0	0	0	0	0	0	...	3	3	3	3	3	3	3	8	8	2017
232836	35328962100	0	0	0	0	0	0	0	0	0	...	0	0	0	0	2	2	2	2	3	2010
232837	7403521415	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	29	29	29	2016

232838 rows × 31 columns

distribution of the number of authors by starting year



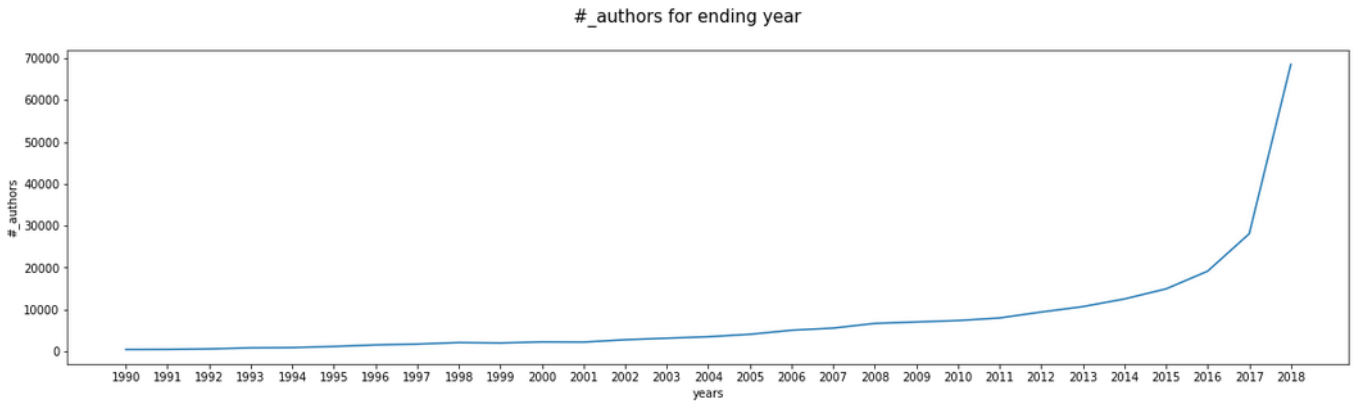
ending year

Located at → `myDATA/00-collaboration_df_with_ending_years.csv`.

	ID	1990	1991	1992	1993	1994	1995	1996	1997	1998	...	2010	2011	2012	2013	2014	2015	2016	2017	2018	ending_year
0	8958327900	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	2000
1	6508297663	0	0	0	0	0	0	0	0	0	...	7	7	8	8	8	8	8	8	8	2016
2	7004267341	0	0	0	0	0	0	0	0	0	...	10	10	16	16	16	16	16	16	16	2015
3	8642393600	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	7	7	7	7	2018
4	55873955900	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	8	8	8	8	2015
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
232833	6507630481	0	0	0	0	0	0	0	0	0	...	18	18	18	18	29	29	29	29	29	2015
232834	24577815500	0	0	0	0	0	0	0	0	0	...	4	4	4	6	13	16	16	16	70	2018
232835	57195243976	0	0	0	0	0	0	0	0	0	...	3	3	3	3	3	3	3	8	8	2017
232836	35328962100	0	0	0	0	0	0	0	0	0	...	0	0	0	0	2	2	2	2	3	2018
232837	7403521415	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	29	29	29	2017

232838 rows × 31 columns

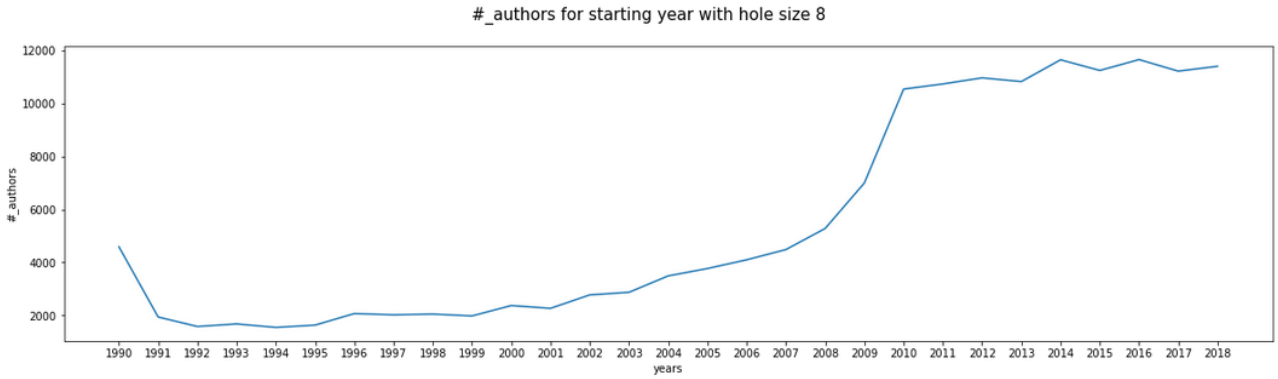
distribution of the number of authors by ending year



10 - splitting_collaborations.ipynb

Each hole lenght based dataset is **splitted in 28 subsets based on the starting year** of each author.

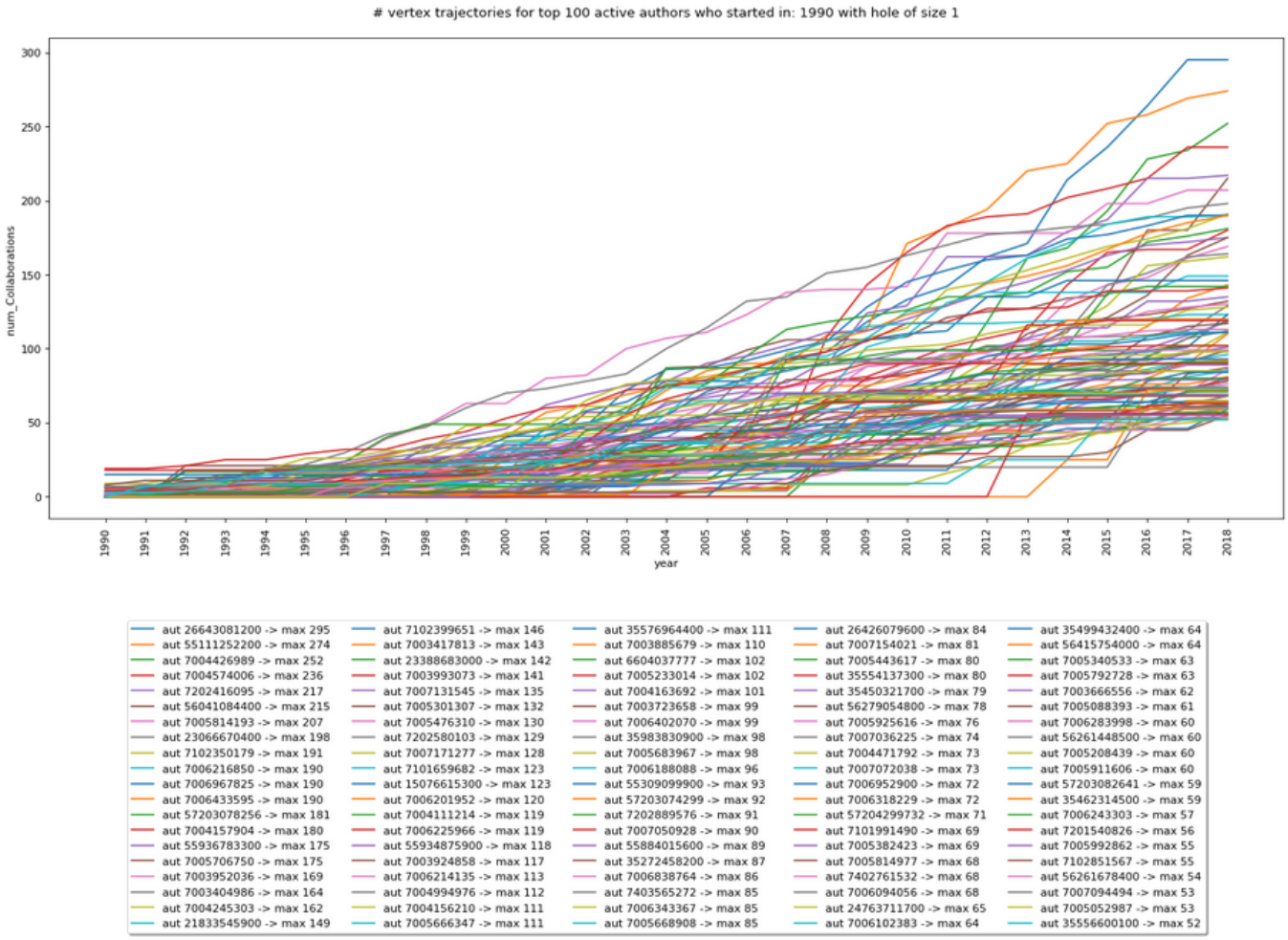
- They are located at `myDATA/10-splitted_by_year/`
- Each hole size based dataset has an associate directory at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/`
- The set of datasets associated with an hole size has a distribution chart showing the number of authors for each starting year, and it's located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/distribution_chart.png`.
  It's shape is the following:



