Building Large Language Model Applications

Introduction to Natural Language Processing

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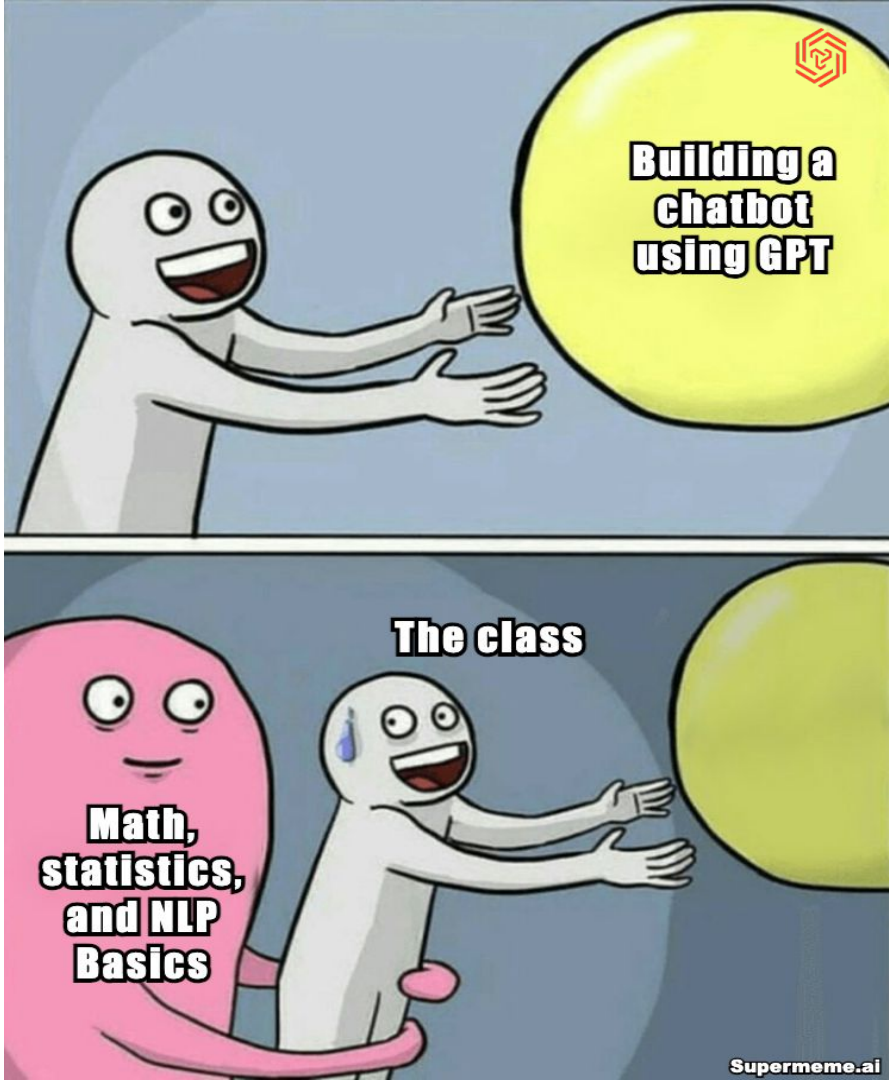
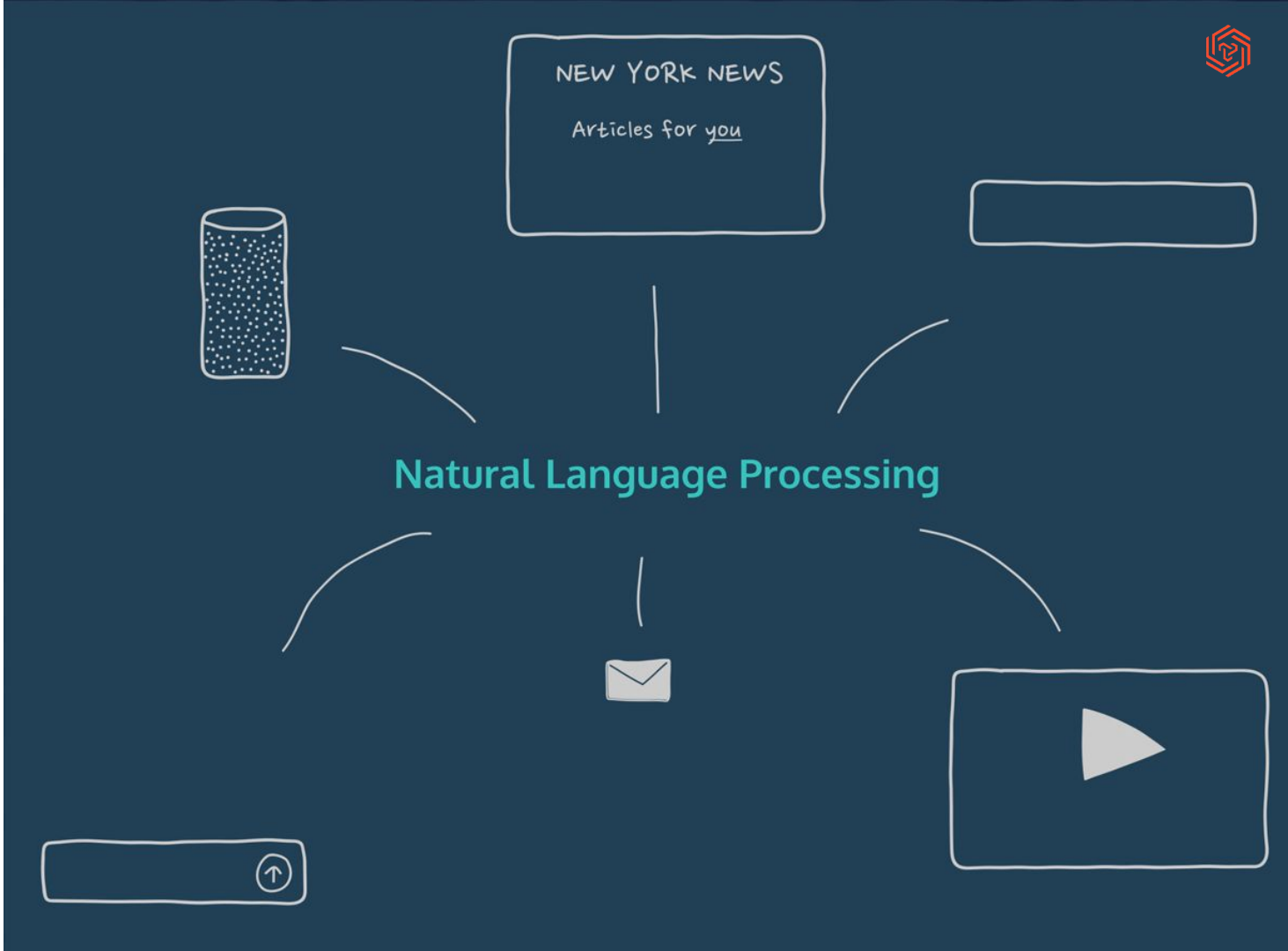


