

Illinois Population Analysis

-- Crystal Xu



Problem Statement

Illinois' population decline reached record levels in 2021 as the state's population dropped by **113,776** residents from July 2020-July 2021. During the year, population decline was widespread, affecting nearly all metropolitan areas of the state

This study will extract information from unstructured news data to identify key reasons for population decline and provide actionable recommendations on what can be done to reverse this trend.

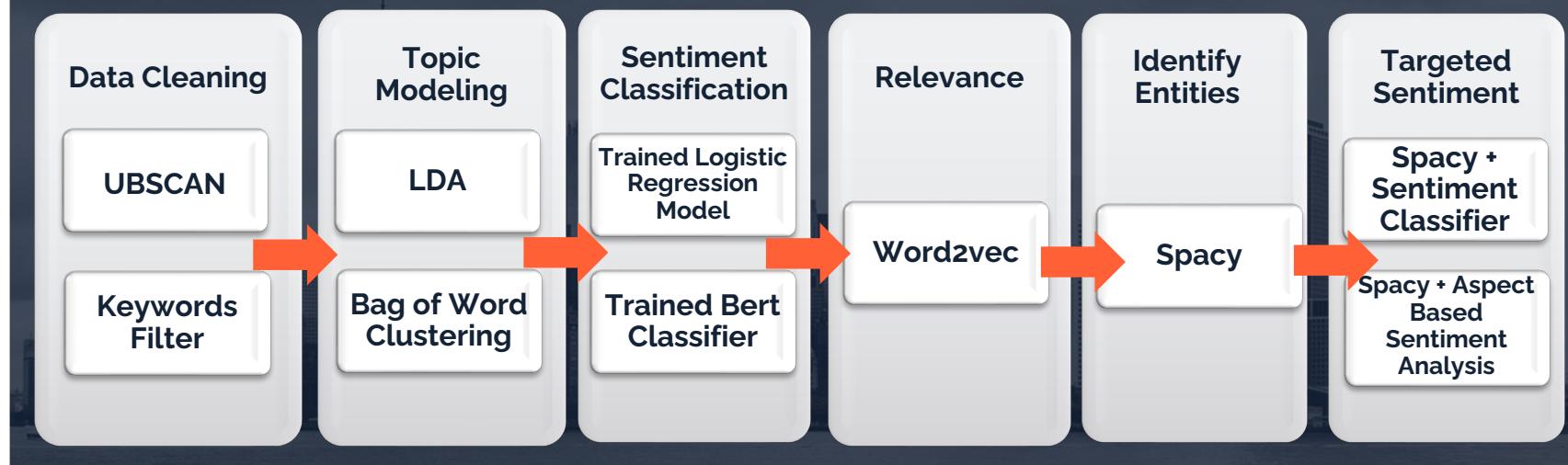
Data Overview

- The dataset contains about 200K news articles related to Chicago or Illinois.
- The features included are the Date, Language, Title and Text of the news articles.

	date	language	title	text
0	2022-01-06	english	No deal, no school: Chicago cancels classes fo...	CHICAGO (AP) — Chicago school leaders canceled...
1	2022-01-06	english	No deal, no school: Chicago cancels classes fo...	CHICAGO (AP) — Chicago school leaders canceled...
2	2022-01-06	english	Watch 'Chicago P.D.' Preview Wednesday	Chicago PD 9x11 "Lies" Season 9 Episode 11 Pro...
3	2022-01-06	english	Trump's Solution for Chicago Public Schools? K...	Wise of Foolish?\nThe Chicago Tribune article ...
4	2022-01-06	english	Family, friends, colleagues gathering today at...	The neighbors near Mashawn Plummer's Portage P...
...
200114	2022-03-05	english	Chicago girl shot after celebrating 12th birth...	Authorities say a girl who was shot in the hea...
200115	2022-03-05	english	Loyola Chicago vs. Northern Iowa – MVC Tournam...	The No. 4 seed Loyola Chicago Ramblers (23-7, ...
200116	2022-03-05	english	DraftKings Illinois Promo Code: \$1,050 Bonus a...	Remember to check out the DraftKings Illinois ...
200117	2022-03-05	english	Sidney, Illinois had a median home valuation o...	[BlockShopper.com] .\n Buyer Address Valuati...
200118	2022-03-06	english	Ukrainian woman weds Chicago fiancé ahead of r...	CHICAGO (AP) — When Russia invaded her home co...

Methodology Overview

- Clean up the outliers
- Labeling the articles with topics and sentiment
- Calculate the relevance score for each article related to "population" and "business"
- Analyze positive and negative sentiment based on the relevance scores, topics and sentiment labels
- Identify entities and apply target sentiment analysis



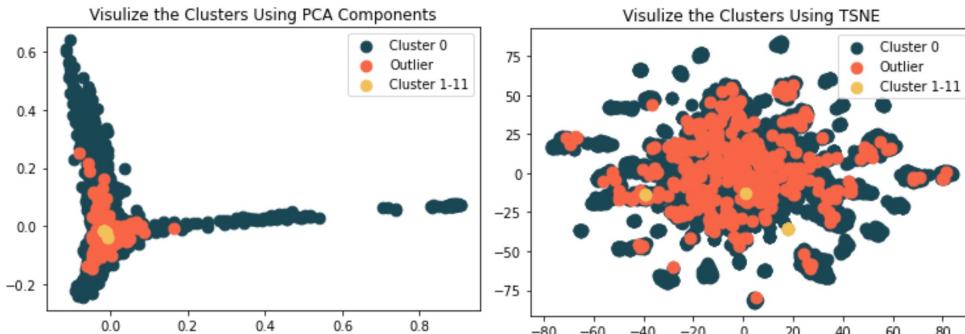
Clustering – Find the Noise

Use DBSCAN to find the articles that are unrelated to the majority content

Preprocess: Clean up text (web addresses; cases; special characters); TFIDF Vectorization

Techniques: DBSCAN ($\text{eps} = 1$, $\text{min_sample} = 10$)

