EasySport Understanding

Artificial Intelligence final project

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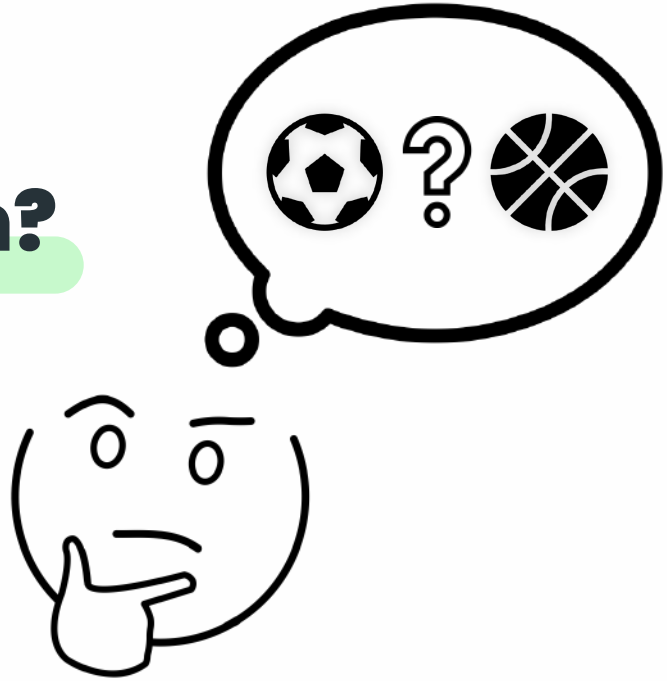
Outline

1 Introduction

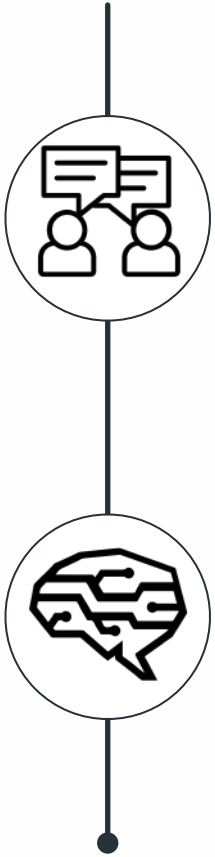
What is the problem?

People found it difficult to follow new sports due to a lack of knowledge



Solution

An application where people can improve their knowledge about sports exploiting common knowledge retrieved from the web



Idea

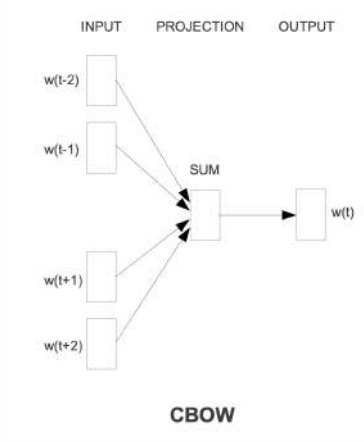
Distributional Representations

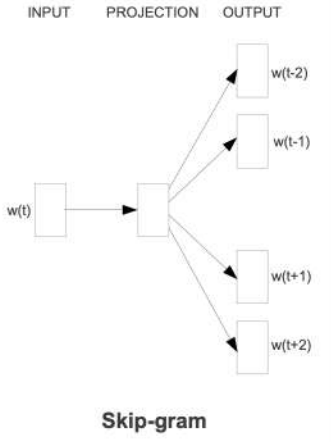
Represent words by n-dimensional dense vectors derived from the usage of words in some text corpus

Background Work

Efficient Estimation of Word Representations in vector Space

"We propose two novel model architectures for computing continuous vector representations of words from very large data sets"





Background Work

Compass-aligned Distributional Embeddings for Studying Semantic Differences across Corpora

"We present a general framework to support cross-corpora language studies with word embeddings, where embeddings generated from different corpora can be compared to find correspondences and differences in meaning across the corpora"

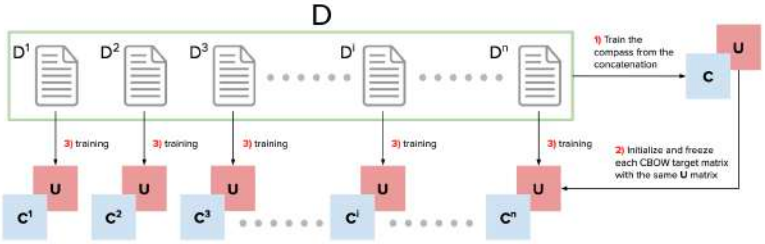


Figure 5: The CADE model.

Methodological Approach

Reddit

pushshift.io

Corpora

NER & NEL

Final Corpora

Word2Vec

Embeddings

CADE

Aligned Embeddings

Web Application

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Dataset

Dataset

Subreddits

r/soccer

r/nba

Seasons

- 2015/16 (31/07/2015 - 31/07/2016)
- 2017/18 (31/07/2017 - 31/07/2018)
- 2019/20 (31/07/2019 - 31/11/2020)

Preprocessing

- **Punctuation** and **Stop Words** removal
- **Emoji**:

  Diego Costa Amazing Goal!🔥 → Diego Costa Amazing Goal **fire**

- **Numbers**:

  The Golden State Warriors **(7-6)** defeat the Los Angeles Lakers **(11-4)** → The Golden State Warriors defeat the Los Angeles Lakers

- **Acronyms**:

  Curry in tonight's win: 8/25 **FG**, 5/20 from 3, 25 points → Curry tonight win **field goals** points

