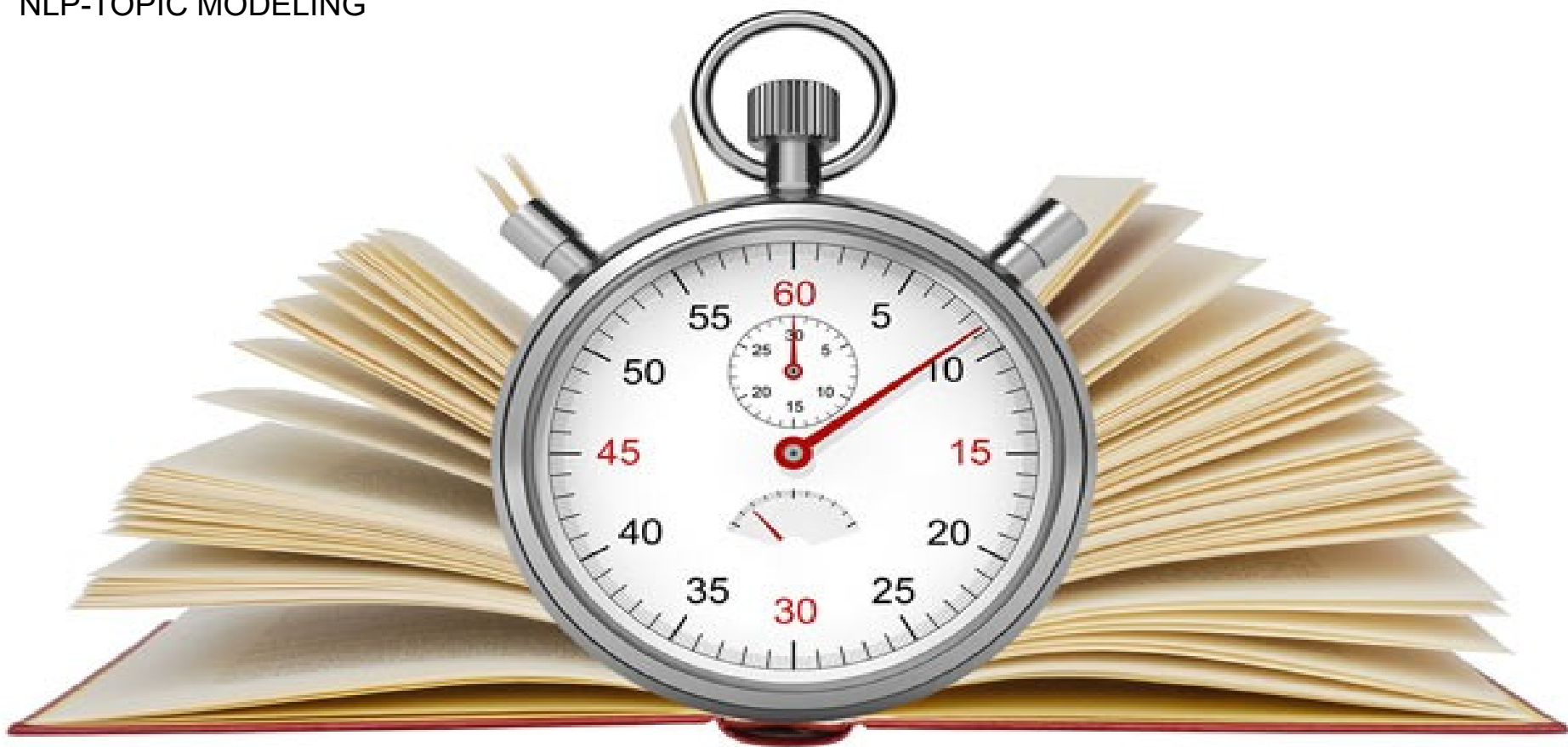


NLP-TOPIC MODELING



Overview

Topic modeling is a context of natural language processing which helps to group or cluster unlabeled texts (unsupervised process) , through hidden structure (similarities) between of them.

GOAL

Use nlp to **read** big amount of Financial news , **in real time** , and provide asset managers with **information advantage**.