Results: Drops 18,248 articles



- Cluster -1 : **OUTLIER** The `min_sample` of the DBSCAN is set to 10, which means for articles in cluster -1, do not have more than 10 articles talking about similar topics with them. This group of articles is not important and will be ignored.
- Cluster 1-11: **DROP** The articles in each cluster have almost the same content and most of them are meaningless. The examples are shown below.
- Cluster 0: **KEEP**

Cluster 1	date	language	title	text
98	2022-02-10	english	No. 7/6 Indiana Rolls To Road Win At Illinois	Thanks for visiting!\nThe use of software that blocks ads hinders our ability to serve you the content you came here to enjoy.\nWe ask that you consider turning off your ad blocker so we can deliver you the best experience possible while you are here.\nThank you for your support!
1329	2022-04-28	english	Illinois Set to Wrap Regular Season at Drake Relays	Thanks for visiting!\nThe use of software that blocks ads hinders our ability to serve you the content you came here to enjoy.\nWe ask that you consider turning off your ad blocker so we can deliver you the best experience possible while you are here.\nThank you for your support!
1565	2022-01-06	english	Women's Basketball Outlasts Northern Illinois In Overtime	Thanks for visiting!\nThe use of software that blocks ads hinders our ability to serve you the content you came here to enjoy.\nWe ask that you consider turning off your ad blocker so we can deliver you the best experience possible while you are here.\nThank you for your support!

LDA – Define Major Topics

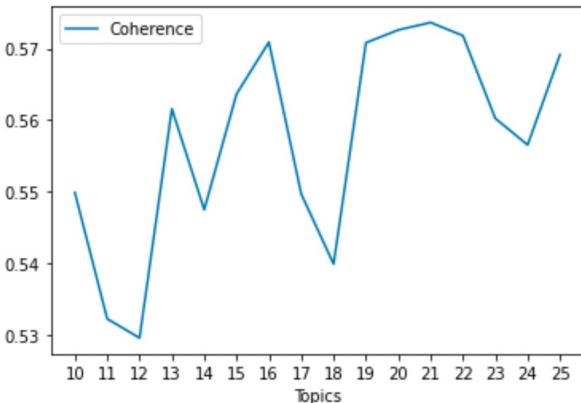
Use LDA Topic modeling to find major topics

Preprocess: Clean up text; lemmatization

Techniques: LdaMulticore (num_topics = 21)

Results:

- Classify the articles into 21 topics
- For each article store top possible topics it may belong to
- Print out the top keywords and representative article for each topic



- The best model has **21 topics** with a **coherence score = 0.574**
- The keywords of each topic will be shown on the next page
- Find the top 3 possible topics and their weights for each article

		title	text	topic1	w1	topic2	w2	topic3	w3
0	No deal, no school: Chicago cancels classes for a 2nd day	CHICAGO (AP) — Chicago school leaders canceled classes T...		1	0.998010	NaN	NaN	NaN	NaN
1	No deal, no school: Chicago cancels classes for a 2nd da...	CHICAGO (AP) — Chicago school leaders canceled classes f...		1	0.998145	NaN	NaN	NaN	NaN
2	Watch 'Chicago P.D.' Preview Wednesday	Chicago PD 9x11 "Lies" Season 9 Episode 11 Promo – Voigh...		6	0.689289	0.0	0.214598	17.0	0.061193
3	Trump's Solution for Chicago Public Schools? King Solomo...	Wise of Foolish?\nInThe Chicago Tribune article titled: Ch...		12	0.457139	1.0	0.322744	6.0	0.075293

- Get top 5 most representative articles for each topic

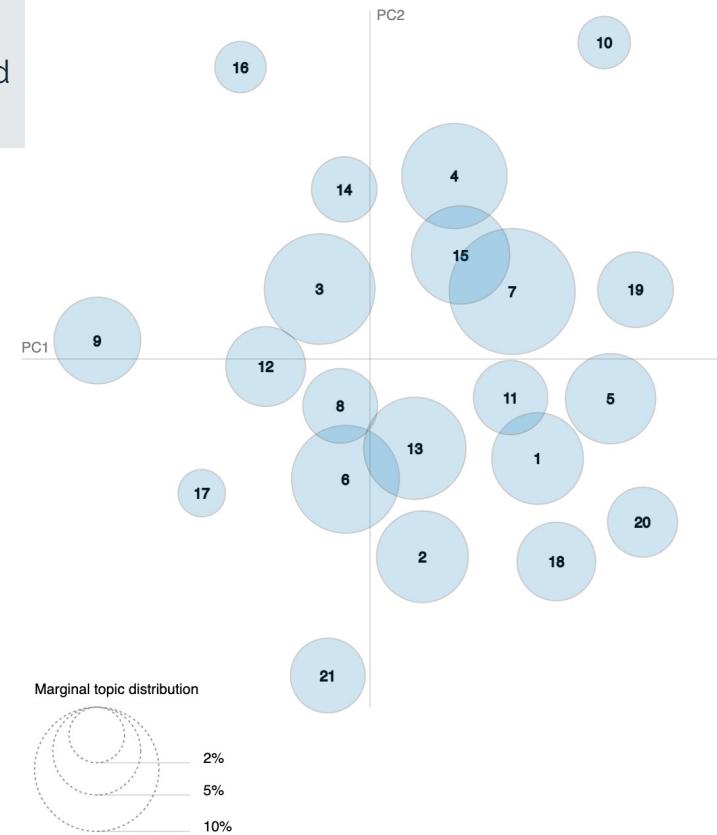
Topic_Num	Topic_Perc_Contrib	index	title	Text
66064	0	0.998540	72605 Not known Details About Illinois Truck Accident Lawyers	Not known Details About Illinois Truck Accident Lawyers...
43774	0	0.998473	48113 Indicators on Illinois Truck Accident Lawyers You Should...	Table of Contents [Some Ideas on Illinois Truck Accident...
42160	0	0.998373	46360 The smart Trick of Chicago Truck Accident Lawyers That N...	The smart Trick of Chicago Truck Accident Lawyers That N...
58535	0	0.998373	64361 The Best Strategy To Use For Chicago Insurance Lawyers	The Best Strategy To Use For Chicago Insurance Lawyers T...
43772	0	0.998355	48110 The Definitive Guide for Illinois Truck Accident Lawyers	Table of Contents [A Biased View of Illinois Truck Accid...