15 - plotting_splitted_data_by_year.ipynb

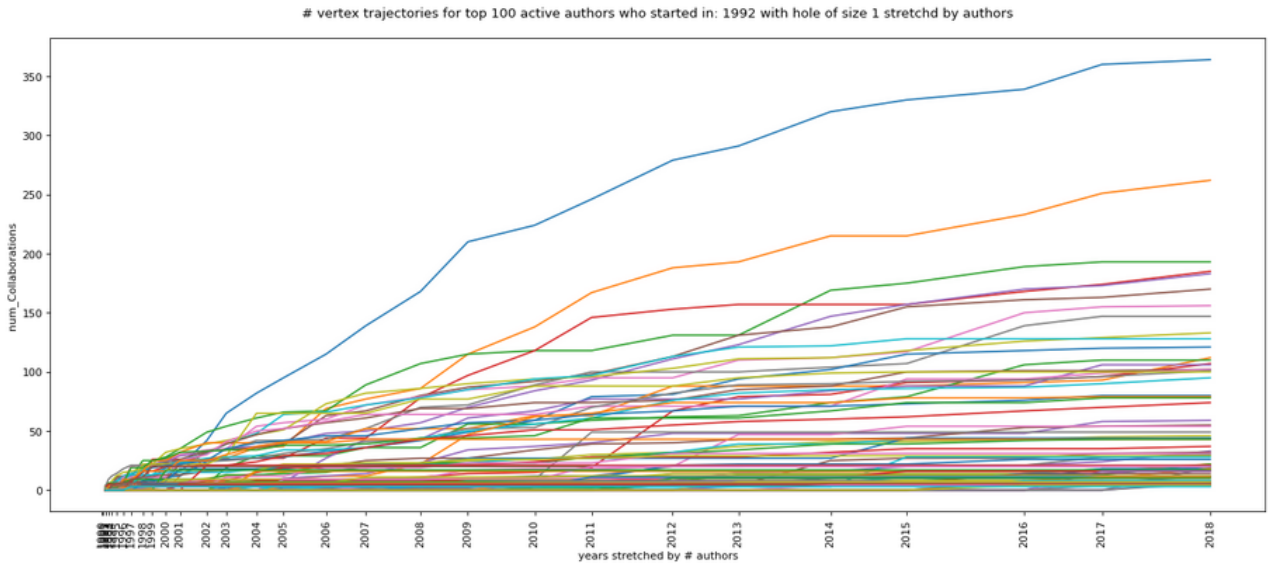
A chart containing the number of collaborations by year for each dataset built in the above described notebook is plotted here. Each one contains only the top 100 collaborative authors.

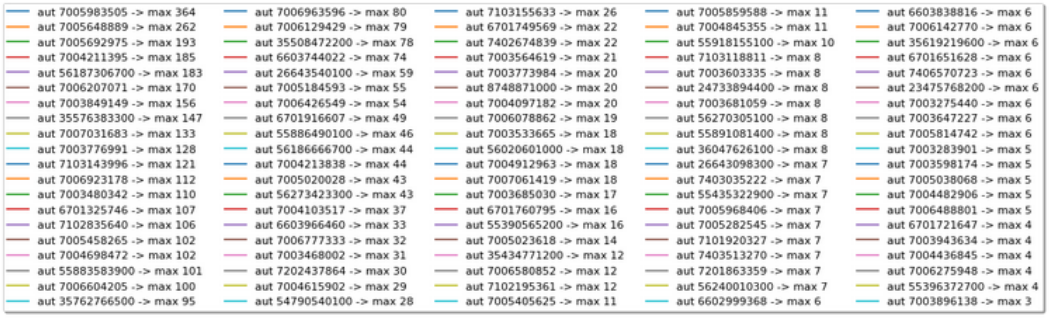
Each of them is located in the directory `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_plt/` and they looks as follow:



16 - plotting_splitted_data_by_event.ipynb

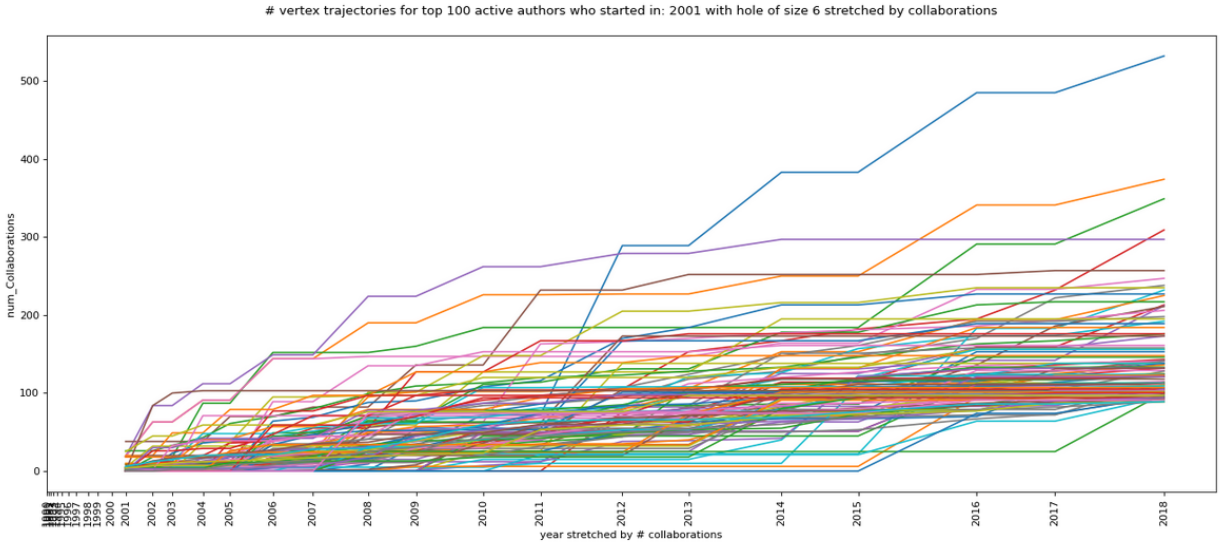
- Firstly the same chart of the previous notebook is stretched by using an **occurence of a new author as an event** instead of the years.





- located at `myDATA/10-splitted_by_year//<HOLE_SIZE>_hole_size_splitted/trajectories_plt_by_events`

- Then the same chart of the previous notebook is stretched by using an **occurence of a new collaboration as an event** instead of the years.

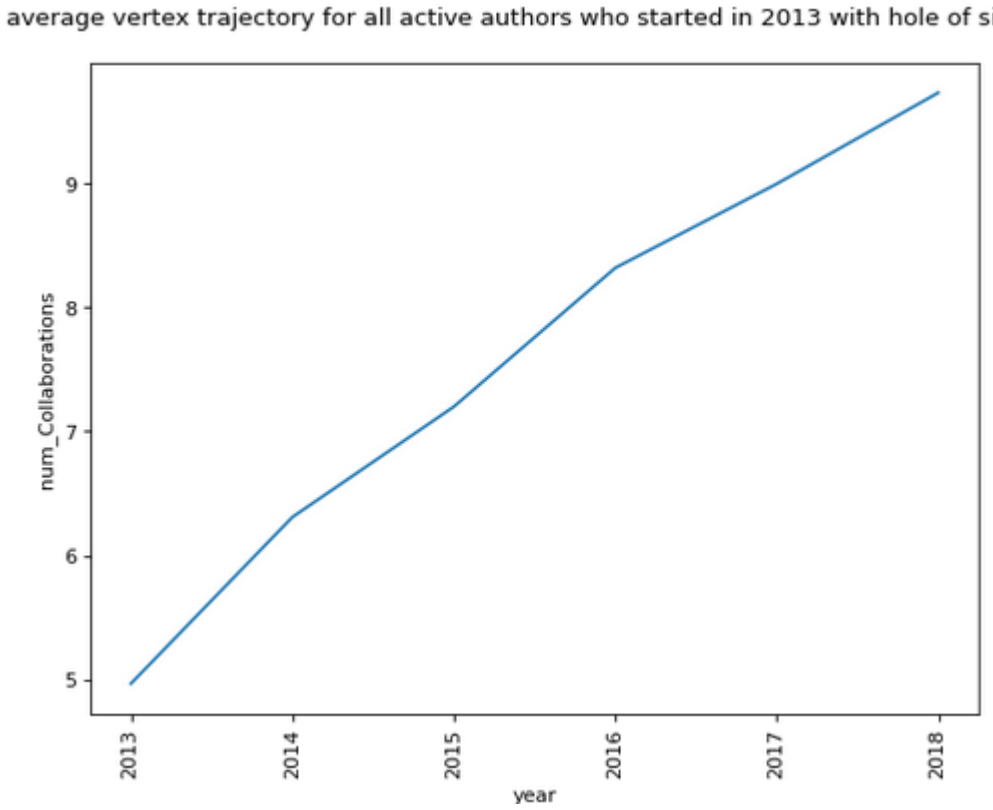


- located at `myDATA/10-splitted_by_year//<HOLE_SIZE>_hole_size_splitted/trajectories_plt_by_events`