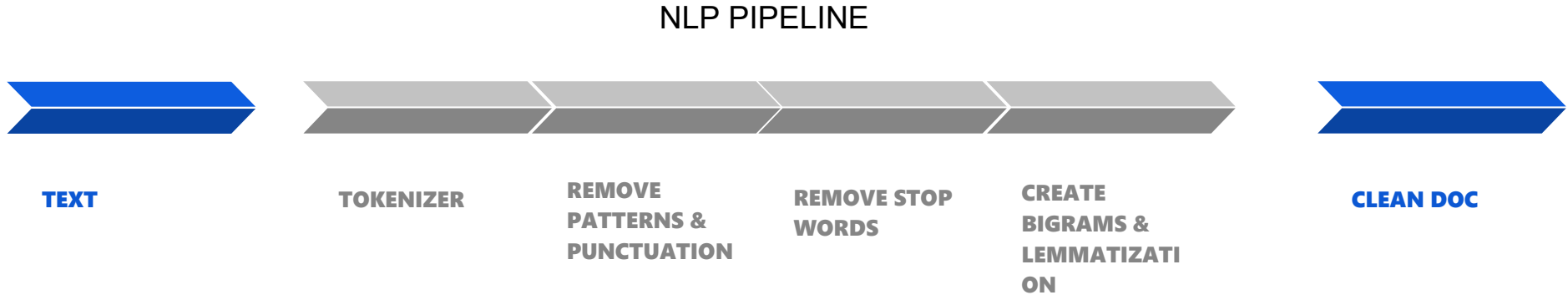
Data description

Provided data by consultancy company, collected from rated as reliable sites for News

- Number of text-documents: 10.000
- Time period of collection: 365 days

Implementation

NLP: prepare and clean our data



TOPIC MODELING:

- Chosen model: LDA, Latent Dirichlet Allocation

- Structural elements:

- 1) Dictionary: assign words to unique id ---> turning words to numbers

- 2) Corpus: a union of sub-bags of words for each doc ---> vectorization of data

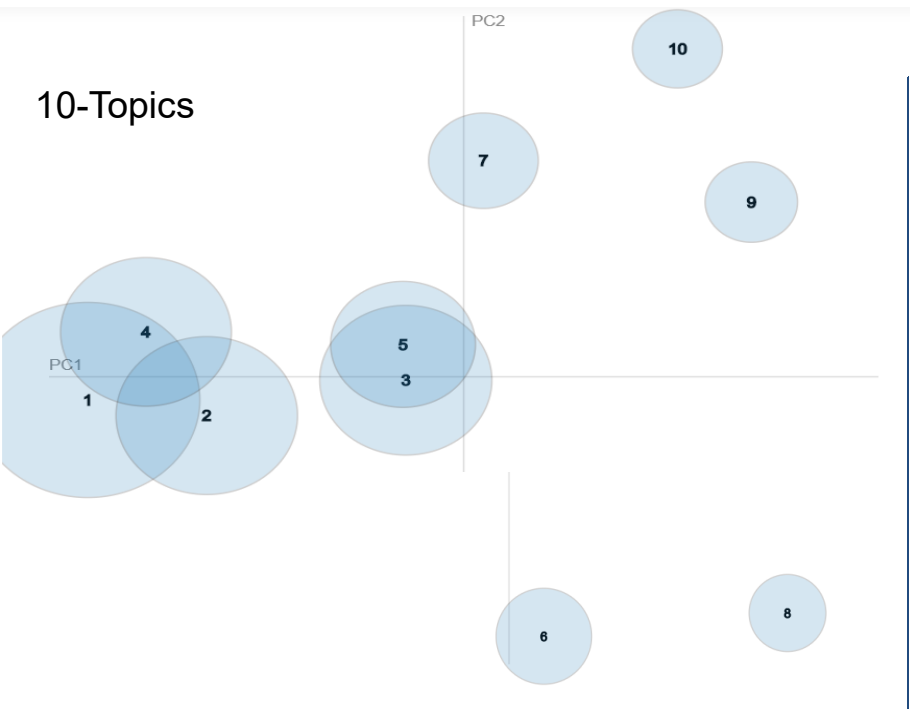
HOW MANY TOPICS?-CAN WE KNOW?