LDA – Define Major Topics

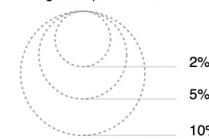
From the LDA result, we can see topics related to **education, sports, law, crime, work, loans, covid, business and food**. Also, there are some topics that include a lot of outliers, like topic 13. Topic unrelated to the analysis will be dropped in the future.

Topic 0 - 0.021 lawyer|0.013 accident|0.010 get|0.008 insurance|0.008 truck
Topic 1 - 0.047 school|0.027 say|0.024 student|0.019 district|0.014 teacher
Topic 2 - 0.031 say|0.020 police|0.014 year|0.011 officer|0.009 man
Topic 3 - 0.034 game|0.016 bull|0.016 team|0.015 point|0.013 season
Topic 4 - 0.032 roof|0.015 roofing|0.015 also|0.012 well|0.009 repair
Topic 5 - 0.008 service|0.008 work|0.007 community|0.007 business|0.007 include
Topic 6 - 0.014 say|0.013 go|0.012 get|0.008 see|0.007 time
Topic 7 - 0.023 say|0.006 russian|0.006 ukrainian|0.006 year|0.006 country
Topic 8 - 0.049 share|0.036 company|0.035 stock|0.027 quarter|0.024 rating
Topic 9 - 0.033 document|0.032 social|0.031 _|0.029 important|0.024 ad
Topic 10 - 0.014 loan|0.012 get|0.009 credit|0.009 check|0.007 cash
Topic 11 - 0.014 covid|0.014 case|0.010 rate|0.010 state|0.010 day
Topic 12 - 0.019 state|0.016 say|0.010 year|0.008 tax|0.007 law
Topic 13 - 0.036 com|0.022 https|0.011 use|0.009 website|0.009 download
Topic 14 - 0.033 bear|0.017 season|0.015 coach|0.013 year|0.013 team
Topic 15 - 0.084 point|0.054 game|0.029 rebound|0.028 average|0.025 last
Topic 16 - 0.030 market|0.026 bet|0.021 bankruptcy|0.014 sport|0.011 match
Topic 17 - 0.027 alcohol|0.017 also|0.015 well|0.013 treatment|0.013 drug
Topic 18 - 0.018 pizza|0.011 also|0.010 food|0.008 style|0.008 crust
Topic 19 - 0.029 court|0.022 family|0.022 lawyer|0.020 parent|0.019 divorce
Topic 20 - 0.029 prize|0.027 sponsor|0.026 winner|0.024 sweepstake|0.014 entrant

Intertopic Distance Map (via multidimensional scaling)



Marginal topic distribution



WOB Clustering – Define Major Topics

Summarize some keywords based on the LDA results and use these keywords to initialize TfIdf Vectorizer. Finally, use the vectorization result to perform clustering.

Preprocess: Clean up text; TfIdf Vectorization

Techniques: KMeans Clustering based on a bag of word

Results: Allocate each article to a cluster and print the top keywords for each cluster

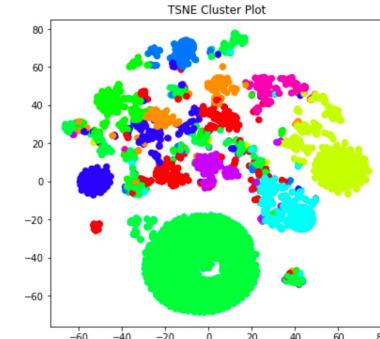
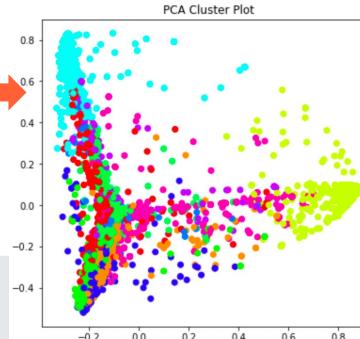
Topics	Keywords
Law	law, court, politics
Crime	crime, drug, alcohol, police, accident, shoot
Education	school, education, child
Sports	game, sports, team
Health	health, healthcare, insurance
Community	living, community, cost
Living Cost	housing, unemployment, job, rental
Business	business, bankruptcy, loan, company
COVID	covid, work, from, home
Public policy	policy, tax, public
Food	restaurant, food

Keywords (BOW) summarized based on the LDA results

Clusters Visualizations

Clustering Result

Cluster	Counts	Keywords
Cluster 0	6485 articles	law, work, insurance
Cluster 1	7662 articles	Job, work, business
Cluster 2	19752 articles	game, sports, work
Cluster 3	10404 articles	business, work, food
Cluster 4	82599 articles	tax, alcohol, cost
Cluster 5	15243 articles	police, crime, court
Cluster 6	6356 articles	food, business, work)
Cluster 7	11220 articles;	work, job, education
Cluster 8	7450 articles	court, law, child
Cluster 9	6978 articles	sports, game, work
Cluster 10	7722 articles	community, work, business



Sentiment Classification

Train the sentiment classifier on the Yelp data. Use the trained model to classify the sentiment of news

Preprocess: tokenization and preprocessing; Countvectorizer

Techniques: Ktrain-bert; Logistic Regression

Results: Classify each article with positive or negative sentiment and the corresponding probability.

Classification result on the News dataset

Logistic Regression

0	116731
1	65140

Ktrain-bert

- Choose Logistic Regression because it can predict the probability for 0 and 1
- After applying sentiment classification, each article has its sentiment label and the corresponding probability.