20 - plotting_avg.ipynb

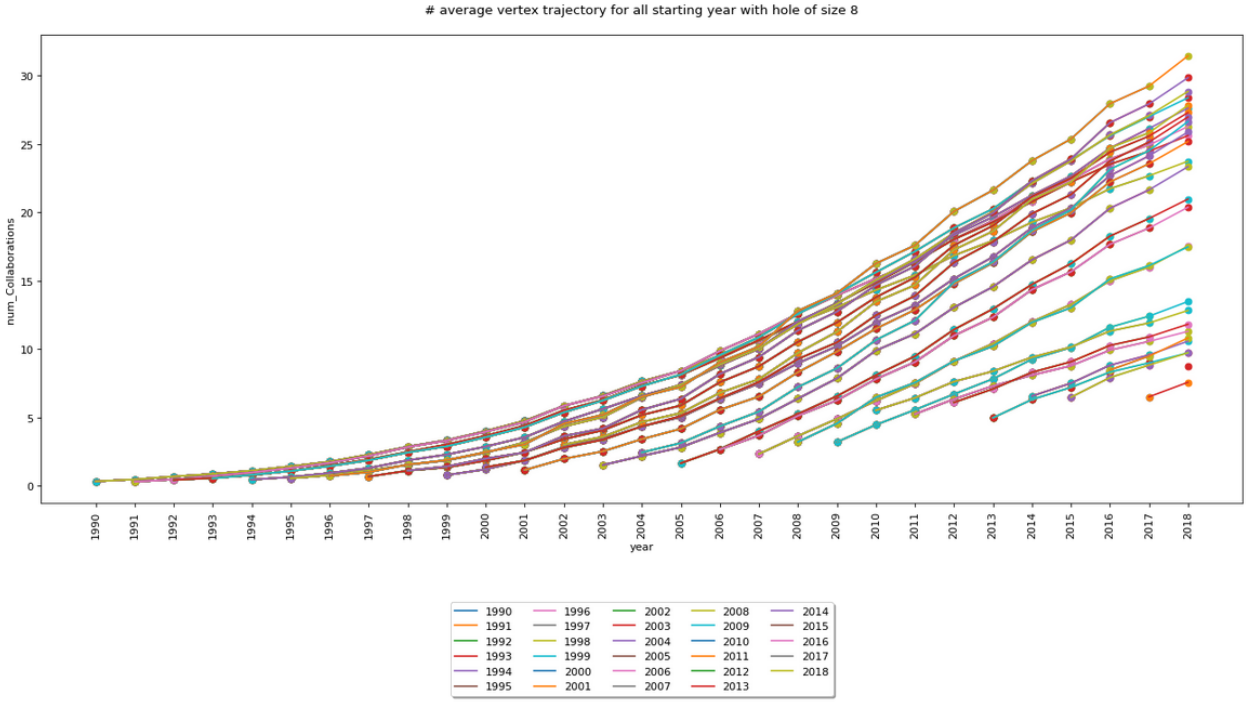
Same as the previous notebbok but, instead of the top 100 collaborative authors, here is plotted the average number of publications for each year.

Each of them is located int the directory `trajectories_avg_plt` and look as follow:



21 - plotting_avg_by_event.ipynb

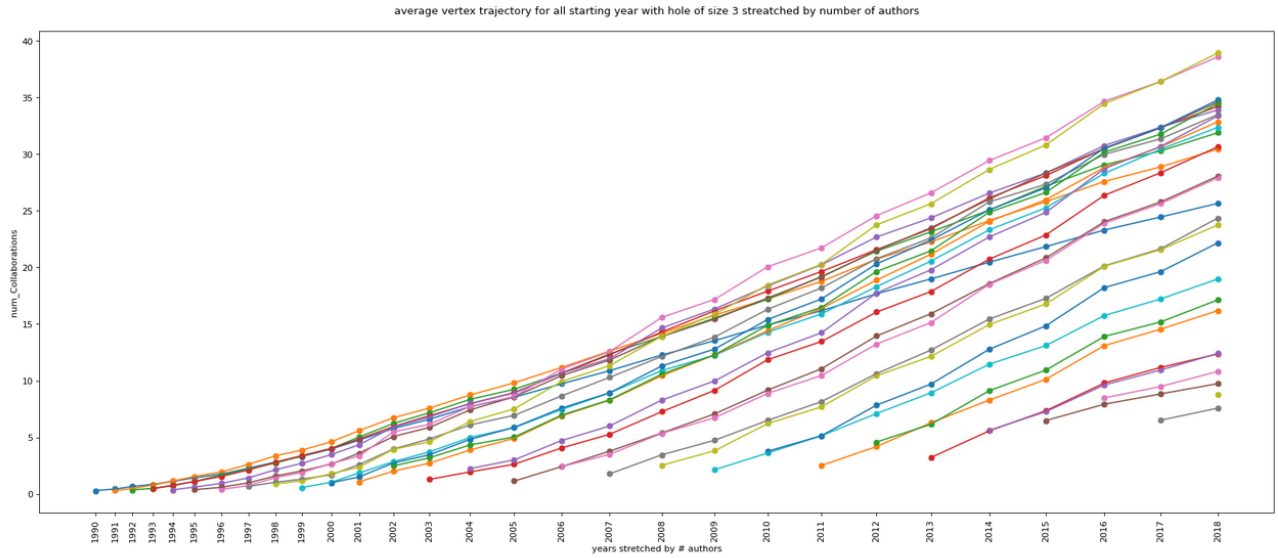
- Firstly are plotted the same averages of the previous notebook but all years associated with the same hole size, are collected in the same chart:



- They are located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/averages_by_year.png`

new author as event

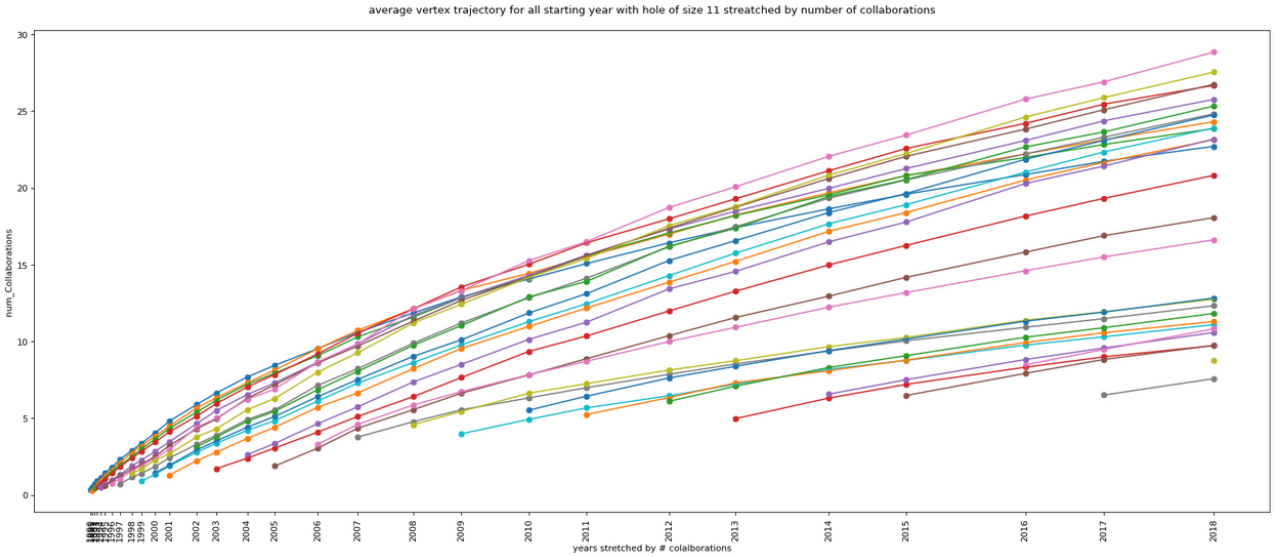
- Then the same chart is stretched by using an **occurence of a new author as an event** instead of the years.



- They are located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/averages_by_num_authors.png`

new collaboration as event

- lastly the same chart is stretched by using an **occurence of a new collaboration as an event** instead of the years.

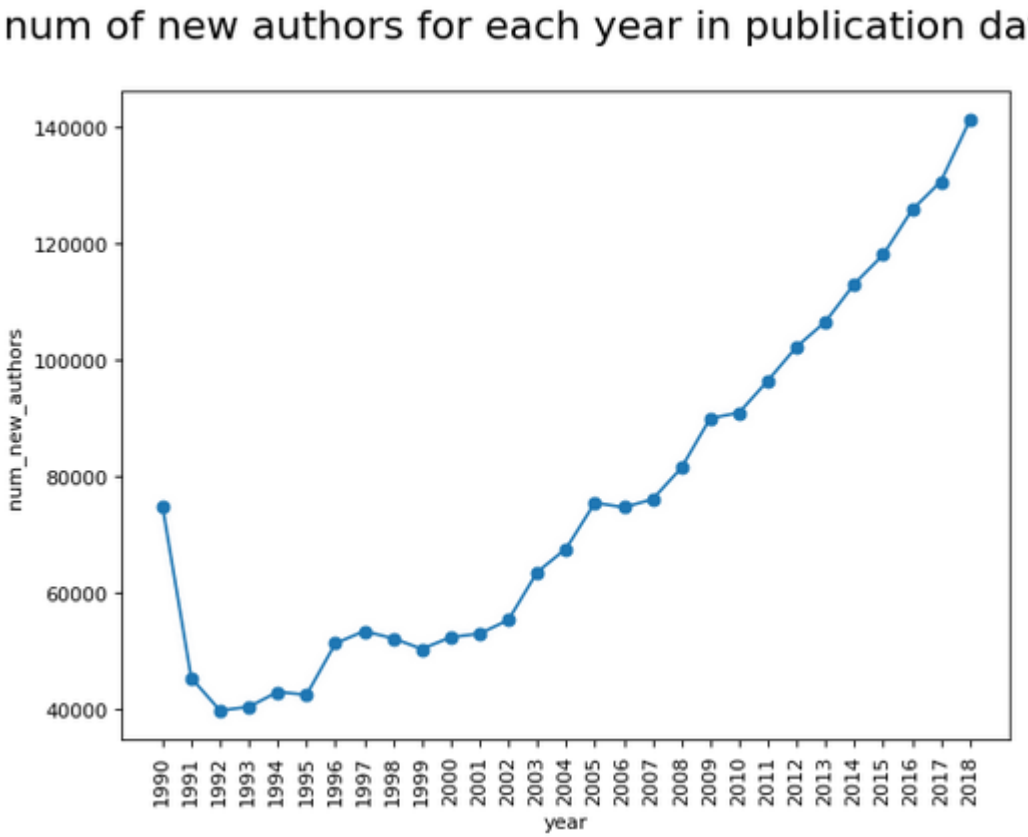


  - They are located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/averages_by_num_collaborations.png`