Learning outcomes

- NLP Overview
- History of NLP
- Applications of NLP
- Conclusion

We live in a world of NLP



What is NLP from the experts' perspective?

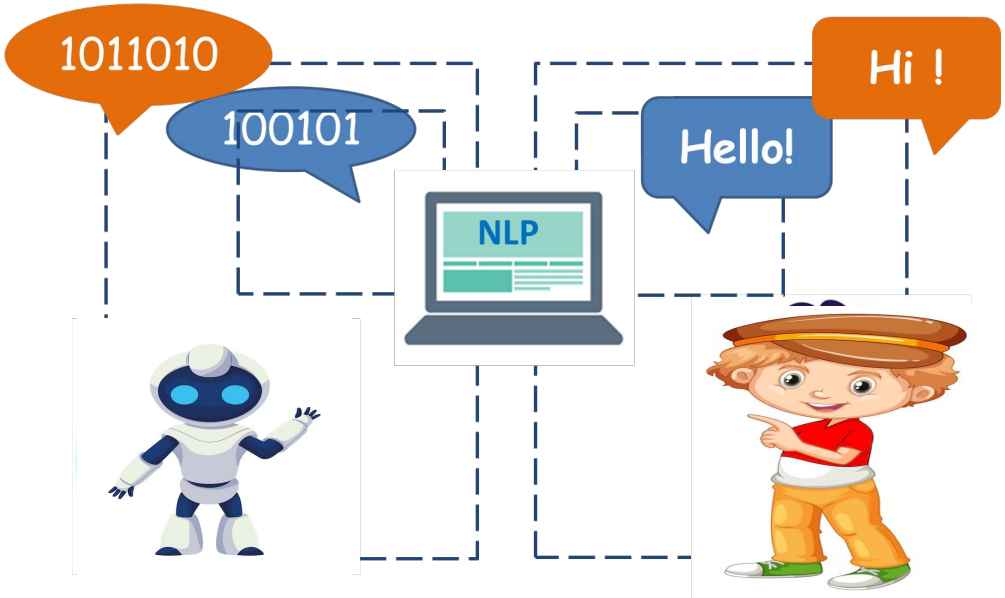
"Natural language is the most important part of artificial intelligence." **John Searle**

"Natural language processing is a cornerstone of artificial intelligence, allowing computers to read and understand human language, as well as to produce and recognize speech." **Ginni Rometty**

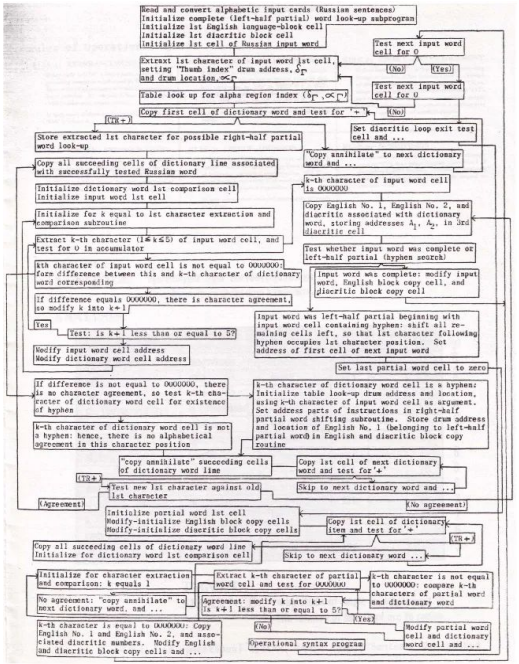
"Natural language processing is one of the most important fields in artificial intelligence and also one of the most difficult." **Dan Jurafsky**

What is NLP?

- **NLP process information** contained in a **natural language text**
- It deals with the interaction between **human** and **computer** using **natural language**



History of NLP?



A FLOWCHART OF PART OF THE IBM'S DICTIONARY LOOKUP PROCEDURES.

1950s

```
 Welcome to
                EEEEEE  LL      IIII   ZZZZZZ   AAAAA
                EE      LL       II       ZZ   AA   AA
                EEEEE   LL       II     ZZZ    AAAAAAA
                EE      LL       II    ZZ      AA   AA
                EEEEEE  LLLLLL  IIII ZZZZZZ    AA   AA

  Eliza is a mock Rogerian psychotherapist.
  The original program was described by Joseph Weizenbaum in 1966.
  This implementation by Norbert Landsteiner 2005.


ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```

https://en.wikipedia.org/wiki/ELIZA

1960s