3

NER & NEL

NER & NEL

NER & **NEL** using **DBpedia Spotlight** with **confidence** equal to 0.6

For each entity were retrieved and saved (if present):

- Its **foaf:name** in English
- Its **dbo:abstract** only first sentence
- Its **rdf:type** (most specific)

NER & NEL

8859

Total entities for **soccer**

NER & NEL

5736

Total entities for **basketball**

Issues

- **Ambiguity** and **polysemy**:

  Antonio Conte signs year deal Chelsea → **antonio_del_pollaiolo** conte signs year deal chelsea_f.c.

  germany vs **italy** friendlies → gianluigi_buffon play game **italy_national_football_team** tonight all-time record azzurri

- **Missed entities**:

  Diego Costa **red card** incident → diego_costa **red card** incident

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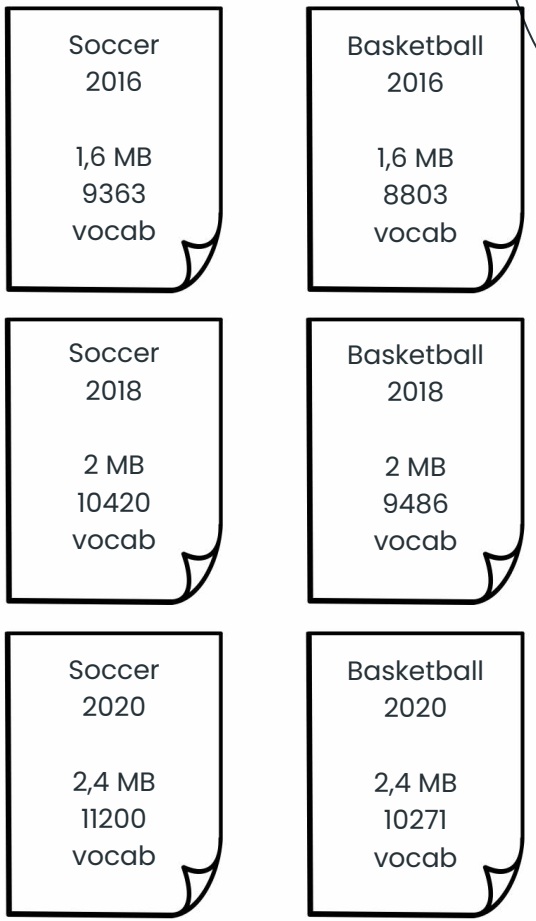
Word Embeddings

Word Embeddings

For each sport and season (plus sports in general):

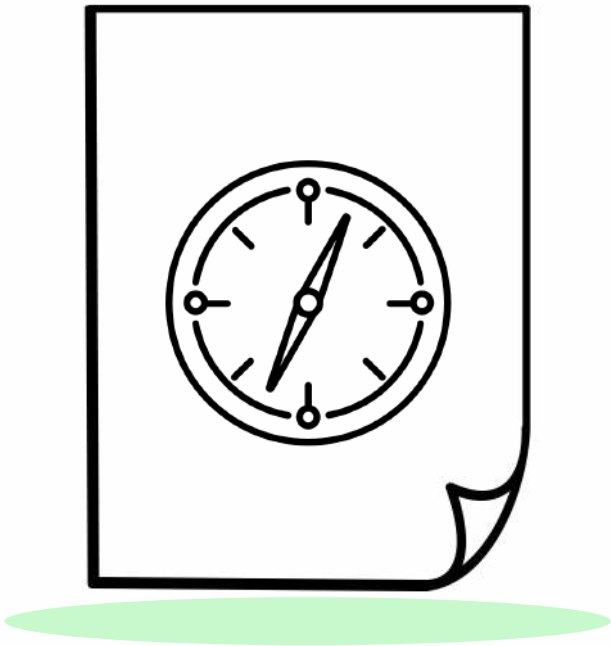
- Word Embeddings using **Word2Vec**



Word Embeddings

For each sport and season (plus sports in general):

- Word Embeddings using **Word2Vec**
- Embeddings **alignment** with **CADE**



Evaluation

Without a ground-truth database, the obtained embeddings were evaluated using some analogies and our knowledge

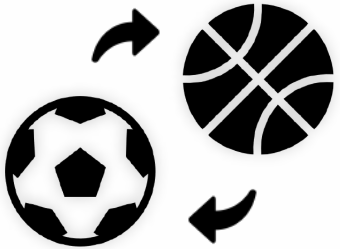
Evaluation was based on different concepts:

- Teams
- Players
- Coaches
- Moves
- Awards

Evaluation

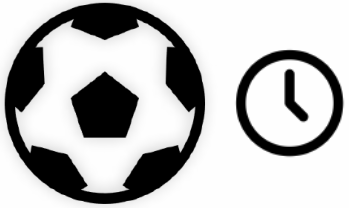
Intra-Corpora Analogies

- Similar entities within the same corpus
- To expand user's knowledge about a known sport