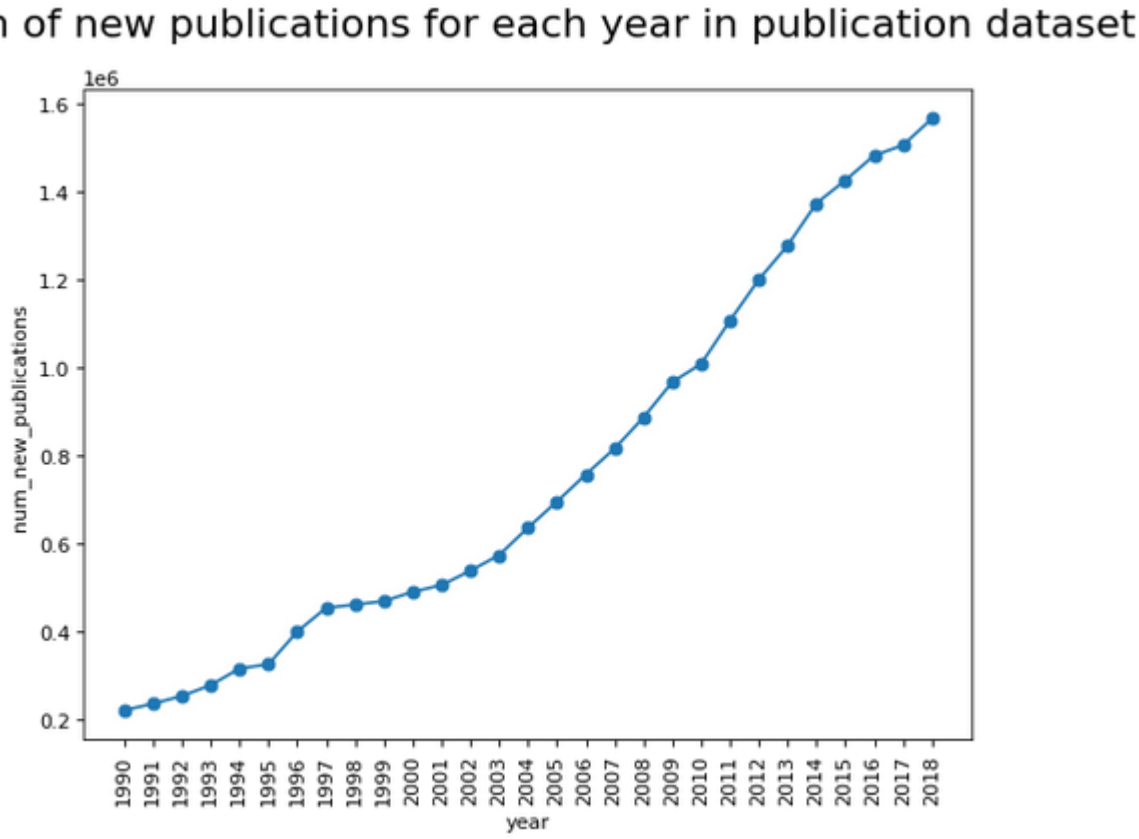
25 - plotting_functions._of_pubblications_df.ipynb

Here are plotted:

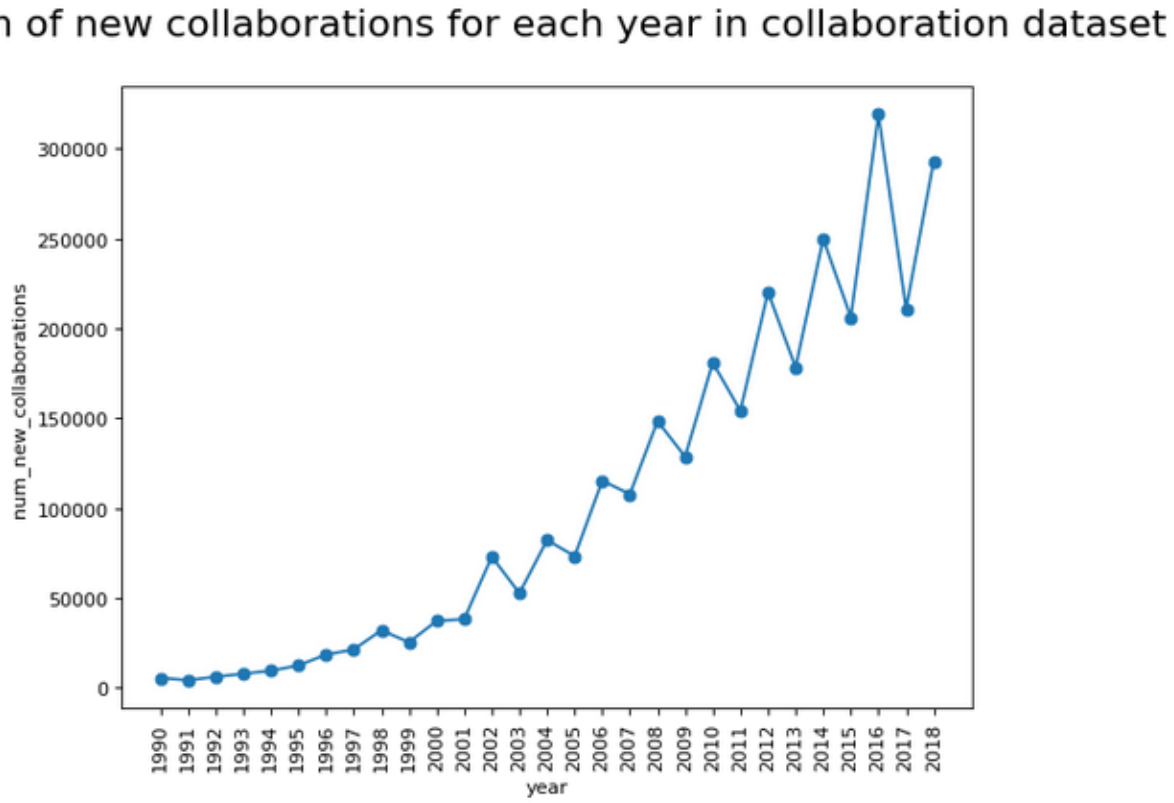
- The **number of new authors** by year in the publication dataset



- The **number of new publications** by year in the publication dataset



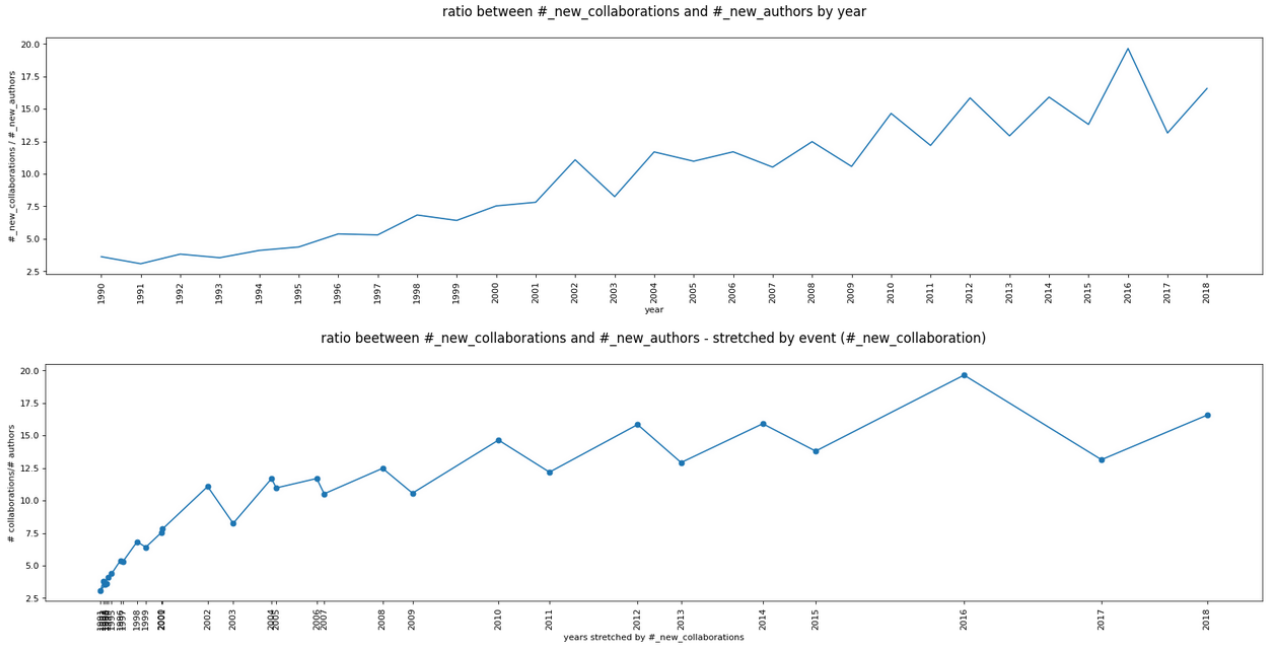
- The **number of new collaborations** by year in the collaboration dataset