Negative	100574
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Positive	81297
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		text	sentiment	sentiment_prob_0	sentiment_prob_1	senti_bert
0	CHICAGO (AP) — Chicago school leaders canceled...	0	1.000000	5.045681e-16	Negative	
1	CHICAGO (AP) — Chicago school leaders canceled...	0	1.000000	4.040775e-19	Negative	
2	Chicago PD 9x11 "Lies" Season 9 Episode 11 Pro...	1	0.246794	7.532063e-01	Negative	

Accuracy on the Yelp review dataset

Logistic Regression

	precision	recall	f1-score	support
0	0.97	0.97	0.97	32016
1	0.97	0.97	0.97	31914
accuracy			0.97	63930
macro avg	0.97	0.97	0.97	63930
weighted avg	0.97	0.97	0.97	63930

Ktrain-bert

	precision	recall	f1-score	support
0	0.99	0.99	0.99	7504
1	0.99	0.99	0.99	7496
accuracy			0.99	15000
macro avg	0.99	0.99	0.99	15000
weighted avg	0.99	0.99	0.99	15000

Word2vec - Relevance

Use a pre-trained Word2vec model to calculate the relevance of each article to a specific topic.

- Calculate the similarity score between each token and the topic
- Calculate the mean similarity for each article as the relevance score.

Preprocess: Clean up text, tokenize

Techniques: Use 'word2vec-google-news-300'

Results:

- Calculate a relevance score for each article corresponding to topics { population, business, resident }
- When analyzing a specific topic, only choose articles that have a relevance score greater than the overall mean to make sure the articles are relevant to the topic.

Sample Output

	title	text	population	business	resident
0	No deal, no school: Chicago cancels classes fo...	CHICAGO (AP) — Chicago school leaders canceled...	0.094708	0.089997	0.068338
1	No deal, no school: Chicago cancels classes fo...	CHICAGO (AP) — Chicago school leaders canceled...	0.093367	0.090444	0.068236
2	Watch 'Chicago P.D.' Preview Wednesday	Chicago PD 9x11 "Lies" Season 9 Episode 11 Pro...	0.067550	0.102209	0.044861
3	Trump's Solution for Chicago Public Schools? K...	Wise of Foolish?\nThe Chicago Tribune article ...	0.104678	0.095248	0.058324

```
[('businesses', 0.6623775362968445),  
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 ('busi_ness', 0.5612965226173401),  
 ('PETER_PASSI_covers', 0.5530025959014893),  
 ('Business', 0.546613872051239),  
 ('businesss', 0.5441080331802368),  
 ('Sopris_supplemental_solutions', 0.525254487991333),  
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 ('buiness', 0.5039401650428772)]
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 ('poulation', 0.6552072167396545),  
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 ('Demographers_predict', 0.5321643948554993)]
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 ('lifelong_resident', 0.602915346622467),  
 ('Resident', 0.6022466421127319),  
 ('residents', 0.5787309408187866),  
 ('retired_schoolteacher', 0.5495061278343201),  
 ('schoolteacher', 0.50212562084198),  
 ('citizen', 0.49899375438690186),  
 ('councilman', 0.4956853985786438),  
 ('Crumland_Farms', 0.4863513708114624),  
 ('Perne', 0.48625093698501587)]
```

Business

Population

Resident

Sentiment Analysis - Negative

Step 1: Remove topics that contain mostly outliers – 13 & 9

Articles in topic 13 are mostly website information and articles in topic 9 are HTML codes

Step 2: Group by topics and calculate mean relevance score related to “population” and drop topics with lower scores

Drop topic 4 (Chicago roofing company and dumpster rental), topic 20 (Chicago sweepstakes), topic 3,14,15 (sports)

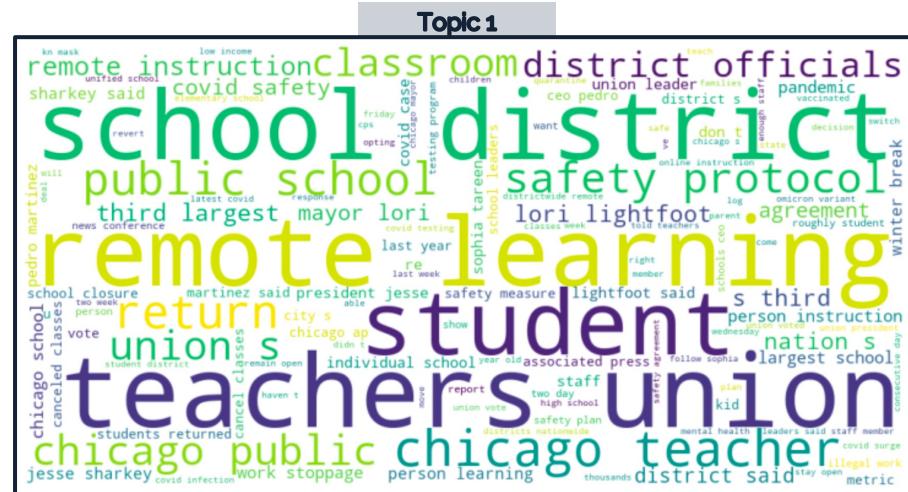
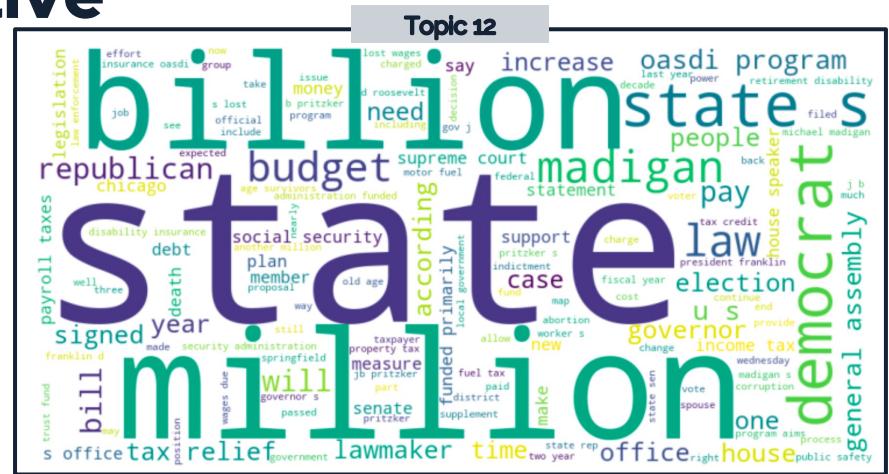
Step 3: Select articles with negative sentiment and calculate the mean probability of 0 from the classifier and mean relevance score

The relevance scores show how relevant the topics are to the “population decline”. The mean_prob_0 shows the extent of negative sentiment within the topics. Based on these two scores, identify **topics 12, 11, 1 and 7 to be the major season for population decline** and topics 5, 19 17 and 18 may also have an impact to some extent.