-A way to go is:

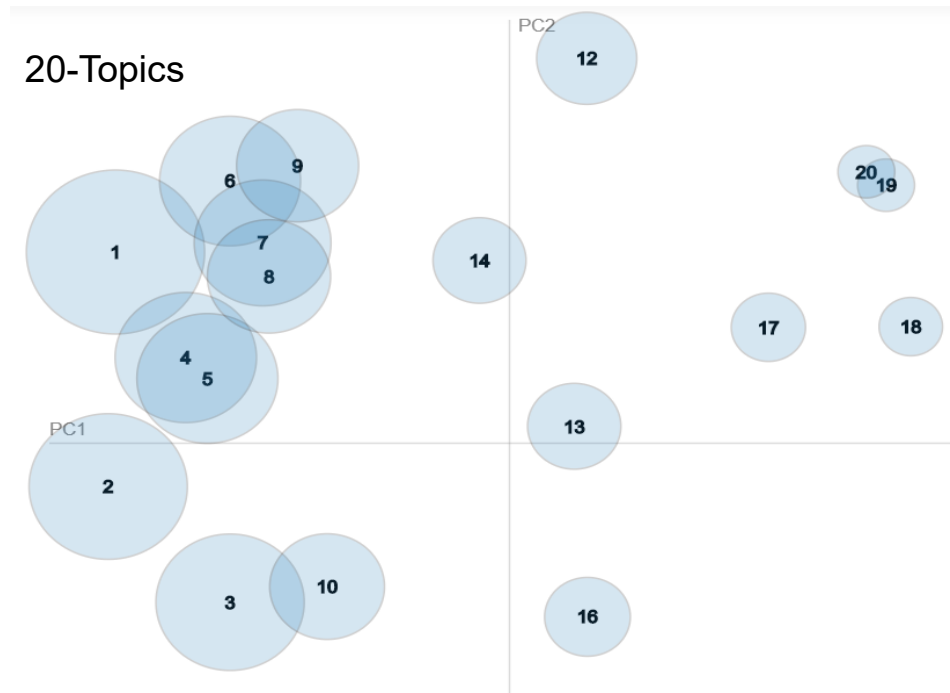
1)Through visualization

-The more segmented are, the less overlapped , the more clear Thema(Topic).

10-Topics



20-Topics



2) Coherence metric:

A pipeline that turns a qualitative result to quantitative.

Coherence results:

- 7 Topics = 0.484

- **10 Topics = 0.502**

- 20 Topics = 0.495

- 40 Topics = 0.428

- Looks 10 is the number of Topics we have to continue and extract further insights.

- Are these enough reliable criteria?

10-TOPICS VS 20-TOPICS

```
[ (0,
'0.014*service' + 0.010*business' + 0.010*technology' + 0.010*company' + '
'0.009*industry' + 0.009*information' + 0.008*include' + 0.008*india' + '
'0.008*provide' + 0.008*datum'),
(1,
'0.035*december' + 0.028*news' + 0.017*tender' + 0.015*research' + '
'0.014*file' + 0.012*open' + 0.011*thursday' + 0.011*report' + '
'0.011*friday' + 0.009*november'),
(2,
'0.090*share' + 0.085*company' + 0.023*hold' + 0.019*value' + '
'0.019*sell' + 0.019*group' + 0.017*price' + 0.016*inc' + '
'0.016*financial' + 0.015*management'),
(3,
'0.019*water' + 0.015*power' + 0.015*vehicle' + 0.012*road' + '
'0.011*energy' + 0.011*area' + 0.011*construction' + 0.010*plant' + '
'0.009*supply' + 0.009*application'),
(4,
'0.023*health' + 0.013*study' + 0.013*medical' + 0.012*care' + '
'0.012*hospital' + 0.010*drug' + 0.010*patient' + 0.009*report' + '
'0.009*research' + 0.008*treatment'),
(5,
'0.013*year' + 0.010*people' + 0.009*time' + 0.009*pron' + 0.006*come' + '
' + 0.006*work' + 0.005*know' + 0.005*home' + 0.005*family' + '
'0.005*child'),
(6,
'0.011*year' + 0.010*plan' + 0.009*government' + 0.009*work' + '
'0.008*change' + 0.008*fund' + 0.007*time' + 0.007*project' + '
'0.007*state' + 0.006*statement'),
(7,
'0.033*date' + 0.027*notice' + 0.026*contract' + 0.025*document' + '
'0.020*information' + 0.018*address' + 0.017*country' + 0.015*type' + '
'0.012*article' + 0.012*contact'),
(8,
'0.040*trade' + 0.039*stock' + 0.032*rate' + 0.024*quarter' + '
'0.023*market' + 0.023*year' + 0.018*report' + 0.017*dollar' + '
'0.015*percent' + 0.015*price'),
(9,
'0.018*president' + 0.017*trump' + 0.013*government' + 0.010*state' + '
'0.009*election' + 0.008*police' + 0.008*party' + 0.008*monday' + '
'0.008*vote' + 0.008*border'] ]
```