35 - Ratios.ipynb

Here, both by year and using the occurence of a new collaboration as event, are plotted:

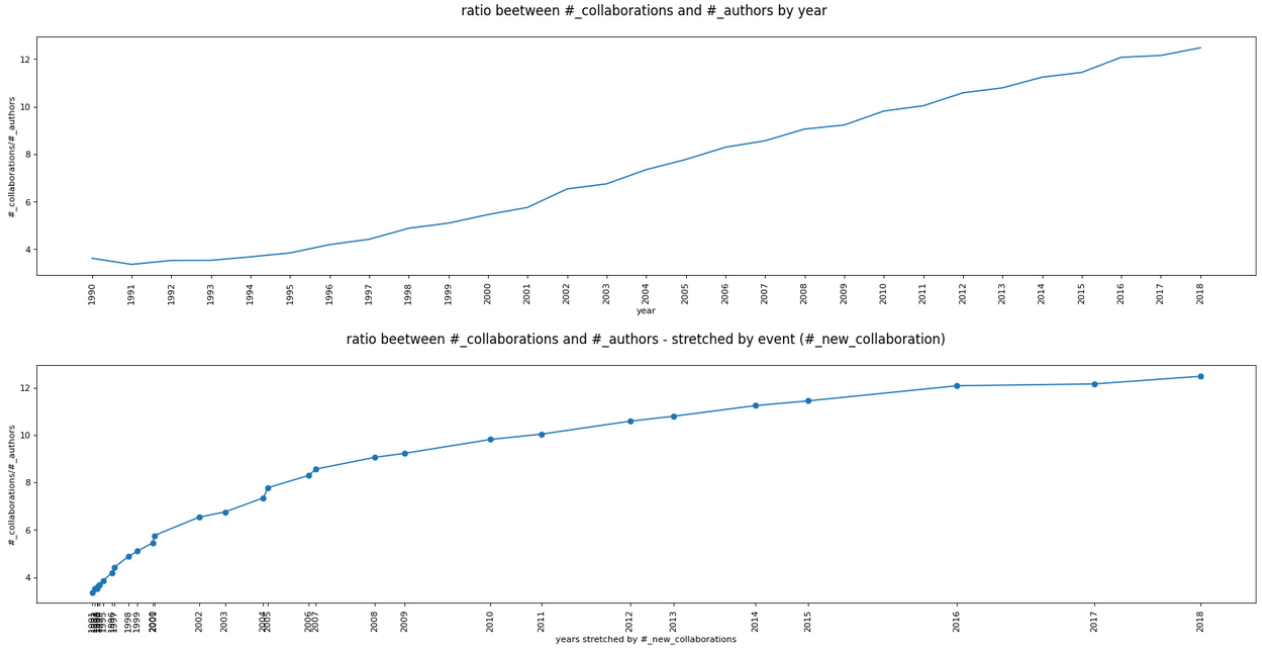
- The **Ratio** between the number of **new collaboration** and **new authors**.



  - located at `myDATA/ratio_beetween_#_newCollaborations_and_#_newAuthors_by_newCollabor`

`ations.png` and `myDATA/ratio_beetween_#_newCollaborations_and_#_newAuthors_by_year.png`

- The **Ratio** between **total** number of **collaboration** and **authors**.

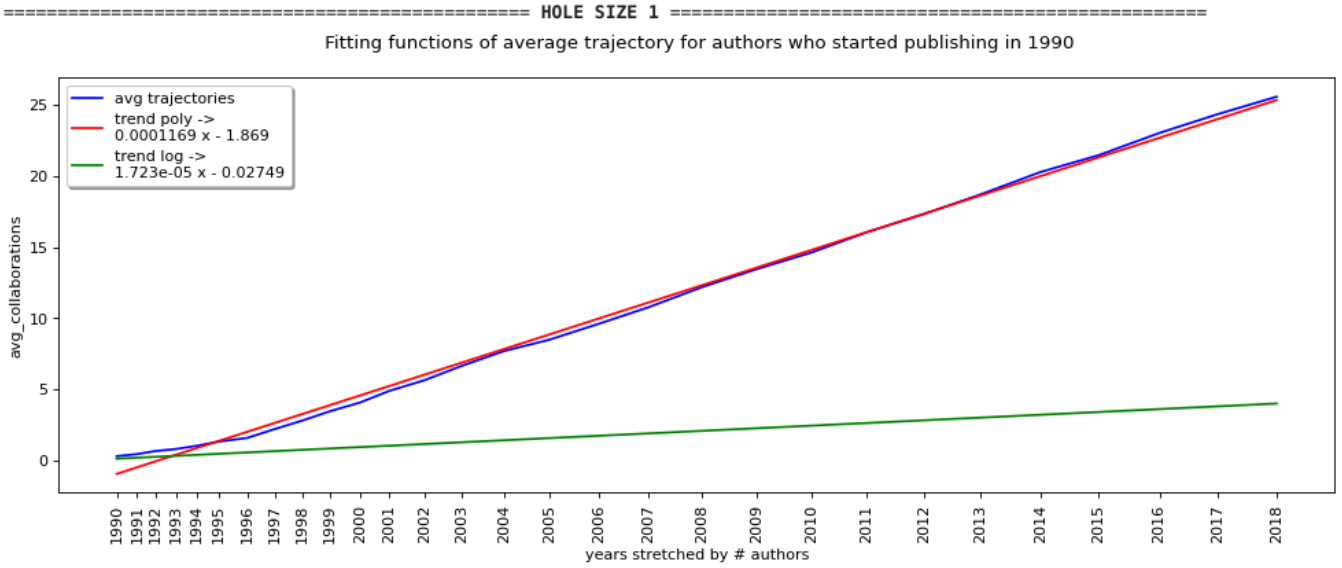


  - located at `myDATA/ratio_beetween_#_collaborations_and_#_authors_by_newCollaborations.png` and `myDATA/ratio_beetween_#_collaborations_and_#authors_by_year.png`

40 - polynomial_fitting_avg_trajectories

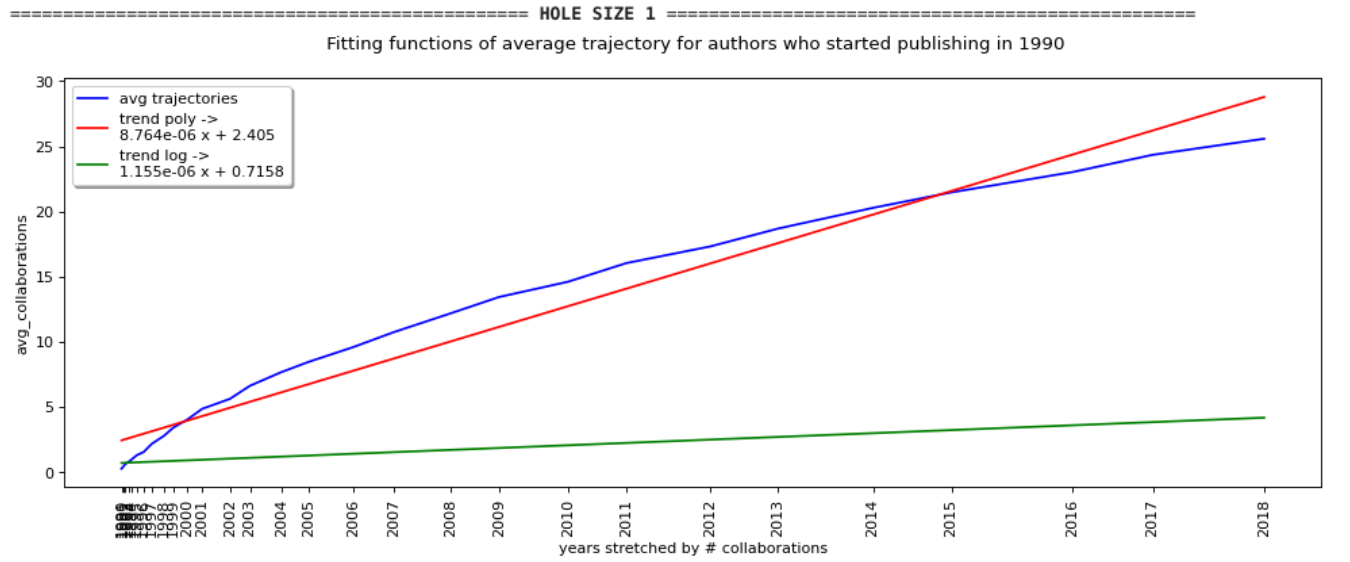
Polynomial fitting of all average trajectories stretched by new authors and new collaborations.