- Topic 12: Statehouse, tax, Fed, public policies, regulations
- Topic 11: Covid, home sales
- Topic 1: School, Covid, education
- Topic 7: Agriculture, supply chain

Step 3 Chart:

topic1	count	mean_prob_0	mean_relevance
0	1677	0.871007	0.087389
1	7249	0.958396	0.093829
2	13234	0.953890	0.089533
5	5091	0.881857	0.094962
6	2120	0.877355	0.088391
7	4089	0.929204	0.095965
8	1121	0.972086	0.084069
10	635	0.918939	0.087976
11	5143	0.932320	0.107351
12	8640	0.961348	0.097369
17	458	0.845732	0.094900
18	572	0.796102	0.091377
19	614	0.873318	0.094061



Text Summarization for representative articles

topic 12	<p>Former Illinois House Speaker Michael Madigan has been indicted by a federal grand jury on multiple counts of racketeering and bribery. The full indictment consists of 22 counts, including for bribery and racketeering, allegedly executed by Madigan and a</p> <p>A leaked draft of an upcoming U.S. Supreme Court decision on abortion reignited a political debate. The court issued a statement confirming it as authentic but denying that it represents a final decision. An appendix to the 98-page document reveals a brief sliver of the history of abortion laws in the United States.</p> <p>Wages Up to \$147,000 Are Currently Taxed for Social Security</p> <p>Gov. J.B. Pritzker and Democratic leaders of the General Assembly announce agreement on a \$45.6 billion budget package. The package would include \$1.8 billion of mostly-temporary tax relief. Senate Republicans outlined their own proposal Thursday, calling for \$2.2 billion in permanent relief.</p>
Topic 11	<p>City at 'Low Community Level' of Transmission Even as Cases Rise. Chicago is averaging 585 new cases of COVID-19 per day over the last week. That represents an increase of 26% from the week prior. Officials say the city remains in a "low community level" risk of transmission. Hospitalization numbers are also largely steady, with 2.8 new admissions per day.</p> <p>Mortgage rates have risen to the highest they've been in a decade. But in many markets, home prices still haven't budged</p> <p>According to Crain's Chicago Business, downtown rents rose more than 30-percent in 2021. In addition, prices are expected to go up another 5-percent this year. High demand and short supply will price many people out of the market, experts say.</p>
Topic 1	<p>Chicago school leaders cancel classes Thursday for a second consecutive day. The move comes after closed-door negotiations Wednesday failed to produce a deal. The Chicago Teachers Union sought to revert to remote instruction during the latest surge of infections. But Chicago Public Schools leaders have said remote learning didn't work.</p>
Topic 7	<p>Boeing is expected to move its headquarters from Chicago to Arlington, Virginia. The move would put the company close to the Pentagon, which certifies its planes. The decision could be announced as soon as Thursday, according to two people familiar with the matter. It would be the second time in a decade that the company has moved its headquarters away from Chicago.</p> <p>The war between Russia and Ukraine, the world's two major producers and exporters of grains, rages on, bolstering global cereal prices. Dry weather in the U.S. Plains wheat belt threatens the size and quality of the crop. Talks to end a strike among grain-truck drivers in Argentina failed, raising a threat to corn and soy export during the key harvest season.</p>

Top reasons for population decline:

- ❑ **(Topic 12) Residents are not satisfied with the politics, social security, law, and public policies.** For example, some articles mentioned the negative sentiment related to the supreme court's decision on abortion. Some articles mentioned corruption in Illinois politics. Diminishment of promised benefits like a retirement plan, tax relief, and other social security plans also makes people unsatisfied
- ❑ **(Topic 11) Department of Public health cannot control the spread of the pandemic and the positive cases continue to surge.**
- ❑ **(Topic 11) After the impact of the pandemic dying out, the rent went up and the mortgage rate have risen to the highest point** over decades, which caused residents to move out.
- ❑ **(Topic 1) Remote Learning due to the pandemic.** School and teacher unions fail to reach an agreement on remote learning and other COVID-19 safety protocols. The class got canceled.
- ❑ **(Topic 7) Leave of large companies,** like Boeing.
- ❑ **(Topic 7) Increasing cost and supply chain problems for the agriculture industry.** The war between Russia and Ukraine, the world's two major producers and exporters of grains caused a shortage of grain importing, driving up the cost of fertilizers and other inputs. Dry weather in the U.S. Plains wheat belt threatens the size and quality of the crop.

Suggest Corrective Actions:

- Make sure people's rights and benefits are protected. There might be a need for constitutional pension reform.
- Get students back to school either remotely or in person.
- Help the economy and residents recover from the pandemic.
- Help farmers deal with supply chain problems and stable the grain price.
- Have benefits on tax or other policies to attract and retain large companies.