Cross-Corpora Analogies

- Similar entities between two different corpus
- To understand a new sport



Short-term Meaning Shift

- To study the evolution of an entity over different seasons

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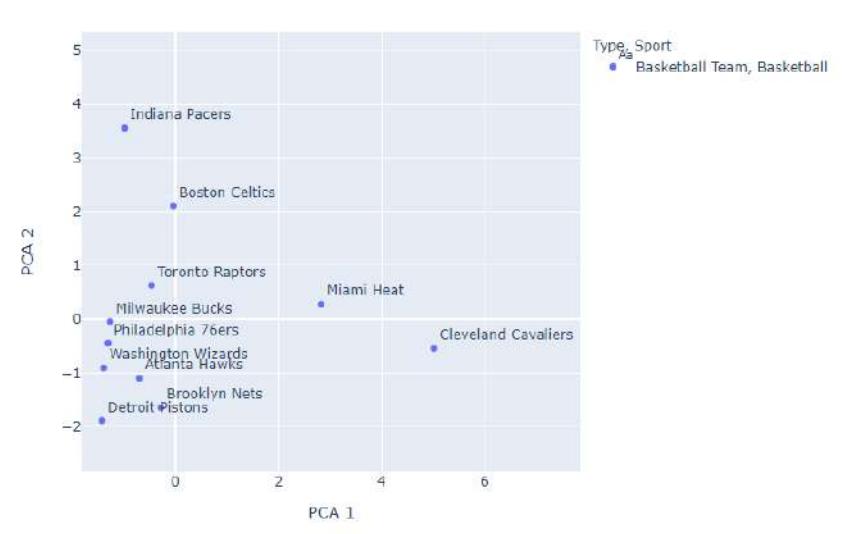
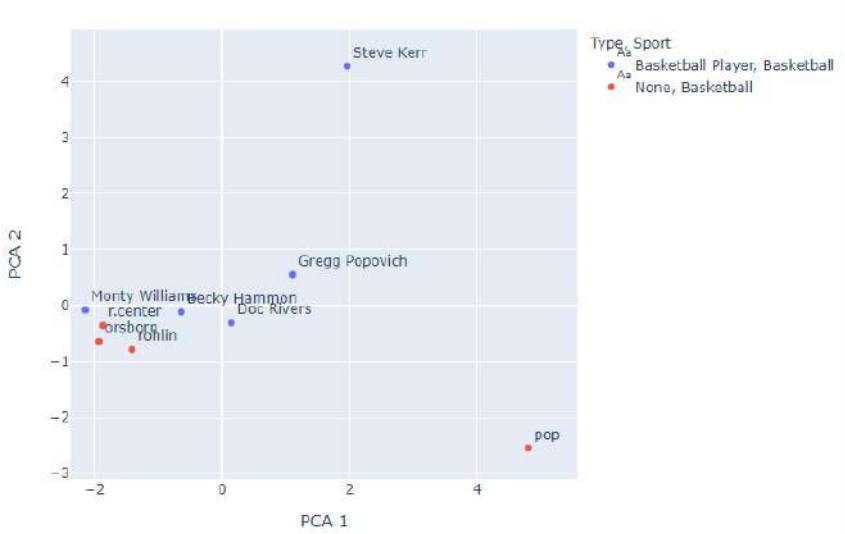
Results

Intra-Corpora Analogies

Most similar to Boston Celtics



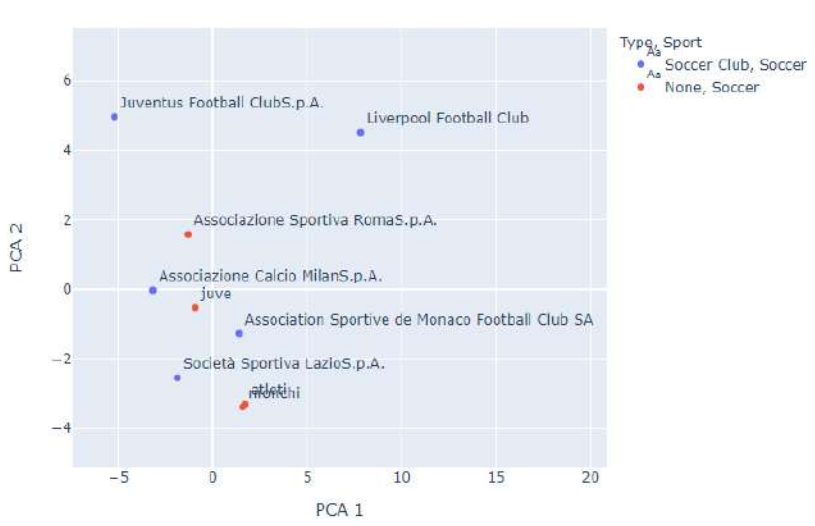
Most similar to Steve Kerr - GSW + Spurs



Intra-Corpora Analogies

Most similar to José Mourinho

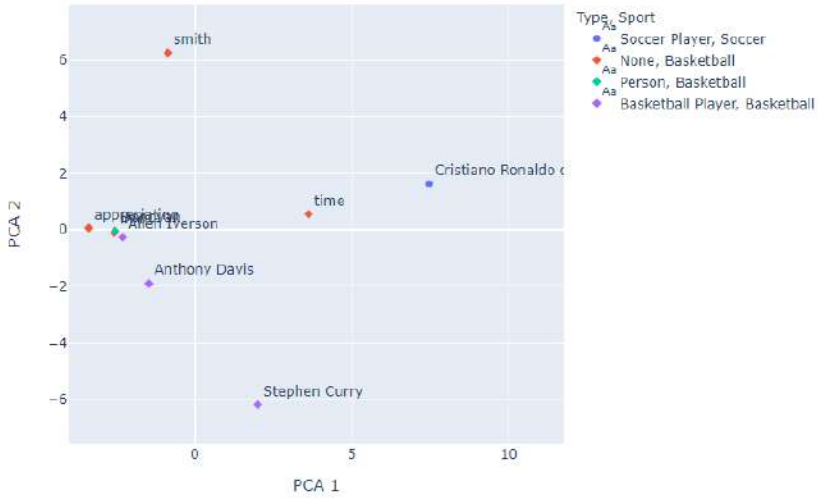
Most similar to F.C. Liverpool - EPL + Serie A