stretched by new authors



- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/<YEAR>_holeSize_<HOLESIZE>by_num_authors_polynomial_fitting.png`

stretched by new collaboration



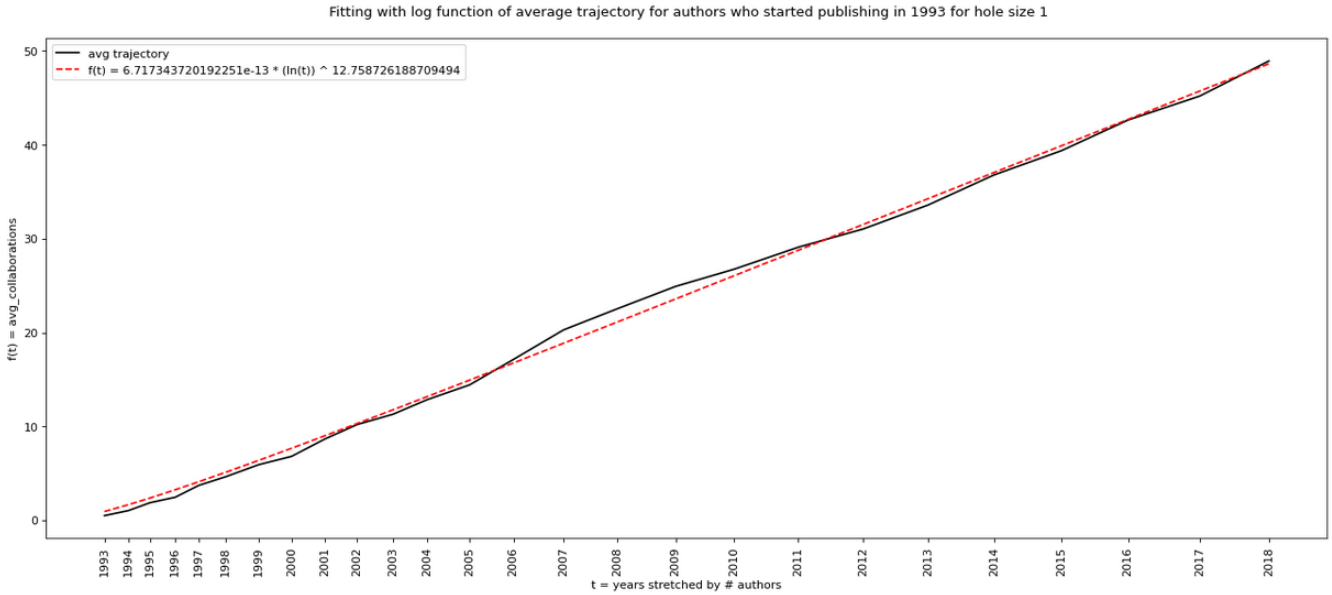
- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/<YEAR>_holeSize_<HOLESIZE>by_num_collaborations_polynomial_fitting.png`

42 - logaritmic_fitting_avg_trajectories

Logarithmic fitting of all average trajectories stretched by new authors and new collaborations.

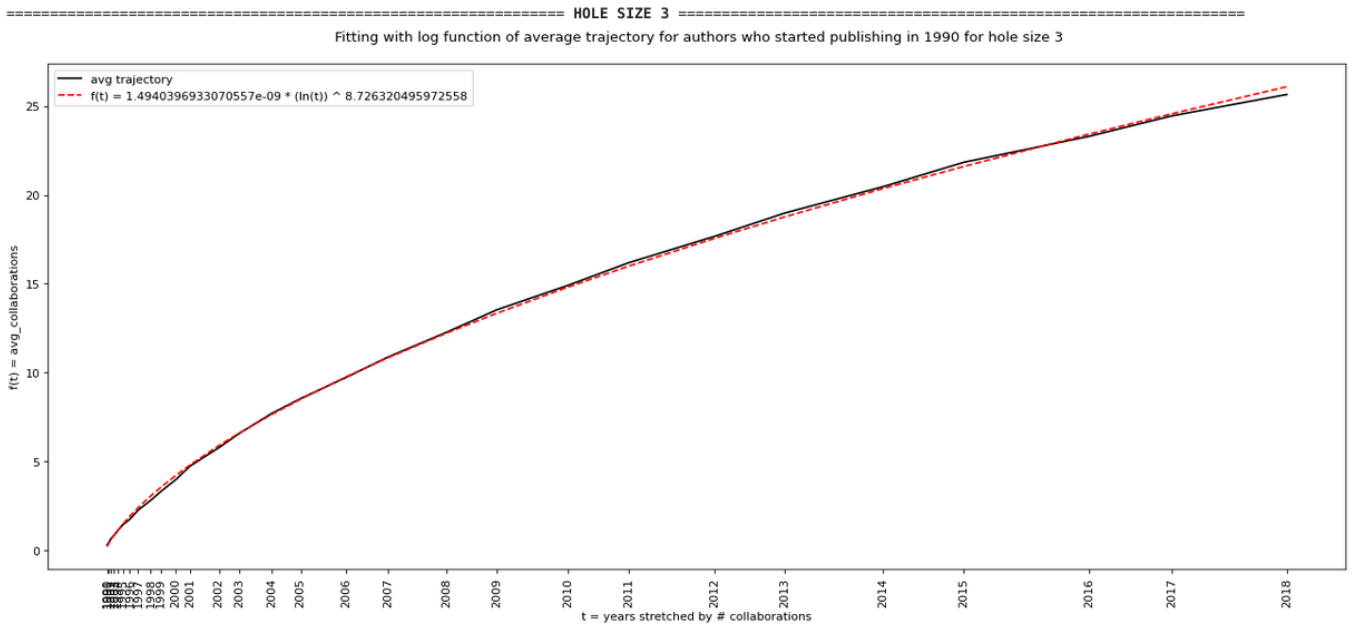
$$f(t) = \alpha * ln(t)^{\gamma}$$

stretched by new authors



- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/<YEAR>_holeSize_1by_num_authors_log_fitting.png`

stretched by new collaboration



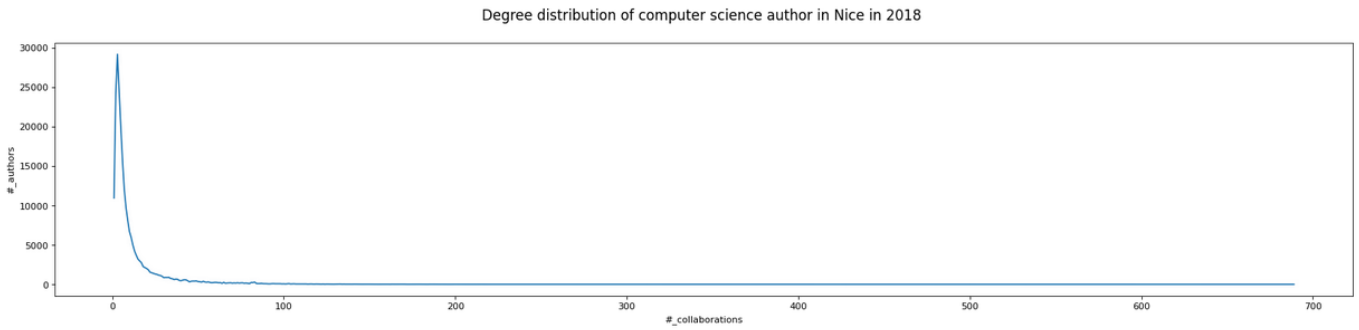
- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/<YEAR>_holeSize_1by_num_collaborations_log_fitting.png`

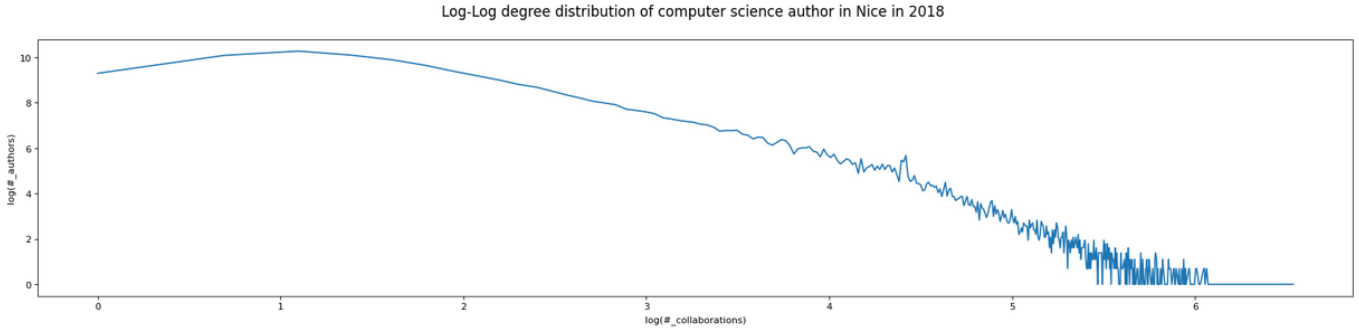
45-degree_distribution.ipynb

Plotted the degree distribution and it's log-log form both for the whole collaboration dataset and for each subset defined by the hole size