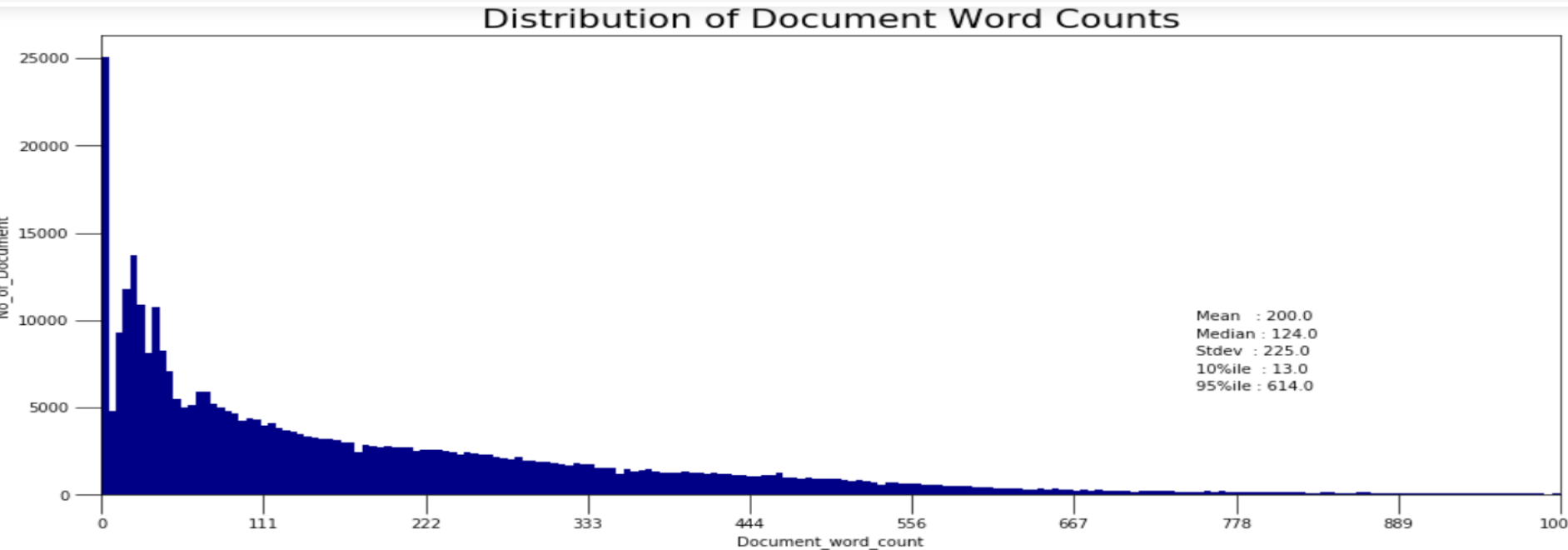
-A direct comparison of topic-9 of the 10-topic model with the topic-8 of the 20-topic model can show us that the thematic in the second one is more clear, and this is what we need. We need more clear and higher coherence between the words that targeting to financial news, even if most of topics are not clear but a couple of them are strong connected for potential financial investments. So in our case will continue with the 20-topics model.