Cross-Corpora Analogies

Stephen Curry in Soccer

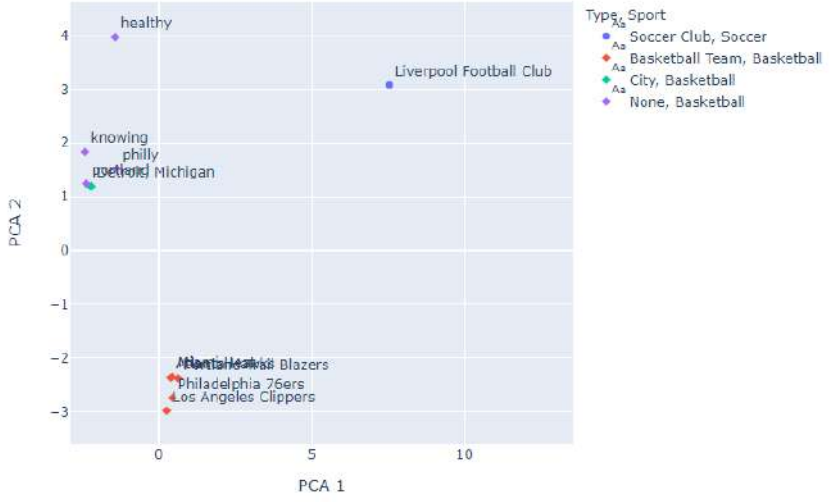
Cristiano Ronaldo in Basketball



Cross-Corpora Analogies

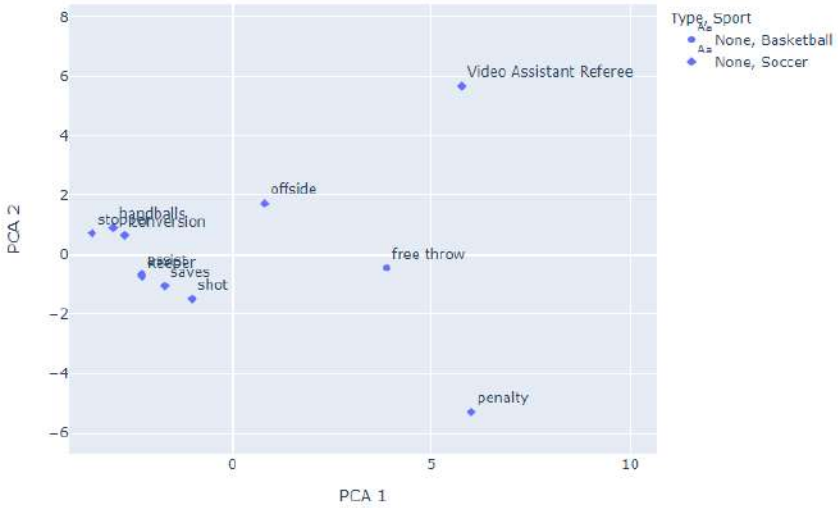
Los Angeles Lakers in Soccer

F.C Liverpool in Basketball

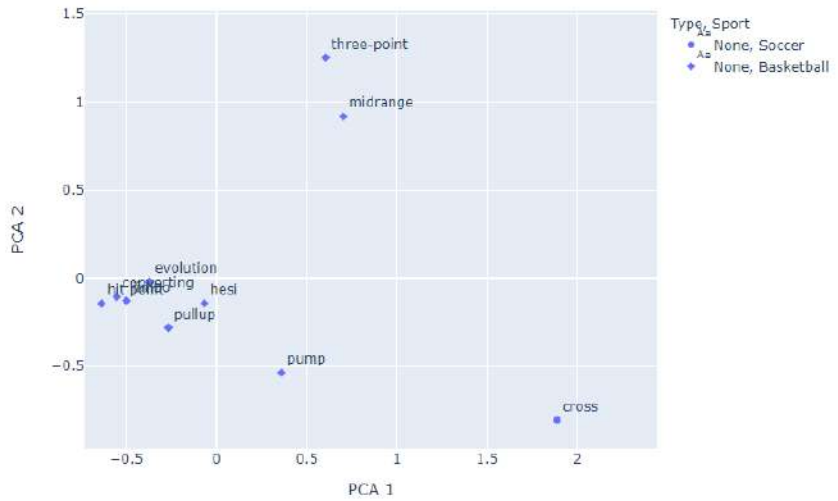


Cross-Corpora Analogies

Free throw in Soccer



Cross in Basketball

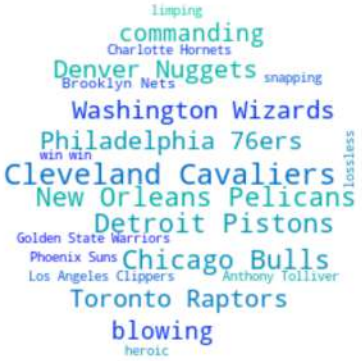