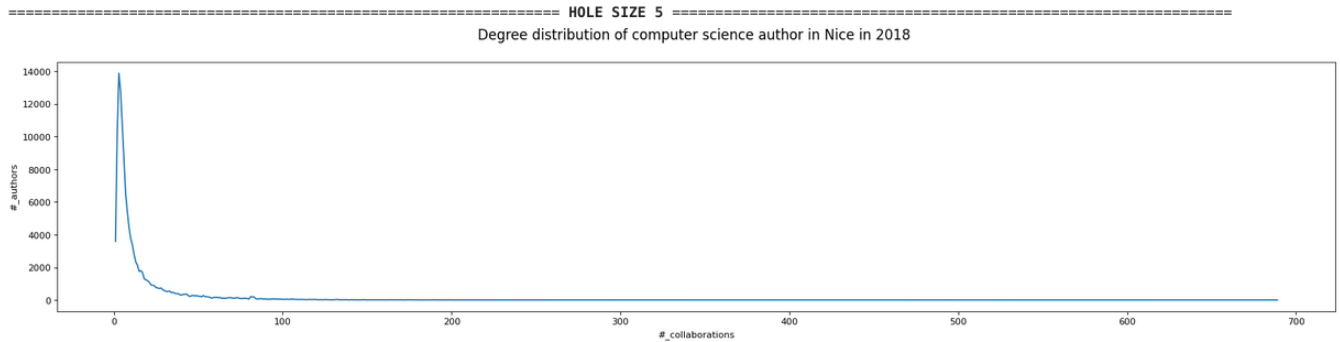
All results are located at `myDATA/40-degree_distribution/`

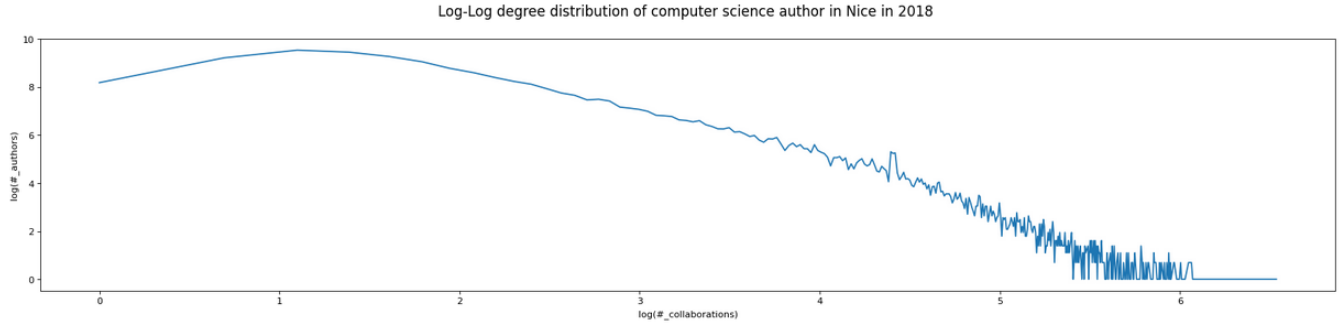
whole data





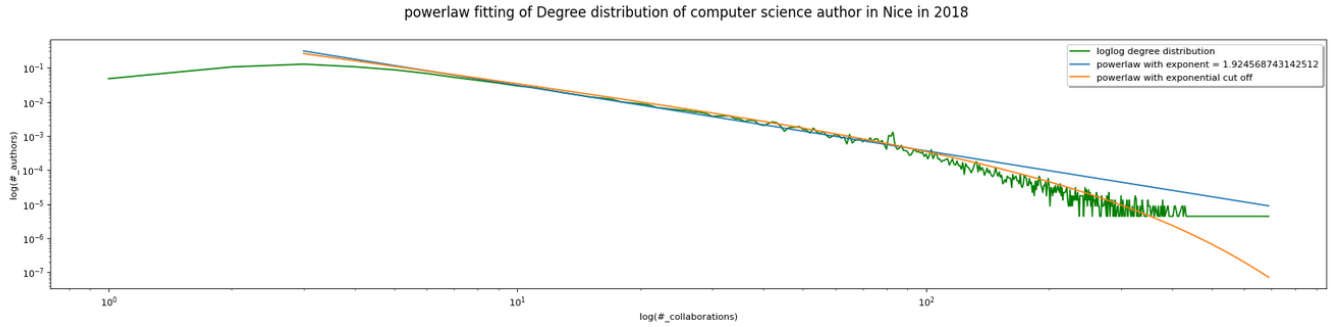
for hole size





46-fitting_degree_distribution.ipynb

Tried to fit the **whole degree distribution** with **powerlaw** lib

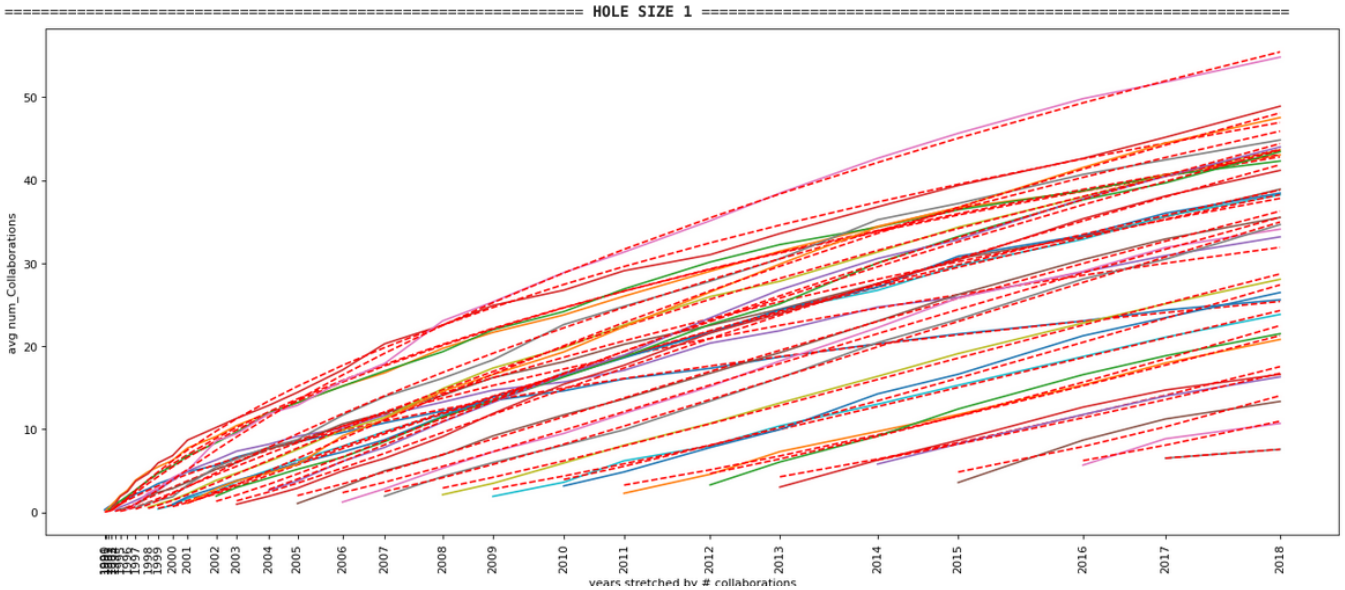


50-generalized_alpha_sigma_log_fitting_for_avg_trajectories

The fitting function used is the following:

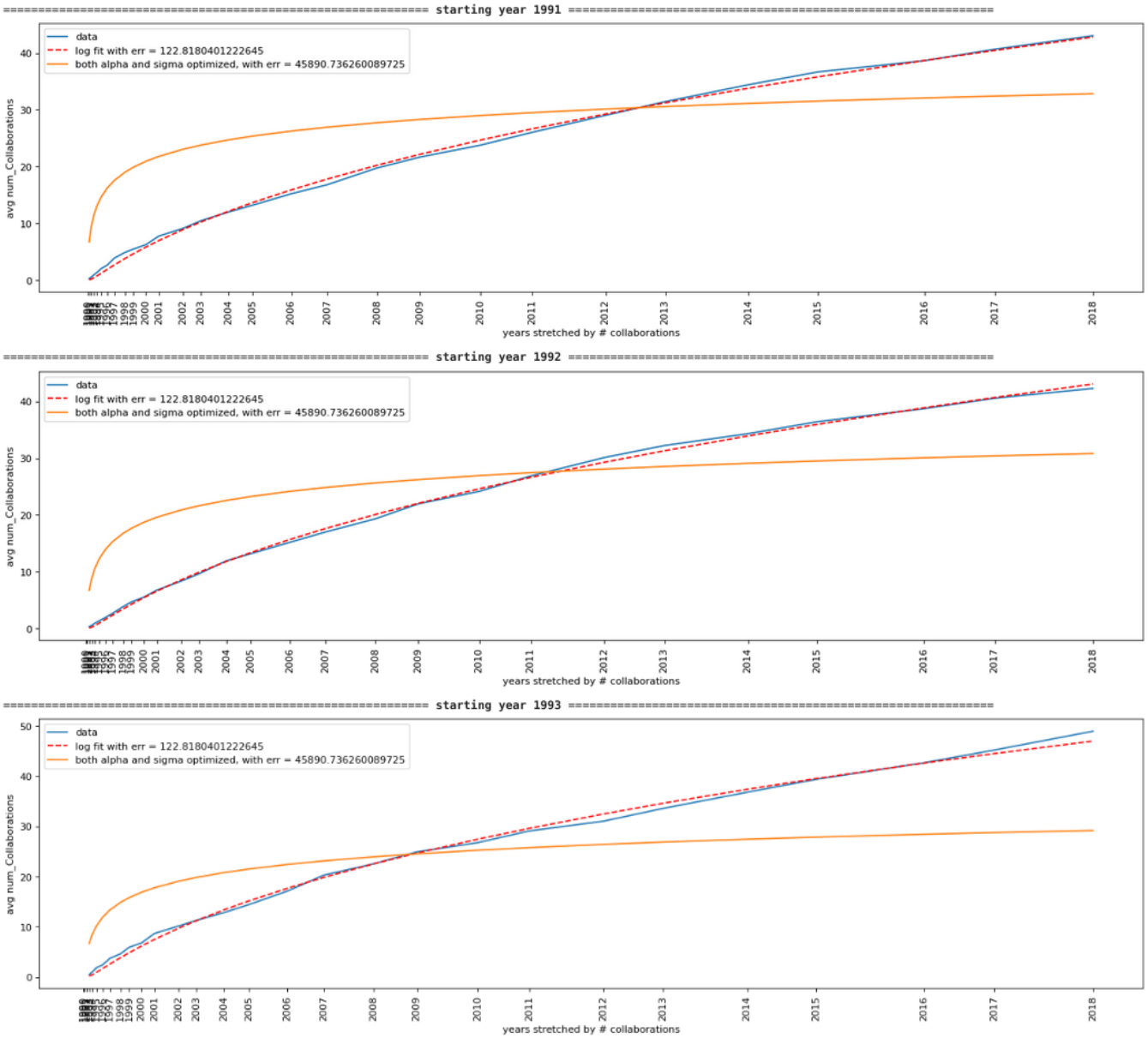
$$g_v(t) = (\alpha * ln(\frac{t}{t_v}) + 1)^{\sigma}$$