```
(defrule 52
 if (site culture is blood)
  (gram organism is neg)
  (morphology organism is rod)
  (burn patient is serious)
 then .4
  (identity organism is pseudomonas))
Rule 52:
 If
  1) THE SITE OF THE CULTURE IS BLOOD
  2) THE GRAM OF THE ORGANISM IS NEG
  3) THE MORPHOLOGY OF THE ORGANISM IS ROD
  4) THE BURN OF THE PATIENT IS SERIOUS
 Then there is weakly suggestive evidence (0.4) that
  1) THE IDENTITY OF THE ORGANISM IS PSEUDOMONAS
```

1970s and 80s

Gemini
1.5 Flash

write a poem on AI in four lines

Here's a poem on AI in four lines:

A mind of metal, thoughts take flight,
Learning fast, both day and night.
Solving problems, complex and grand,
AI's future, close at hand.

I hope this resonates with you! Let me know if you'd like a different style or theme.

Today

Go beyond the keyword matching

- Identify the **structure** and **meaning** of words, **sentences, texts** and **conversations**
- **Deep** understanding of **broad** language
- NLP is all around us

Knowledge requirements for Machine

Phonetics and Phonology: Knowledge about linguistic sounds

Morphology: Knowledge of the meaningful components of words

Syntax: Knowledge of the structural relationships between words

Semantics: Knowledge of meaning

Pragmatics: Knowledge of the relationship of meaning to the goals and intentions of the speaker

Discourse: Knowledge about linguistic units larger than a single utterance