Sentiment Analysis - Negative

Sentiment Changing Plots related to Population

Figure 1: Plot of negative and positive sentiment

- Set the positive article to 1 and the negative sentiment to -1. Group by date and plot the sum.
- In most of the data, there are more negative articles than positive, except for the first several days of May.
- There is an increase in negative sentiment in the first half of January

Figure 2: Plot of the Mean probability of negative sentiment group by date

- The plot shows decreases in negative sentiment around 02-10 and 05-01

Figure 3: Plot the Mean probability of negative sentiment for different topics

- There is a huge reduction of negative sentiment for topic 1 around 04-25

Figure 1

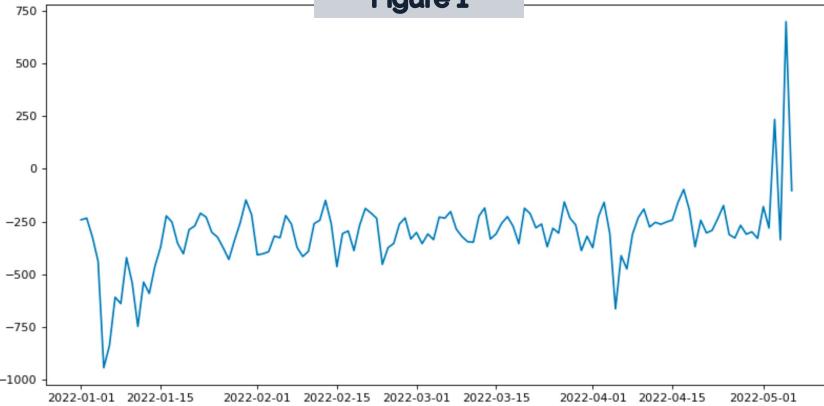


Figure 3

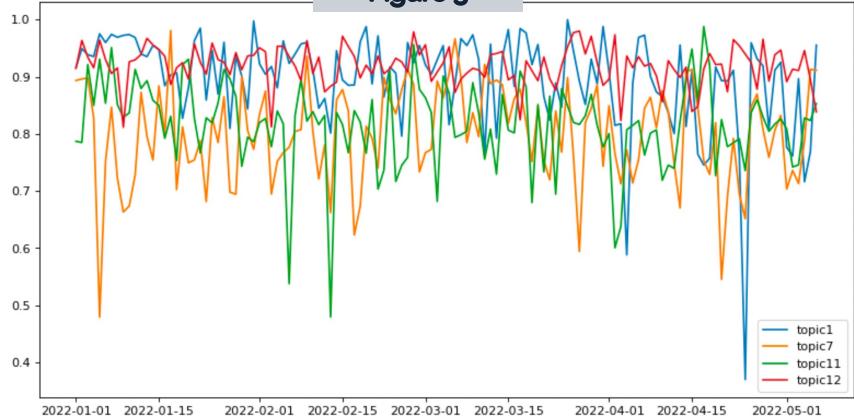
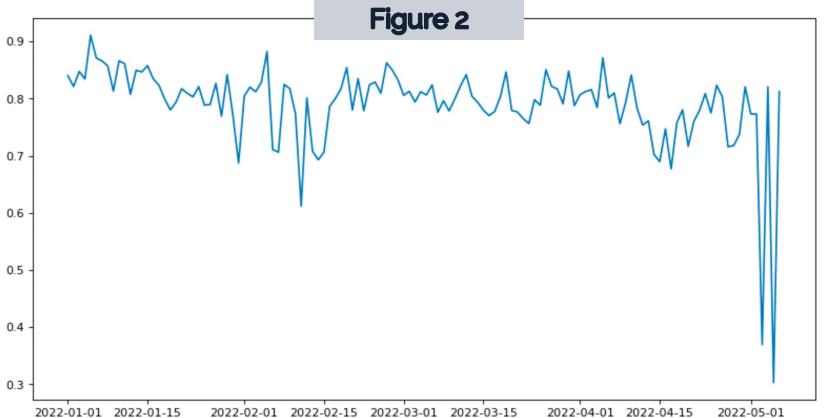


Figure 2



Sentiment Analysis - Positive

Similar steps with the negative sentiment analysis, but targeting "business"

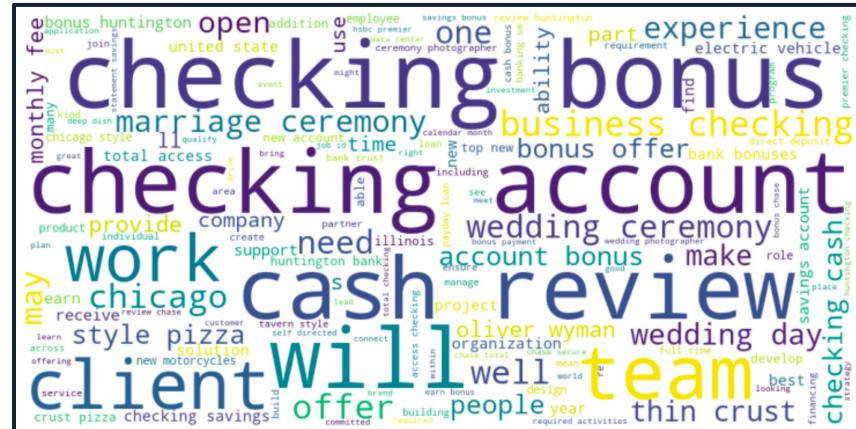
Based on the relevance score and positiveness , **topics 5, 16, 18 and 10 might include the top reasons businesses like the city.**