Plotted all average trajectories for each starting year and the fitted curve for each of them



- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/_holeSize_<HOLE_SIZE>by_num_collaborations_log_fittings_all.png`

Then tried to find the best parameters α and σ able to fit all curves minimizing the total error



- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/<YEAR>_by_num_collaborations_alpha_sigma_poly_fitting_generalized.png`

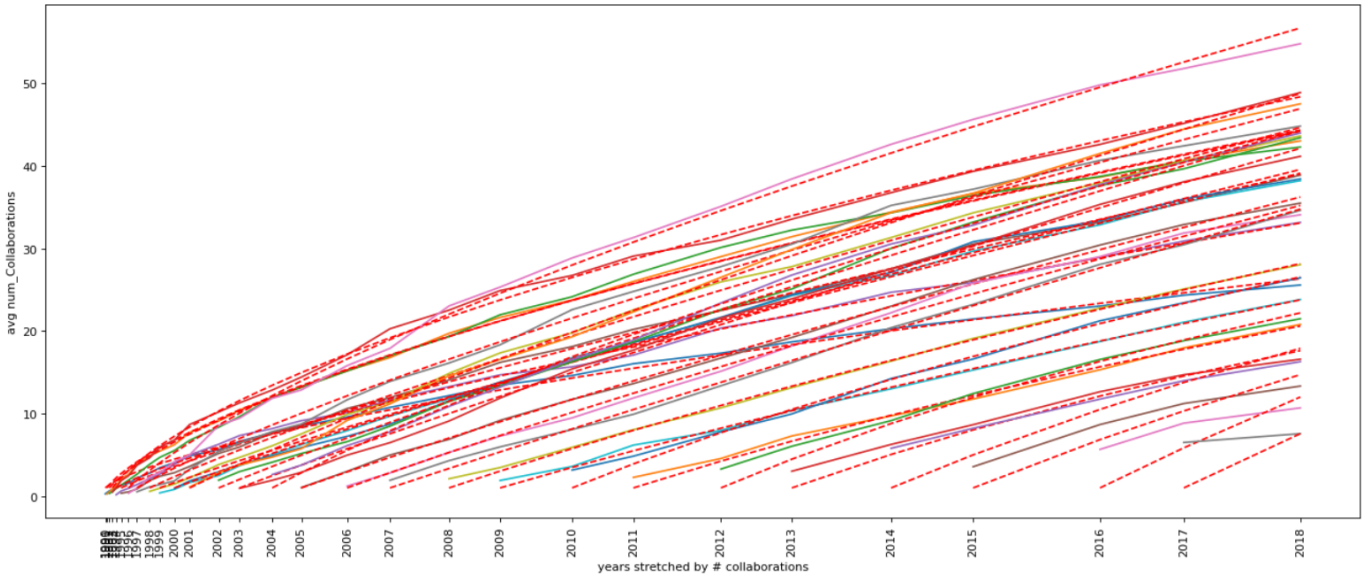
55-generalized_gamma_beta_poly_fitting_for_avg_trajectories

Same as notebook **50** but with a different function

The fitting function used is the following:

$$g_v(t) = (\gamma + 1) * (\frac{t}{t_v})^{\beta} - \gamma$$

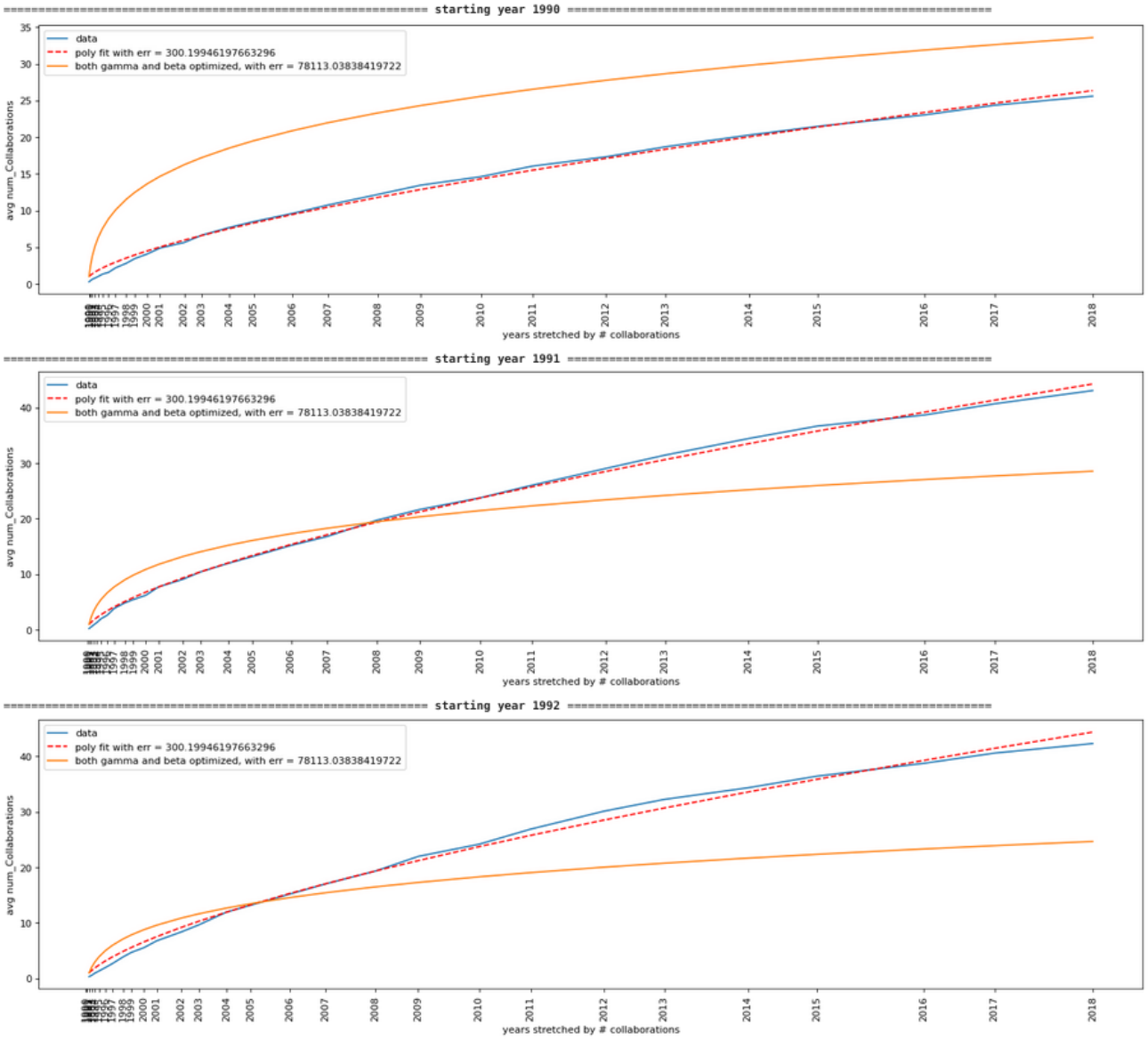
Plotted all average trajectories for each starting year and the fitted curve for each of them



total error for all fitted curves 300.19946197663296

- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/_holeSize_<HOLE_SIZE>by_num_collaborations_poly_fittings_all.png`

Then tried to find the best parameters γ and β able to fit all curves minimizing the total error



- located at `myDATA/10-splitted_by_year/<HOLE_SIZE>_hole_size_splitted/trajectories_avg_plt/<YEAR>_by_num_collaborations_gamma_beta_poly_fitting_generalized.png`