

Natural Language Processing

Introduction to natural language processing

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What is natural language processing?

- **Natural language processing** develops methods for making human language accessible to computers.
- Some well-known example applications are web search, machine translation, and chatbots.
- These diverse applications are based on a common set of ideas from algorithms, machine learning, and other disciplines.

Question answering

Which Stanford University alumna co-founded the educational technology company Coursera?

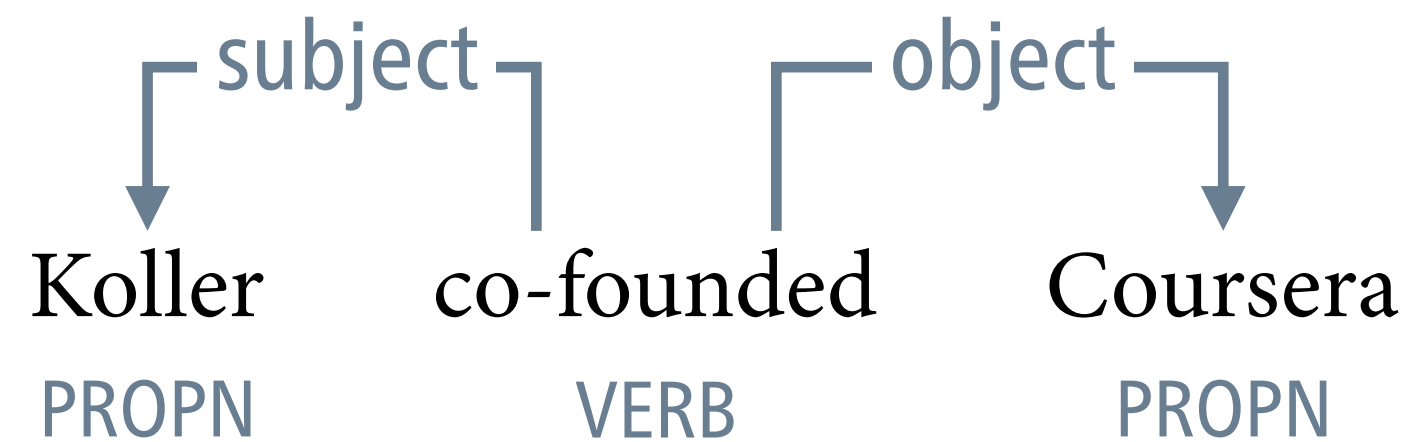


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[SPARQL query against DBPedia](#)

```
SELECT DISTINCT ?x WHERE {  
  ?x dbp:education dbr:Stanford_University.  
  dbr:Coursera dbp:founder ?x.  
}
```

Linguistic representations



dbr:Coursera dbr:founder dbr:Daphne_Koller

End-to-end neural networks



You

Which Stanford University alumna co-founded the educational technology company Coursera?