Text Summarization for representative articles

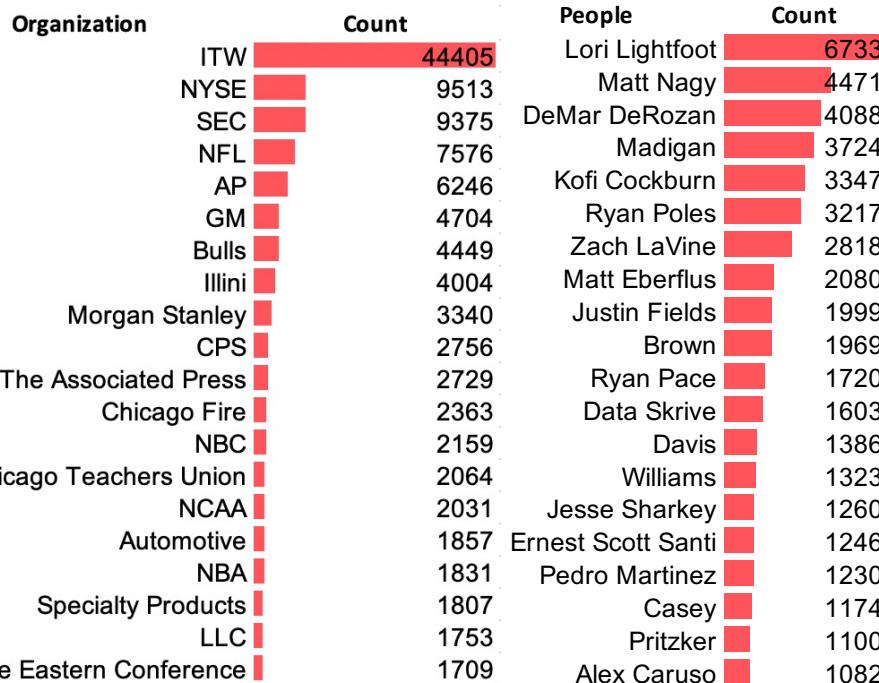
Topic 5	Personnel realted Company announcements; recruiting information	<p>Adyen announces new tech hubs in Chicago and Madrid. The move is a signal of the company's long-term investment in its technology teams. Adyen delivers frictionless payments across online, mobile, and in-store channels. With offices across the world, the company serves customers including Facebook, Uber, Spotify, Casper and Bonobos.</p>
Topic 16	Market reports	<p>The Sterling Bay Scholar Program provides financial and professional supports for one student each academic year as he/she/they explores a two-year education in the life sciences. Jillian Tyson, a sophomore at Chicago State University majoring in Pre Nursing, was selected from a pool of talented candidates for her commitment to a career in pediatric nursing.</p>
Topic 18	Food	<p>ICF Next is looking for a seasoned consumer marketer, thought leader and proven strategist well-versed in the realm of CRM, Loyalty and Digital Marketing. We are looking for the best of the best with a unique blend of talent, experience, expertise and ingenuity.</p>
Topic 10	Loan, Monetary benefits	<p>The global Wine Glass Bottle market size will reach USD million in 2028, growing at a CAGR of % over the analysis period. North America (United States, Canada and Mexico) Europe (Germany, France, United Kingdom, Russia, Italy, and Rest of Europe) Asia-Pacific (China, Japan, Korea, India, Southeast Asia, and Australia) South America (Brazil, Argentina, Colombia and rest of South America) Middle East & Africa (Saudi Arabia, UAE, Egypt, South Africa)</p>
		<p>Taven-style Pizza chefs a bit longer and the crust obtains crispier than New York-style pizza. 4 vertical cuts as well as four horizontal cuts on a rounded pie produces ideal little squares of pizza between, yet little odd-shaped pieces around the edge. Pizano's in the Loophole is a pizzeria in the heart of Chicago.</p>
		<p>Take advantage of the latest Town Bank bonuses, promotions and offers here. Town Bank provides Wisconsin with the resources of a big bank while maintaining the personalized service of a true local community bank. Some popular bank offers include Chase Bank, Discover Bank, TD Bank, Huntington Bank, HSBC Bank and many more.</p> <p>You will be wise by some lenders belonging to the choice within a few minutes, and many may take as much as two company period. Payday advances enhances, installment funds and you may automobile identity signature loans rating exorbitant above and you can will set you back. People who exploit cash advance currency usually for example him or her while they becomes bucks quickly.</p>

How the city/state can attract new businesses:

- (Topic 10) Favorable loan term and checking bonus.** Favorable monetary policies, loan terms, savings, and checking bonuses can help the new business start easier with access to funds and attract new business.
 - (Topic 5) Having large firms and a good industrial ecosystem.** For example, having some headquarter or tech hub of some large firms can attract upstream or downstream companies
 - (Topic 5) Talents.** Good education and living environment can attract more talents, which then makes companies moving to Chicago possible and attractive.
 - (Topic 10) Provide Incentives or tax benefits.**
 - (Topic 16) Develop competitive advantage for key industries and segmentation.**



NER – Identify Organizations and People



Use Spacy to identify organization and person

Filter:

- Filter out outlier topics
- Only keep articles having topic weight > 0.9 to make sure they are related to the topics

Tools:

- Spacy is used to find organization and people

Result:

- Top 20 organizations and people are shown left
- Top 20 organizations contain some firms, sports teams, press, and security exchanges.
- Top 20 people identified are mainly officials and athletes

Targeted Sentiment Analysis -Organizations

Steps for targeted sentiment analysis

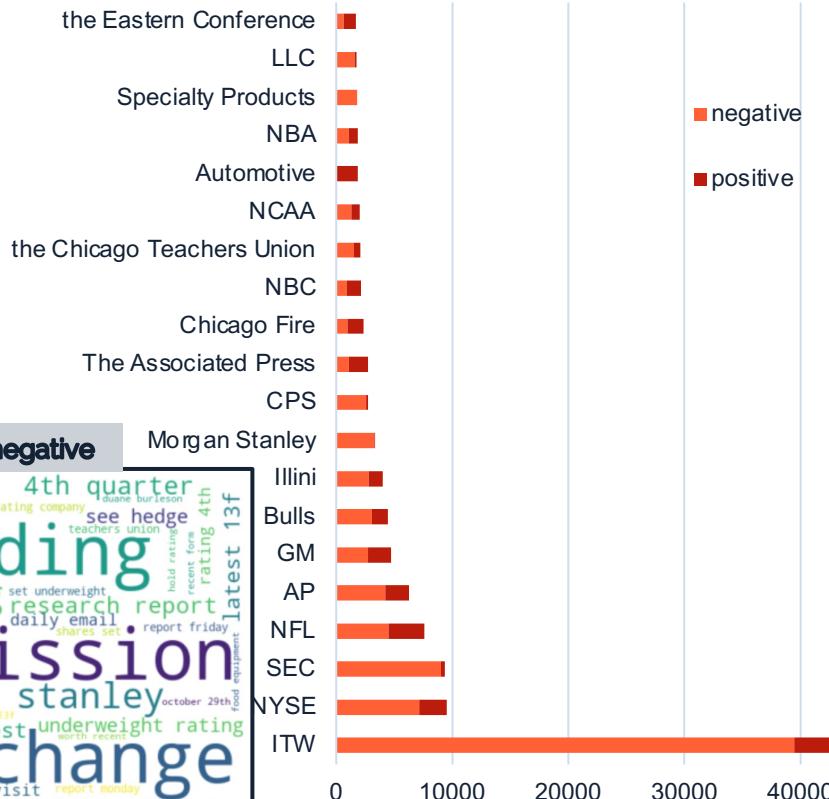
- Identify organizations and people
 - Extract related sentences
 - Classify the sentiment of the sentence
 - Use a pre-trained logistic regression model
 - Use the aspect-based-sentiment-analysis package
 - Analyze the related sentences