20 TOPICS

```
[0,
'0.022*service" + 0.019*system" + 0.018*information" + 0.018*technology" +
' + 0.016*datum" + 0.012*provide" + 0.010*include" + 0.010*website" +
'0.010*network" + 0.010*application'),
(1,
'0.012*photo" + 0.007*video" + 0.006*world" + 0.006*start" +
'0.006*away" + 0.006*play" + 0.005*show" + 0.005*appear" + 0.005*image" +
' + 0.005*game'),
(2,
'0.079*contract" + 0.028*supply" + 0.026*article_content" +
'0.026*requirement_contact" + 0.018*australia" + 0.017*profit" +
'0.017*volume" + 0.015*value" + 0.015*hong_kong" + 0.011*fuel'),
(3,
'0.078*wall" + 0.023*gold" + 0.021*material" + 0.013*temperature" +
'0.012*heat" + 0.012*producer" + 0.010*metal" + 0.009*maximum" +
'0.009*powell" + 0.008*inch'),
(4,
'0.016*case" + 0.016*issue" + 0.014*agency" + 0.014*federal" +
'0.013*department" + 0.013*order" + 0.013*public" + 0.012*information" +
'0.011*state" + 0.011*report'),
(5,
'0.023*people" + 0.017*pron" + 0.016*time" + 0.011*tell" + 0.011*year" +
' + 0.011*want" + 0.011*come" + 0.011*know" + 0.010*work" +
'0.009*think'),
(6,
'0.038*year" + 0.018*percent" + 0.014*high" + 0.011*monday" +
'0.011*month" + 0.009*increase" + 0.009*give" + 0.009*change" +
'0.009*expect" + 0.009*economic'),
(7,
'0.066*december" + 0.025*news" + 0.022*open" + 0.020*inc" +
'0.020*thursday" + 0.020*november" + 0.019*address" + 0.017*service" +
'0.016*comment" + 0.015*daily'),
(8,
'0.031*trump" + 0.028*country" + 0.019*president" + 0.016*india" +
'0.015*china" + 0.014*border" + 0.012*government" + 0.011*force" +
'0.010*shutdown" + 0.010*security'),
(9,
'0.021*school" + 0.018*year" + 0.017*community" + 0.015*cent" +
'0.014*program" + 0.014*work" + 0.012*university" + 0.012*student" +
'0.012*member" + 0.011*center'),
(10,
'0.090*rate" + 0.050*dollar" + 0.045*bank" + 0.040*fund" +
'0.035*financial" + 0.030*investment" + 0.026*market" + 0.019*capital" +
'0.019*revenue" + 0.018*ratio'),
(11,
'0.098*share" + 0.072*company" + 0.070*stock" + 0.061*trade" +
'0.037*price" + 0.024*hold" + 0.023*sell" + 0.018*value" +
'0.017*purchase" + 0.014*christmas'),
(12,
'0.046*tender" + 0.046*date" + 0.039*file" + 0.035*notice" +
'0.034*document" + 0.034*court" + 0.019*district" + 0.018*type" +
'0.012*person" + 0.011*time'),
(13,
'0.034*city" + 0.033*police" + 0.022*area" + 0.019*road" + 0.017*water" +
' + 0.017*fire" + 0.016*park" + 0.014*home" + 0.012*station" +
'0.010*south'),
(14,
'0.025*food" + 0.025*store" + 0.022*holiday" + 0.019*sale" +
'0.018*brand" + 0.018*product" + 0.015*retail" + 0.014*shop" +
'0.012*online" + 0.011*consumer'),
(15,
'0.082*report" + 0.077*quarter" + 0.055*research" + 0.040*news" +
'0.036*analyst" + 0.033*target" + 0.030*year" + 0.030*worth" +
'0.027*earning" + 0.025*group'),
(16,
'0.039*health" + 0.022*study" + 0.021*medical" + 0.021*care" +
'0.019*hospital" + 0.016*drug" + 0.016*patient" + 0.014*treatment" +
'0.014*editor_mailto" + 0.014*query_respect'),
(17,
'0.031*company" + 0.023*business" + 0.018*project" + 0.016*market" +
'0.016*development" + 0.014*industry" + 0.012*statement" +
'0.011*officer" + 0.010*energy" + 0.009*work'),
(18,
'0.076*index" + 0.036*unit" + 0.035*accuse" + 0.032*vehicle" +
'0.017*patent_classification" + 0.014*aircraft" + 0.013*state" +
'0.013*equipment" + 0.012*table" + 0.012*valuation'),
(19,
'0.027*government" + 0.023*state" + 0.021*election" + 0.020*party" +
'0.018*vote" + 0.017*president" + 0.016*house" + 0.013*democrat" +
'0.012*political" + 0.011*minister']]
```