Applications of NLP

What are the NLP applications you interact with daily?

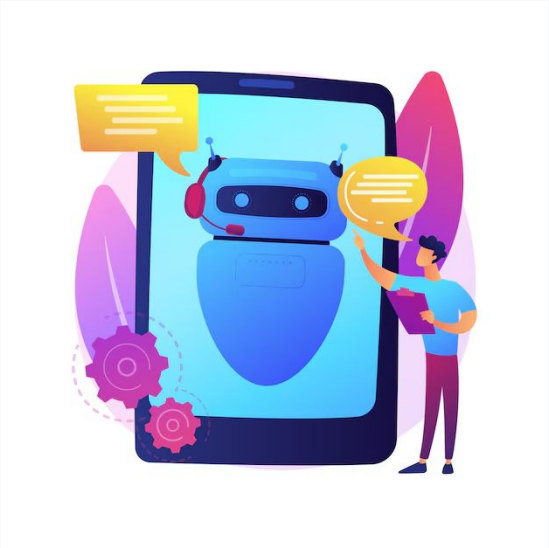
- Search engines
- Google Translate
- Social Media
- Job Seeking
- ...

Most ideas stem from Academia, but big guys have (several) strong NLP research labs (like Microsoft, Yahoo, AT&T, IBM, etc.)

Applications

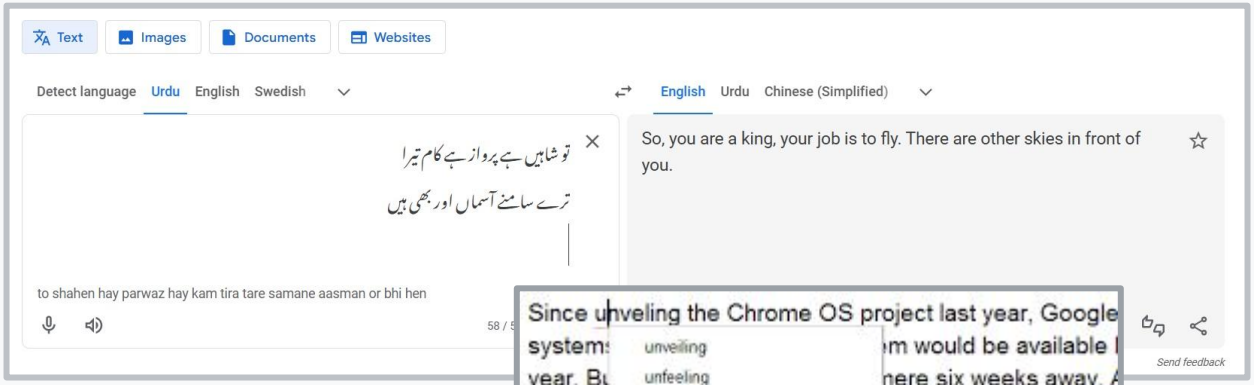
Conversational agents contains:

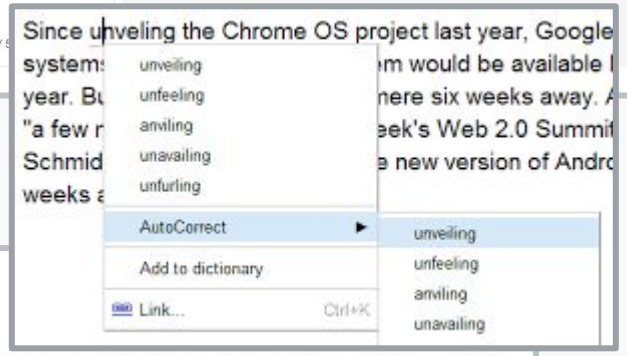
- Speech recognition
- Language analysis
- Dialogue processing
- Information retrieval
- Text to speech



Applications

- Machine Translation
- Summarization
- Auto Completion
- Spell Correction





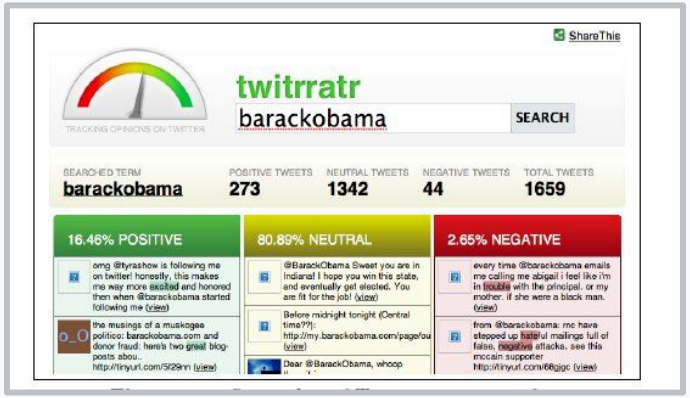
PDF SUMMARY

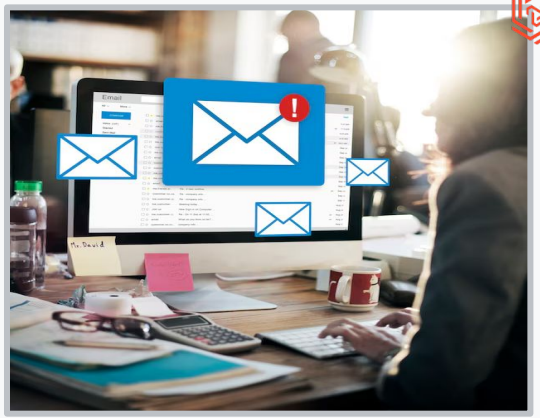
This study analyzes public sentiment towards AI tools using 500,000 tweets from January to March 2023. Several NLP models, including BERT, RoBERTa, DistilBERT, Sci-BERT, and VADER, were used for sentiment classification (positive, negative, neutral). RoBERTa achieved the highest accuracy (95.36%), while other models showed accuracy above 92%. The research provides insights into public opinion on AI tools during this period.

Applications

- Sentiment Analysis
- Text Classification

Many More...





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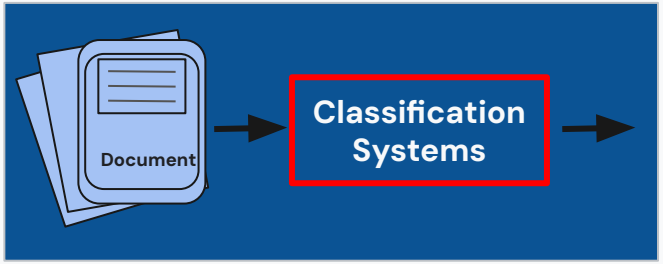

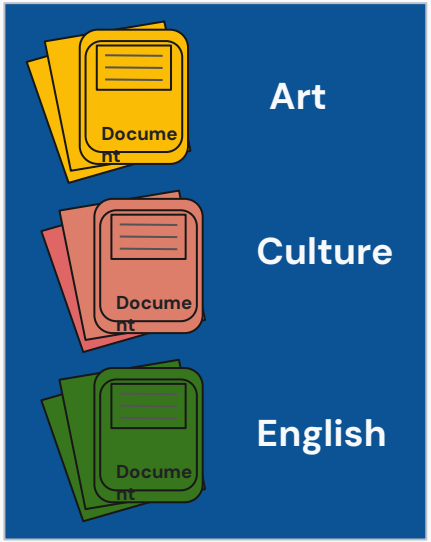

Conclusion

What is NLP?

Key challenges and applications