Short-term Meaning Shift

Cleveland Cavaliers in 2016

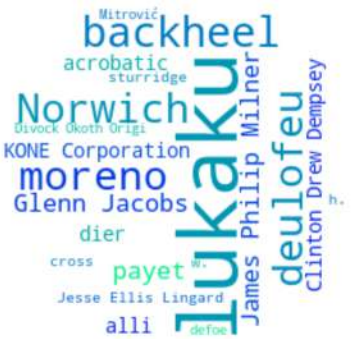
Cleveland Cavaliers in 2018

Cleveland Cavaliers in 2020

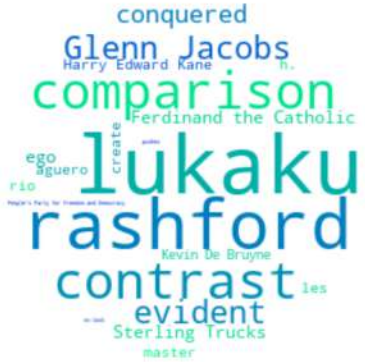


Short-term Meaning Shift

Lukaku in 2016



Lukaku in 2018

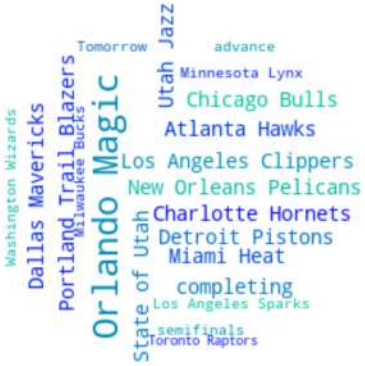


Lukaku in 2020

Short-term Meaning Shift

Orlando Magic in 2016

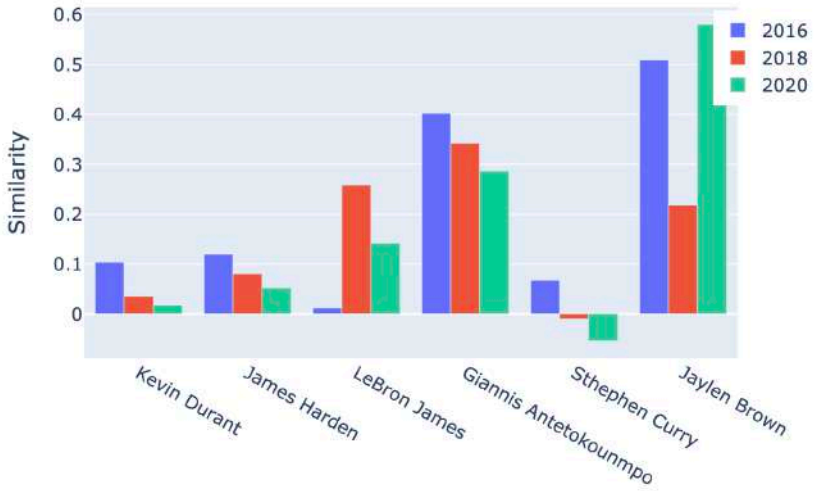
Orlando Magic in 2018