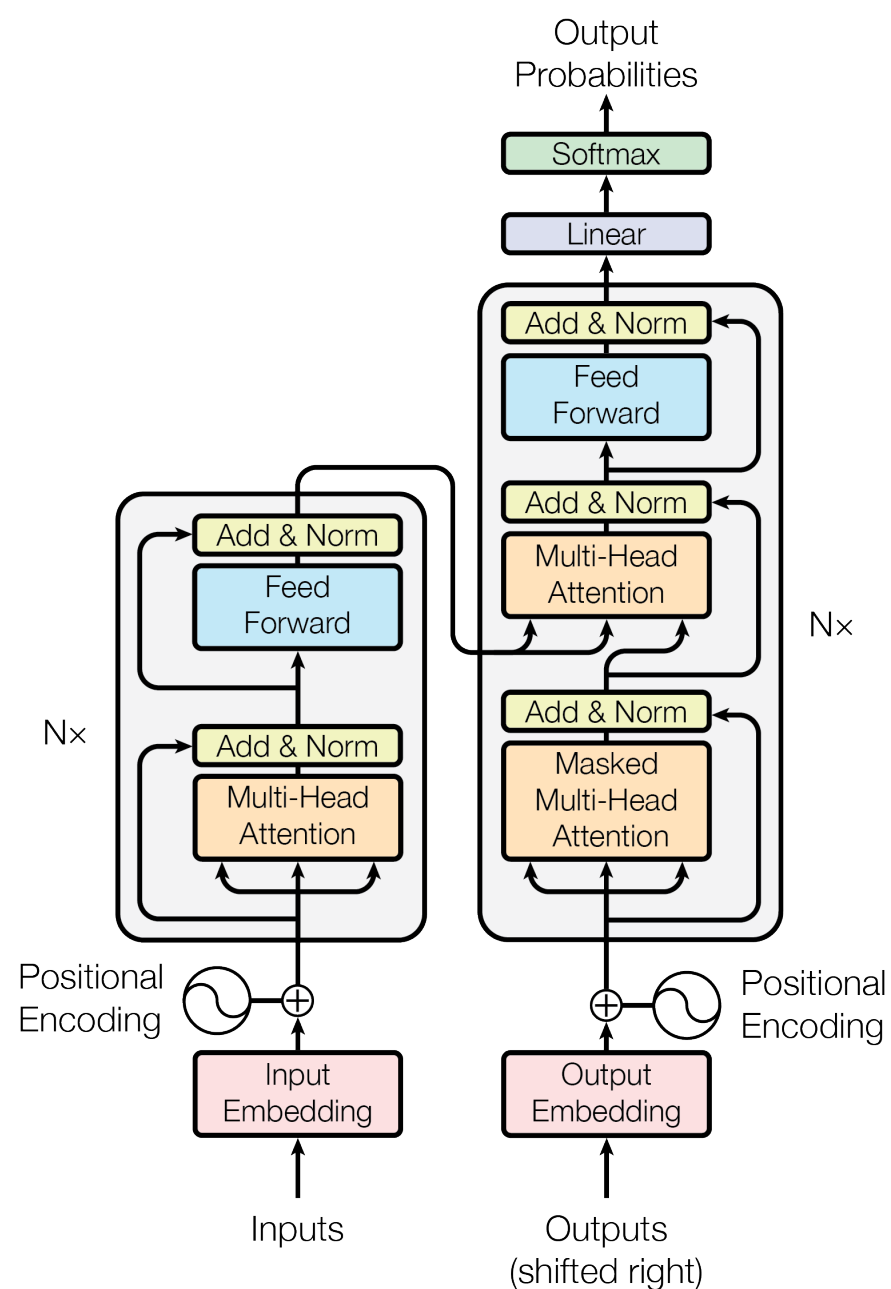
ChatGPT

The Stanford University alumna who co-founded the educational technology company Coursera is Daphne Koller. She co-founded Coursera in 2012 alongside Andrew Ng, another Stanford professor, with the goal of providing universal access to world-class education.