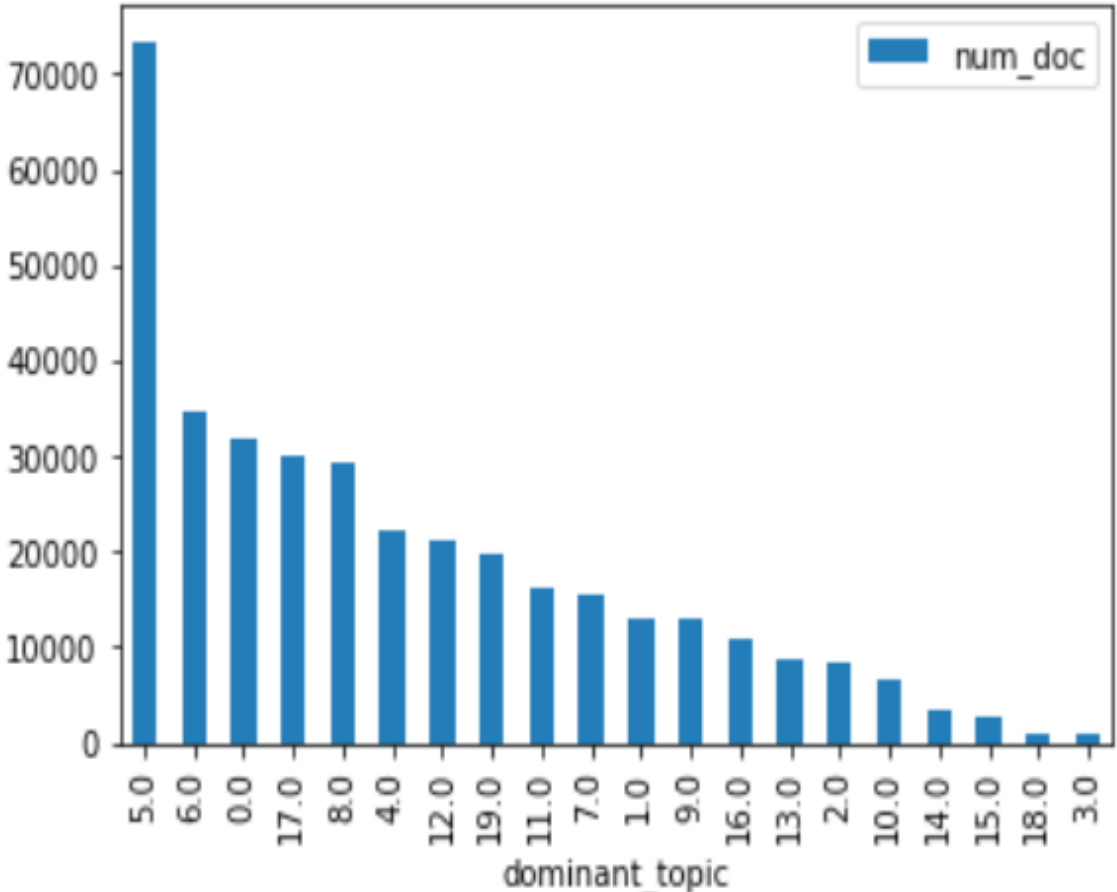
Extract info from the 20-TOPICS model

doc_num	Dominant_Topic	Topic_Perc_Contrib	Keywords	text	just_date
0	0	5.0	0.1671	people, pron, time, tell, year, want, come, kn...	* Anger over corruption and hardship fuels pro... 2018-01-01
1	1	6.0	0.2462	year, percent, high, monday, month, increase, ...	Bureau of Economic Analysis Table 1.3.1. Perce... 2018-01-01
2	2	17.0	0.2500	company, business, project, market, developmen...	High-profile companies like Wells Fargo, Uber,... 2018-01-01
3	3	8.0	0.1588	trump, country, president, india, china, borde...	President Donald Trump slammed Pakistan for 'l... 2018-01-01
4	4	4.0	0.3455	case, issue, agency, federal, department, orde...	Scope.\nApproved March 28, 2013. 160 pages. A ... 2018-01-01