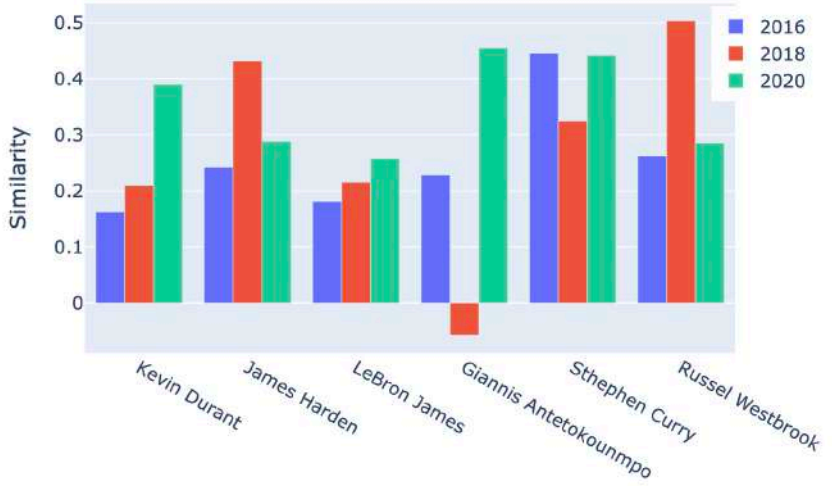
Orlando Magic in 2020

Temporal Analogies

Similarity with Boston Celtics

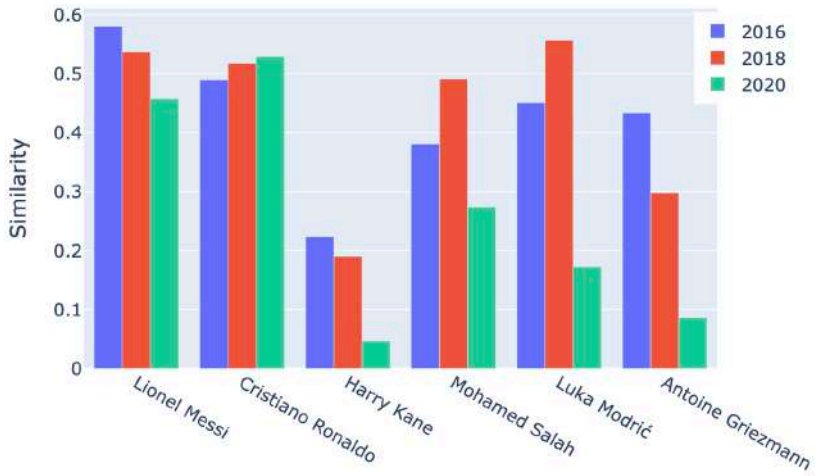


Similarity with MVP

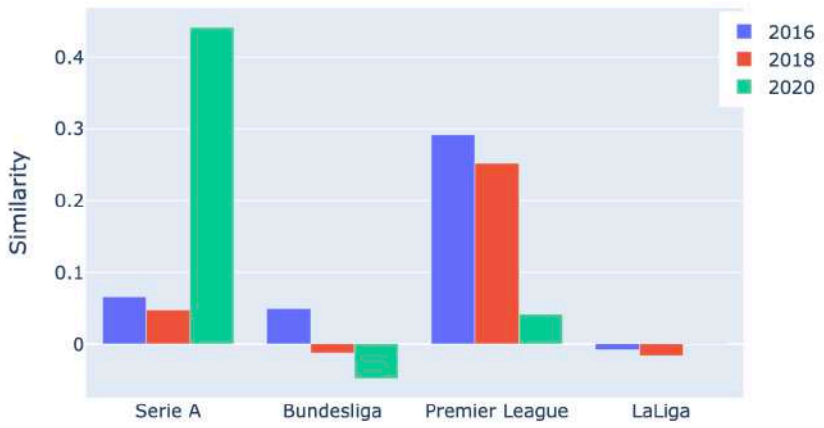


Temporal Analogies

Similarity with Ballon d'Or



Similarity with Romelu Lukaku



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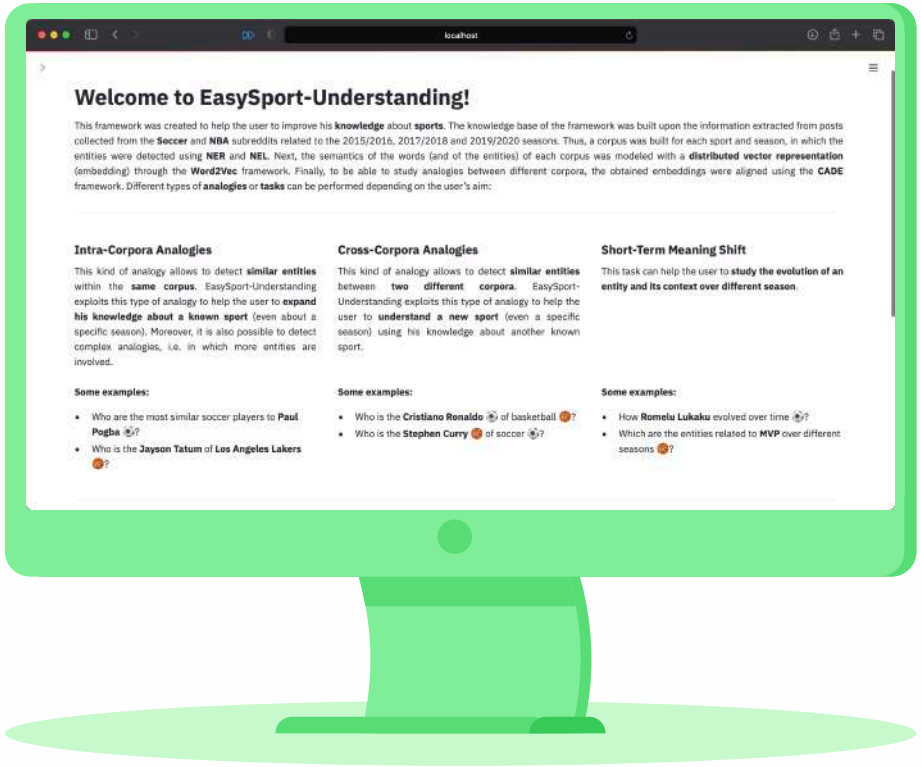
Web Application