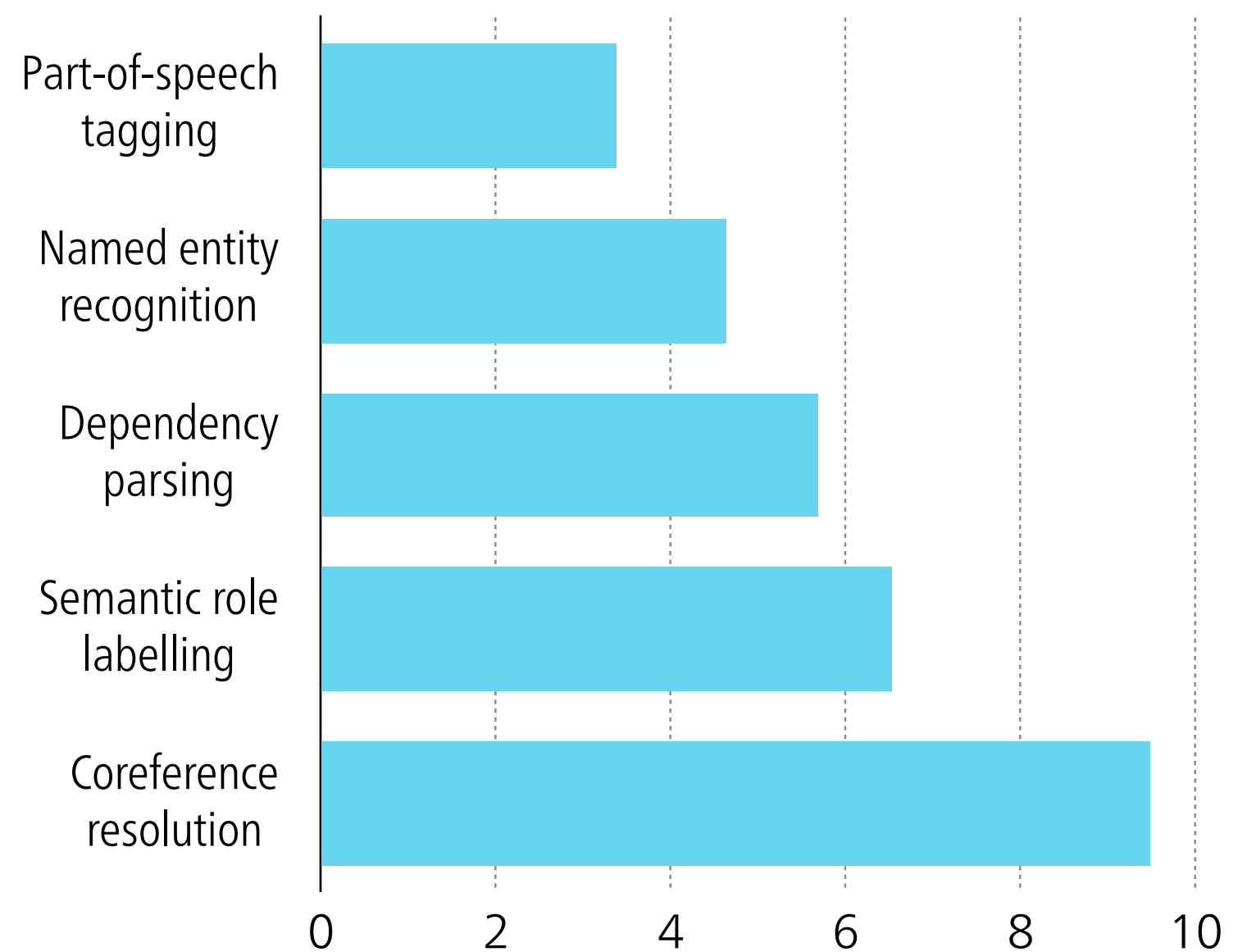


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"Natural language processing from scratch"



Vaswani et al. (2017)



Tenney et al. (2019)



You

Convert the following question into a SPARQL query against DBPedia: "Which Stanford University alumna co-founded the educational technology company Coursera?"



ChatGPT

To convert your question into a SPARQL query for querying DBpedia, we need to construct a query that looks for a person who is an alumna of Stanford University and a co-founder of the educational technology company Coursera. Here's how the query would look:

sparql

Copy code

```
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbr: <http://dbpedia.org/resource/>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

SELECT ?person WHERE {
    ?person dbo:almaMater dbr:Stanford_University .
    ?person dbo:occupation dbr:Entrepreneur .
    ?person dbo:knownFor dbr:Coursera .
    ?person a dbo:Person .
    ?person dbo:gender dbr:Female .
} LIMIT 10
```

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Two paradigms

Eisenstein (2019), § 1.2.1

- **Linguistic knowledge**

Build pipelines of modular components that produce general-purpose representations grounded in linguistic knowledge.

morphemes, parts-of-speech, dependency trees, meaning representations

- **Deep learning**

Train end-to-end neural networks that directly transmute raw text into whatever form the desired application requires.

text, code, images



You

Please give me a complete list of Swedish kings born in the 19th century.



ChatGPT

The Swedish kings born in the 19th century were:

1. **Oscar I** (4 July 1799 – 8 July 1859): He was the son of Charles XIV John and reigned from 8 March 1844 to 8 July 1859.
2. **Charles XV** (3 May 1826 – 18 September 1872): The son of Oscar I, he reigned from 8 July 1859 to 18 September 1872. He was the first monarch of the House of Bernadotte to be born in Sweden.
3. **Oscar II** (21 January 1829 – 8 December 1907): Also a son of Oscar I, his reign lasted from 18 September 1872 to 8 December 1907 [\[1\]](#).



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You

Please generate a sentence that starts and ends with the same word.



ChatGPT

"Tomorrow brings another tomorrow full of hope and new beginnings."



ChatGPT 4, 2023-12-31



You

Please generate a sentence that starts and ends with the same word.



ChatGPT

"Tomorrow brings new challenges, yet ends as it begins: tomorrow."



ChatGPT 4, 2024-01-06