

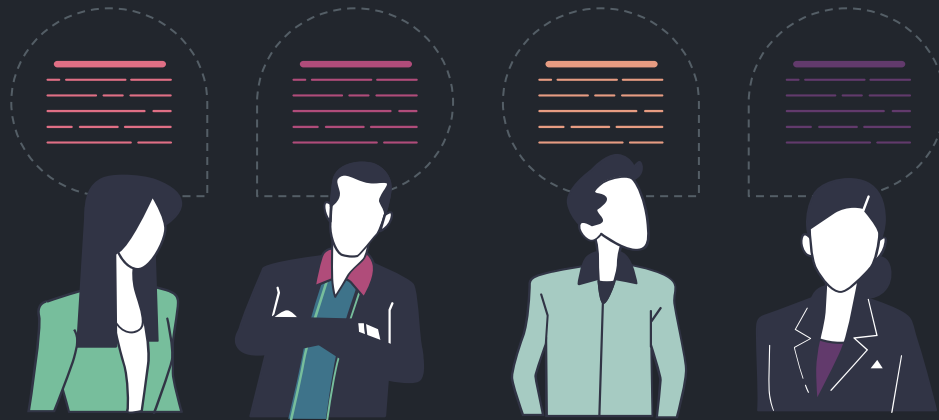
An isometric illustration of a city skyline with various skyscrapers in shades of blue and teal. The buildings have different architectural styles, including some with helipads, antennas, and flags. A small helicopter is flying in the center. The background is a solid dark blue.

# ILLINOIS: IN OR OUT?

Meenu Ravi  
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NLP

## Motivation

Examining Illinois' migration patterns can help policy makers better understand progress on important public policy issues



## EXECUTIVE SUMMARY



### Problem

Illinois policy makers are looked to make this state a safe and welcoming place for businesses and residents by addressing social and economic problems.



### Mission

For businesses to thrive and residents to feel safe, the policy makers should identify which areas of social and economic issues to focus on



### Solution

By examining news articles, a committee was created to address 3 major areas:

- health safety
- Crime rates
- economic/racial inequality



### Impact

By working to address these problems, Illinois can become a cosmopolitan center for financial conglomerates, scholars, tourists and artists

# METHODOLOGY

## STEP 1

### Examine Data

439,835 articles  
from past year  
about Illinois

## STEP 2

### Clean Data / Filtering

Clean the dataset to pull only  
relevant articles (~250 articles)

- Stop words removal
- Keyword search
- Duplicate removal

## STEP 3

### Topic Modeling

Identify what major  
topics are in the  
relevant articles

- LDA

## STEP 4

### Sentiment Analysis

Analyze articles based on positive and negative  
sentiment to see why people/businesses are moving  
out of Chicago

- Train models: Logistic Regression, Naive Bayes, SVM

## STEP 5

### NER Sentiment Analysis

Analyze sentiment around  
major businesses and people  
to see how businesses can  
thrive in Illinois

## STEP 6

### Recommendation

Based on analysis above, identify actionable  
tasks the policy makers can do to attract  
residents and curb population decline



## TOPIC DETECTION

# Why are residents and business migrating in and out of Illinois?

### LDA Topic Modeling:

Helps find topics an article belongs to based on the frequency of words in it

15 topics visualized using LDA



BLM  
Movement

10

PC2

11

Home Safety

2

Police/  
Fire Dept  
Action

PC1

4

Healthcare/  
COVID

13

Crime/ Shooting

# SENTIMENT ANALYSIS

## Customized Method:

- **Hand labeled** ~100 sentences from ~250 articles for training set as
  - 0= Negative
  - 1=Positive
  - 2=Neutral
- Ran **Countvectorizer**
- **Trained:**
  - Logistic Regression
  - Naïve Bayes
  - SVM
- **Skimmed** to see which was best on test set:  
*Logistic Regression*
- **Divided** sentences into positive and negative sentiment
- **Customized** by filtering certain words
- **Created word clouds** for positive and negative sentiments

## Findings:

- Positive Sentiment centered around
  - Police action
  - BLM Movement
  - Peoria, Illinois
  - Colleges/Enrollment
  - Vaccines
- Negative Sentiment centered around:
  - Shooting
  - Police action
  - Fires
  - Hospitalization

## Positive Sentiment



## Negative Sentiment



# NER SENTIMENT ANALYSIS

## Method:

- Ran spacy NER on ~250 articles
- **Identified** ORG and PERSON using SPACY
- For both ORG and PERSON:
  - Ran NLTK **Vader Sentiment analysis**
  - If compound score  $\leq -0.05$ : Negative
  - If compound score  $\geq 0.05$ : Positive
  - **Divided** sentences into positive and negative sentiment
  - **Created word clouds** for positive and negative sentiments





NER POSITIVE  
SENTIMENT

### Organizations associated with a positive Sentiment



## Findings:

- Positive Sentiment centered around
  - ACFR/ Federal Register: official journal of the federal government of US and the Administrative Committee of the Federal Register
  - UChicago Medical Center
  - Amazon
  - North Illinois Food Bank
  - Certain government officials

Government Officials associated with a positive Sentiment



NER NEGATIVE  
SENTIMENT

### Organizations associated with a negative Sentiment



## Findings:

- Negative Sentiment centered around
  - Police Department
  - New Companies:
    - Chicago Sun
    - NBC
    - CBS
    - Chicago Tribune
  - Apple Store
  - UChicago

Government Officials associated with a negative Sentiment

Verfolgungsjagd  
Todd  
Brown  
Toddler  
Med  
Bitte

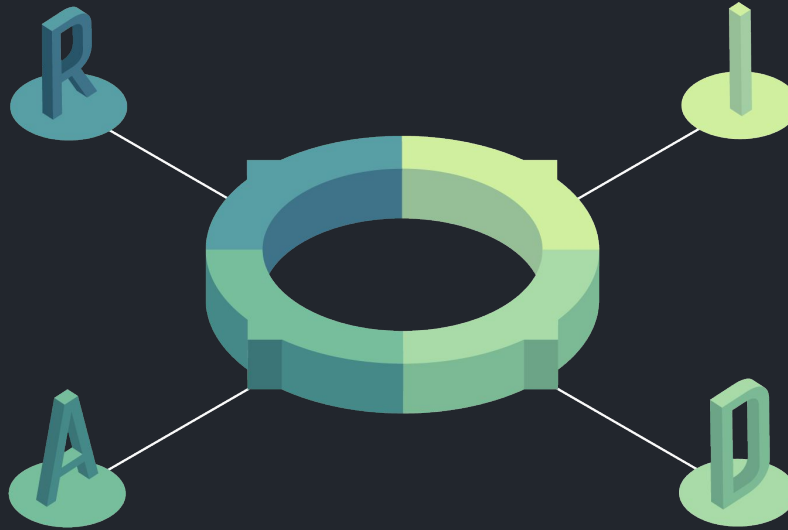
# ACTIONABLE RECOMMENDATIONS

## RESULTS

By developing changes to address the issues and areas from analysis, residents and businesses can immigrate here for education, healthcare and attractions and this change can be reflected in news articles

## ADDRESS

Focusing on how we can curb emigration by focusing on improving the issues of Illinois will automatically help immigration



## ISSUES/ AREAS

- Racial Inequality
- Healthcare
- Crime
- Education/ Attractions
- News Articles

## DEVELOPING CHANGES

**Racial Inequality:** Introduce these topics in elementary schools, income equality, have hiring quotas

**Healthcare:** mandatory masks increase budget for patient care, increase pay and shorten staff

**Crime:** Strengthen police training, increase police recruitment, gun control laws