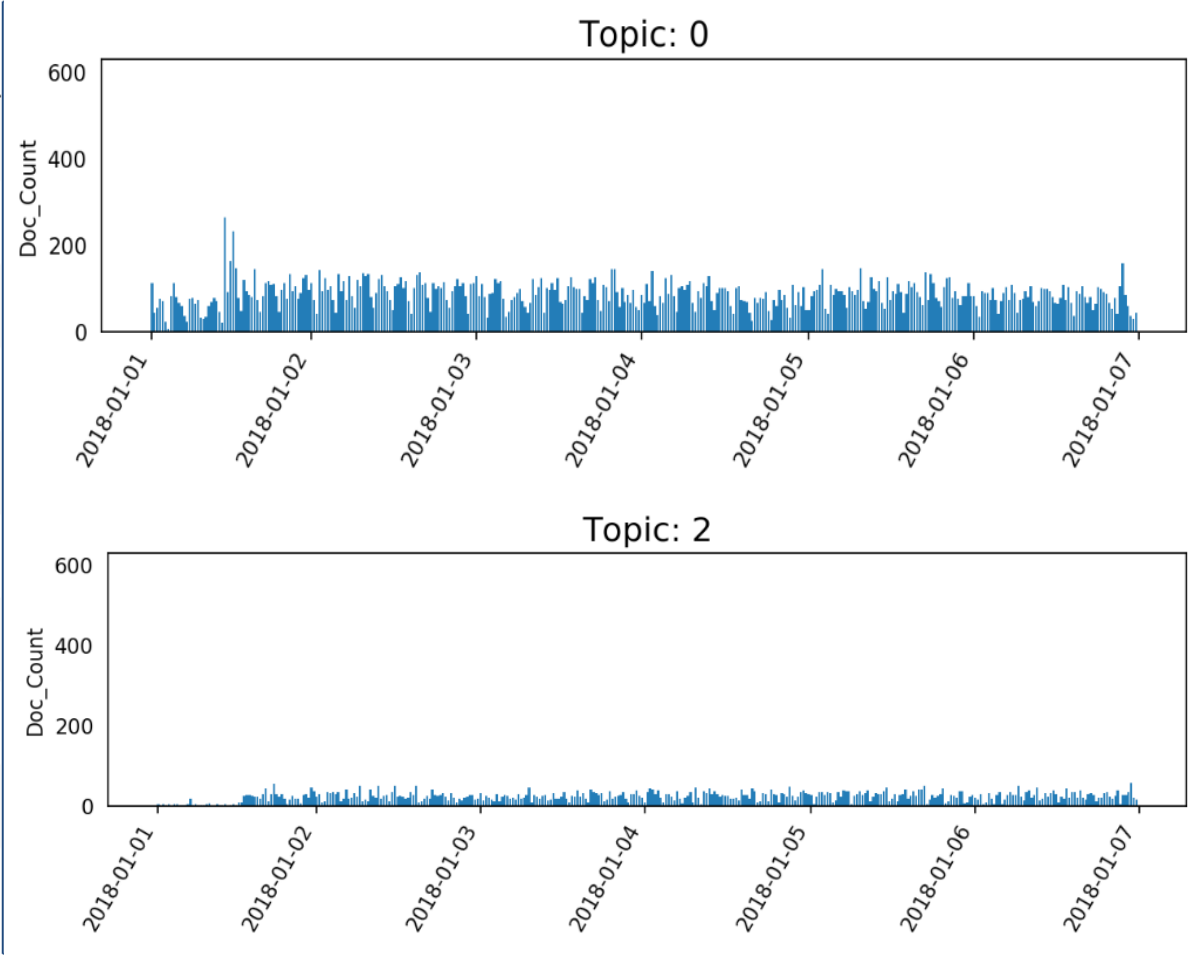
Total number of Doc per Topic

	dominant_topic	num_doc	perc_doc
0	5.0	73481	0.202
1	6.0	34671	0.096
2	0.0	31816	0.088
3	17.0	30059	0.083
4	8.0	29460	0.081
5	4.0	22365	0.062
6	12.0	21132	0.058
7	19.0	19711	0.054
8	11.0	16030	0.044
9	7.0	15498	0.043



Per day / Per Topic sum of Documents

	Dominant_Topic	just_date	sum_of_doc
0	0.0	2018-01-01	112
1	0.0	2018-01-02	45
2	0.0	2018-01-03	55
3	0.0	2018-01-04	76
4	0.0	2018-01-05	71
5	0.0	2018-01-06	24
6	0.0	2018-01-07	8
7	0.0	2018-01-08	82
8	0.0	2018-01-09	113
9	0.0	2018-01-10	80



Most representative Documents

```
[doc_num          209239
Dominant_Topic    0
Topic_Perc_Contrib 0.7387
Keywords          service, system, information, technology, datu...
text              Alexandria, July 31 -- NEC Corporation has sec...
just_date         2018-07-31
Name: 209239, dtype: object,
doc_num          174703
Dominant_Topic    1
Topic_Perc_Contrib 0.5692
Keywords          photo, video, world, start, away, play, show, ...
text              * window._taboola = window._taboola || []; _ta...
just_date         2018-06-26
Name: 174703, dtype: object,
doc_num          325465
Dominant_Topic    2
Topic_Perc_Contrib 0.5423
Keywords          contract, supply, article_content, requirement...
text              Slovakia, Nov. 23 -- Contract Id: 1350536.\nDe...
just_date         2018-11-24
Name: 325465, dtype: object,
doc_num          358876
Dominant_Topic    3
Topic_Perc_Contrib 0.8529
Keywords          wall, gold, material, temperature, heat, produ...
text              28.12.2018 - 14:47 Uhr.\n\n\nDGAP-Ad-hoc: MyBu...
just_date         2018-12-28
```

```
doc_num          72650
Dominant_Topic    4
Topic_Perc_Contrib 0.5911