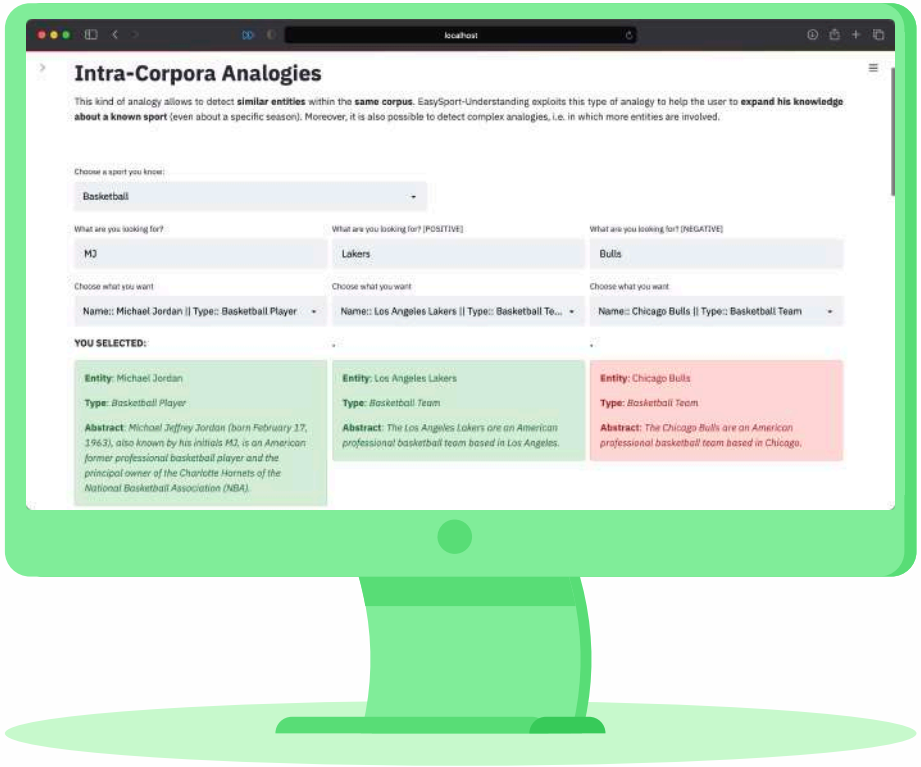
Application

- Python
- **Streamlit** framework



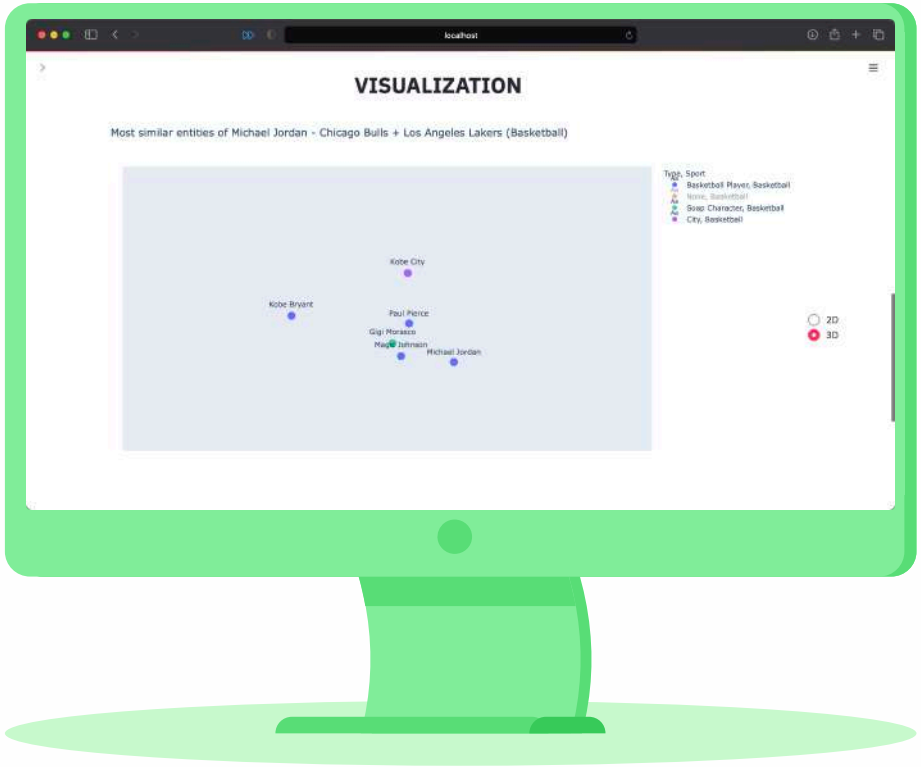
Intra-Corpora

- Choose a **sport**
- Choose an **entity**:
  - Optional **positive** entity
  - Optional **negative** entity
- Entities' **info** are shown



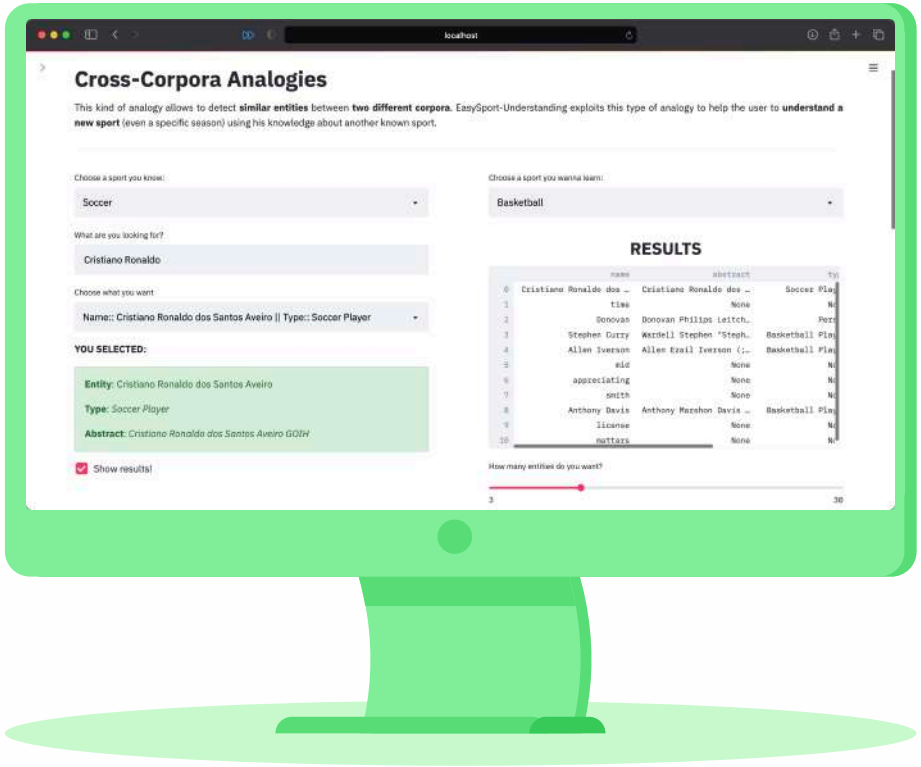
Intra-Corpora

- Results are shown in a **table**
- **2D** Visualization
- **3D** Visualization



Cross-Corpora

- Choose a **known sport**
- Choose an **unknown sport**
- Choose an **entity**
- Entity **info** are shown