Result:

The articles mentioned in these organizations are mostly SEC filings or Company reports.

- The negative sentiment is mainly caused by **bad operating results, underweight ratings and other illegal operations** like Insider trades.

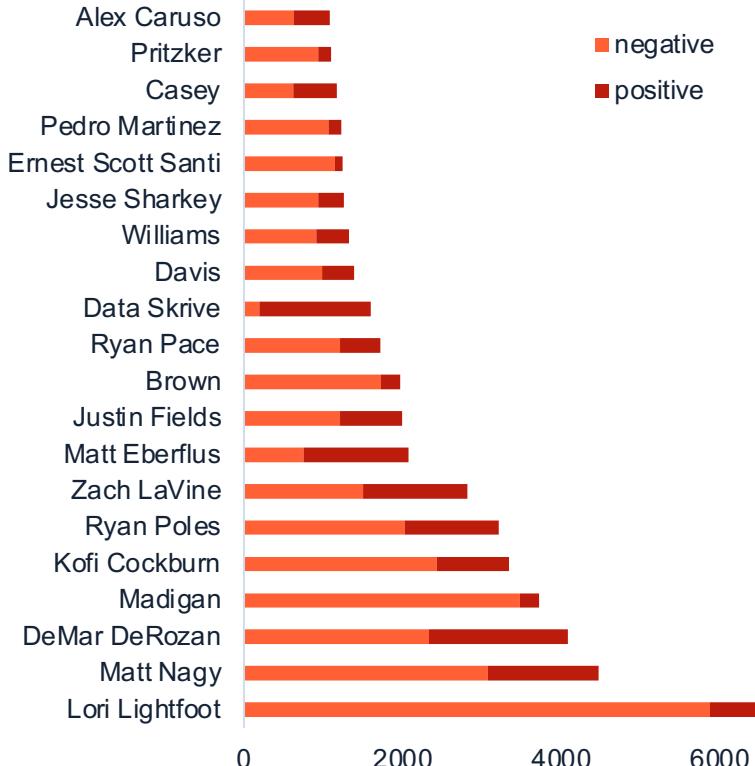
➤ The positive sentiments are from **ports games and the great earning results**



Targeted Sentiment Analysis - People

People who have the majority of negative comments and the topics they are complained about

- **Lori Lightfoot** (Mayor of Chicago): Teachers union; Remote Learning; Public schools; Wrong blame
- **Pritzker** (Governor of Illinois): Mask mandate; School district; Income tax
- **Michael Madigan** (former speaker of the Illinois House of Representatives): Court filing; Political power; indictment;
- **David Brown** (Superintendent of the Chicago Police Department): Gun; Murder; Felony
- **Pedro Martinez** (CEO of Chicago Public Schools): Public Schools; Instructions; Teachers union
- **Jesse Sharkey** (labor leader): Teacher union; Accusing



Conclusion

Key reasons for population decline

- Residents are dissatisfied with some of the state and city officials, regulations, social security terms, laws and public policies. Especially tax, public school policies, and public service are driving people out of the city.
- Remote learning and work from home. People do not need to live in Chicago at a higher expense. Also, after the impact of the pandemic dying out, the rent and mortgage rates went up.
- Leave of large companies.
- Residents are worried about public safety. With the rising crime rate, people complained about the police department and the officers..

What people like about Chicago

- Sports: There are plenty of sports teams and events in Chicago, attracting many sports fans.
- Dining: Chicago has world-class restaurants and the best pizza
- Career opportunities: Chicago has a lot of large firms and great opportunities.

Topic summary

- **Education:** public school, teachers union
- **Law:**
 - Injury lawyer
 - family lawyer
- **Crime:**
 - shooting, police report,
 - alcohol, drug, rehab
- **Sports**
- **Business:**
 - holdings
 - loan
 - market reports
 - Company announcements, Recruiting information
- **COVID:** covid, real estate
- **Public policies/politics**
- **Food & Restaurant**
- **TV show**
- **Agriculture**

How to make Chicago more attractive

Attract Business:

- Talents. High-skilled workforce: Help the students seeking education in Chicago to find jobs and stay in Chicago. Providing benefits or deductions to help them settle down.
- Provide Incentives or tax benefits to businesses.
- Develop competitive advantage for key industries and segmentation.
- Favorable loan term and checking bonus
- Introduce large firms to the city and build up a good industrial ecosystem.

Attract Residents:

- Make sure people's rights and benefits are protected.
- Ensure accessibility to good education resources like public schools and colleges.
- Help the economy and residents to recover from the pandemic.
- Have benefits on tax or other policies to attract and retain large companies.
- Pay attention to public safety problems and make residents feel safe.
- Provide public services matching with tax level
- Increase the benefits of the social security program

Thanks!

GitHub Link

https://github.com/crystal997/Projects/tree/master/NLP_Crystal_Xu