Keywords          case, issue, agency, federal, department, orde...
text              SUMMARY: In accordance with the Privacy Act of...
just_date         2018-03-16
Name: 72650, dtype: object,
doc_num          172112
Dominant_Topic    5
Topic_Perc_Contrib 0.6834
Keywords          people, pron, time, tell, year, want, come, kn...
text              Love Island could live up to its name this eve...
just_date         2018-06-24
Name: 172112, dtype: object,
doc_num          37437
Dominant_Topic    6
Topic_Perc_Contrib 0.7549
Keywords          year, percent, high, monday, month, increase, ...
text              Robust demand lifts mentha oil futures by 1.14...
just_date         2018-02-09
Name: 37437, dtype: object,
doc_num          203214
Dominant_Topic    7
Topic_Perc_Contrib 0.6994
Keywords          december, news, open, inc, thursday, november,...
text              LANXESS Aktiengesellschaft: Release according ...
just_date         2018-07-25
```

Insights-Results-Comments

-We found in which doc each topic is assigned with the highest percentage. So, This document is the most related with each topic.

-Slides 8,9,10 are not giving us now any insights but are very important for the maintenance and stability of the model later.(if we want to run a classification model or do sentiment analysis)

How interpret ,labeling our topics and get benefit of the output.

-Topic 0: manual-label/ information technology

The context speaks about a patent on a communication device. This could be an area for potential investment.

-Topic 8: manual-label/ U.S foreign policy

The context speaks about military actions of U.S. in Persian gulf

GOAL SUCCEED

10.000 Documents



Downsized to



20

THANKS