Cross-Corpora

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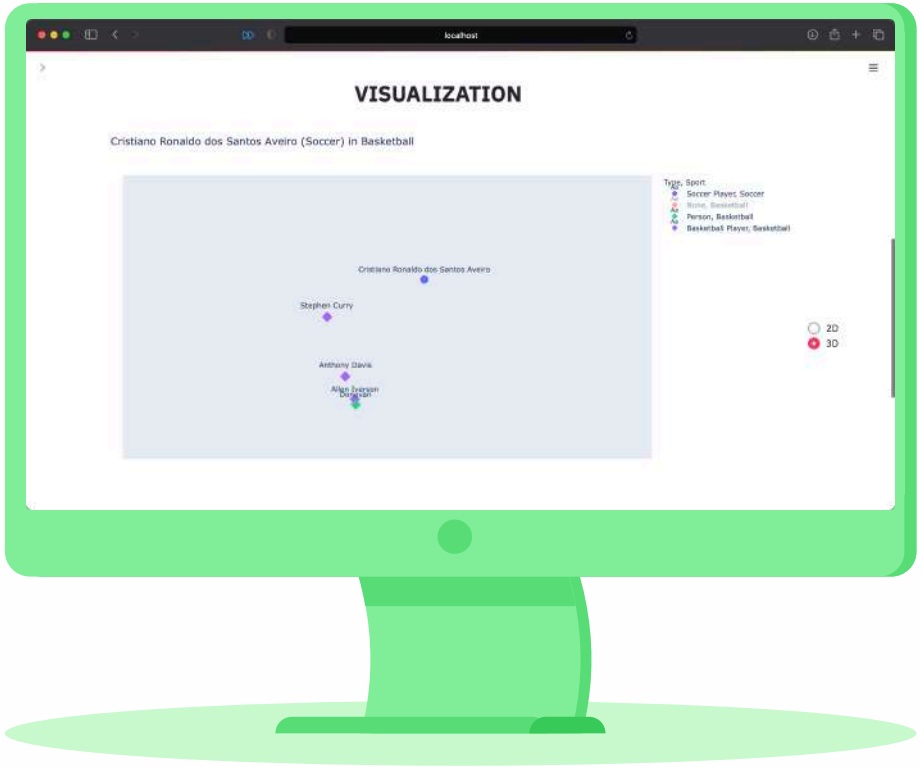
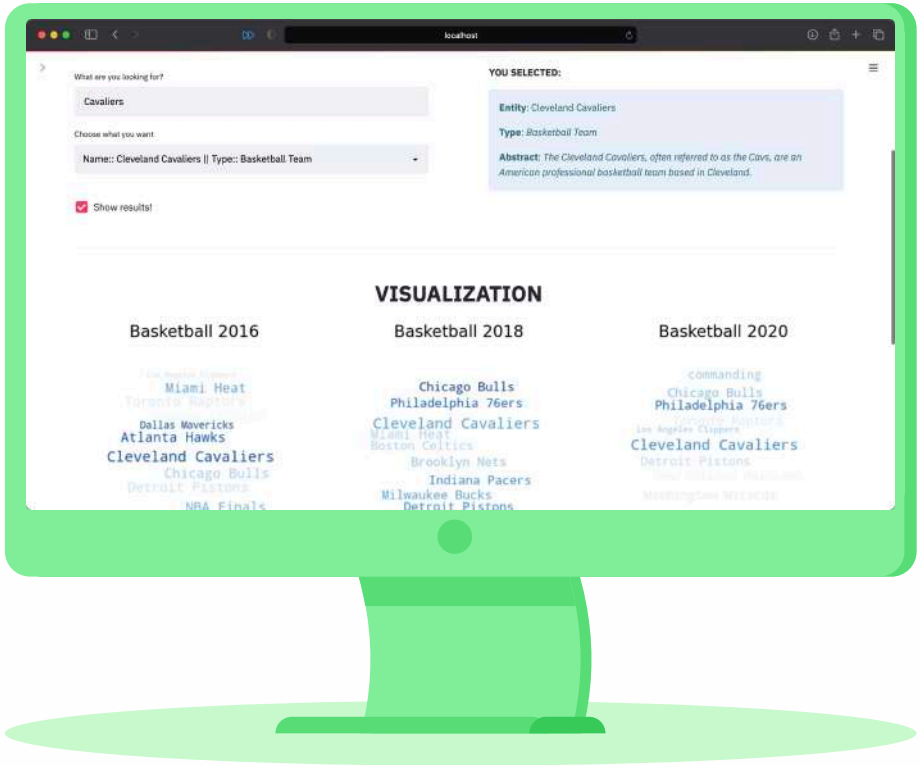


Meaning-shift

- Choose a **sport**
- Choose an **entity**
- Entity' **info** are shown
- **Word Cloud** visualization



7

Conclusions

Conclusions

Considerations

- Good results but not optimal, ambiguity is the main problem
- Low quality sources
- Missing entities

Future studies

- More sports
- Test other approaches
- Better NER & NEL (different techniques or confidence)

References

- Mikolov, Tomas, et al. "Efficient estimation of word representations in vector space." *arXiv preprint arXiv:1301.3781* (2013).
- Bianchi, Federico, et al. "Compass-aligned Distributional Embeddings for Studying Semantic Differences across Corpora." arXiv preprint arXiv:2004.06519 (2020)

Thank you!

Let’s try a demo!