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  (morpheme)
- Helpful in reducing data dimensionality, text cleaning
- Types : Stemming and Lemmatization

# Normalization: Stemming

- Elementary rule based process of removal of inflectional forms from a token
- Outputs the stem of a word

"laughing", "laughed", "laughs", "laugh" >>> "laugh"

| Form | Suffix | Stem |
|---|---|---|
| studies | -es | studi |
| studying | -ing | study |
| niñas | -as | niñ |
| niñez | -ez | niñ |

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- Outputs the stem of a word

  “laughing”, “laughed”, “laughs”, “laugh” >>> “laugh”
- May generate non-meaningful terms

  his teams are not winning

  >> hi team are not winn

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# Normalization: Lemmatization

- Systematic process for reducing a token to its lemma

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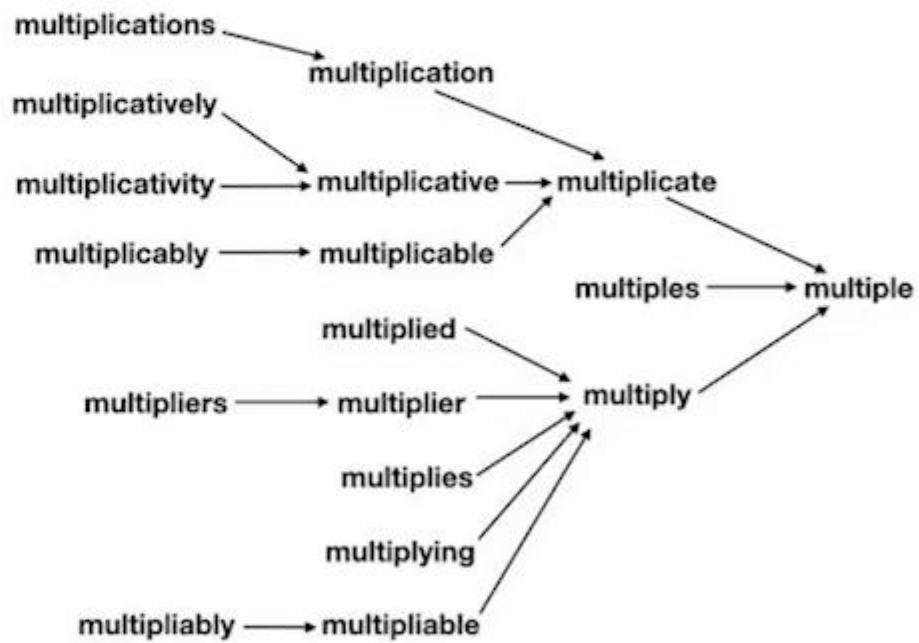
- Systematic process for reducing a token to its lemma
- Makes use of vocabulary, and morphological analysis
- Example :

  am, are, is >> be

  running , ran , run , rans >> run



# Information Extraction

# About Module

1. What is Information Extraction?
2. Part-of-Speech Tagging (POS)

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2. Part-of-Speech Tagging (POS)
3. Dependency Parsing
4. Named Entity Recognition (NER)
5. Relation Extraction

# What is Information Extraction?

Information Extraction is the process of extracting meaningful information from text data.

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Eg, The symptoms of COVID-19 are fever, cough, shortness of breath, sore throat and fatigue.

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Eg, The symptoms of COVID-19 are fever, cough, shortness of breath, sore throat and fatigue.

Information:

- Disease: COVID-19
- Symptoms: [ “fever”, “cough”, “shortness of breath”, “sore throat”, “fatigue” ]

# Applications of Information Extraction

- Business Intelligence

# Applications of Information Extraction

- Business Intelligence
- Resume Harvesting

**John Doe**

San Francisco CA • (123) 456-7891

john_doe@email.com

SUMMARY

Analytical professional with 8+ years of experience in generating and analyzing data reports for management. A strategic mindset that focuses on problem-solving tasks and maintaining priorities on strict deadlines.

EDUCATION

Temp Tech
Aug '08 - May '12
Computer Science/Programming

EXPERIENCE

XYZ Analytics, Data Analyst
2012 - 2015

- Manage department metrics report and database
- Test and develop a database management plan

ABC.ai, Lead Data Analyst
2015- Current

- Research existing database methods and create a study for suggested changes
- Lead database project with 5 team members

SKILLS

- Project management
- Data analysis

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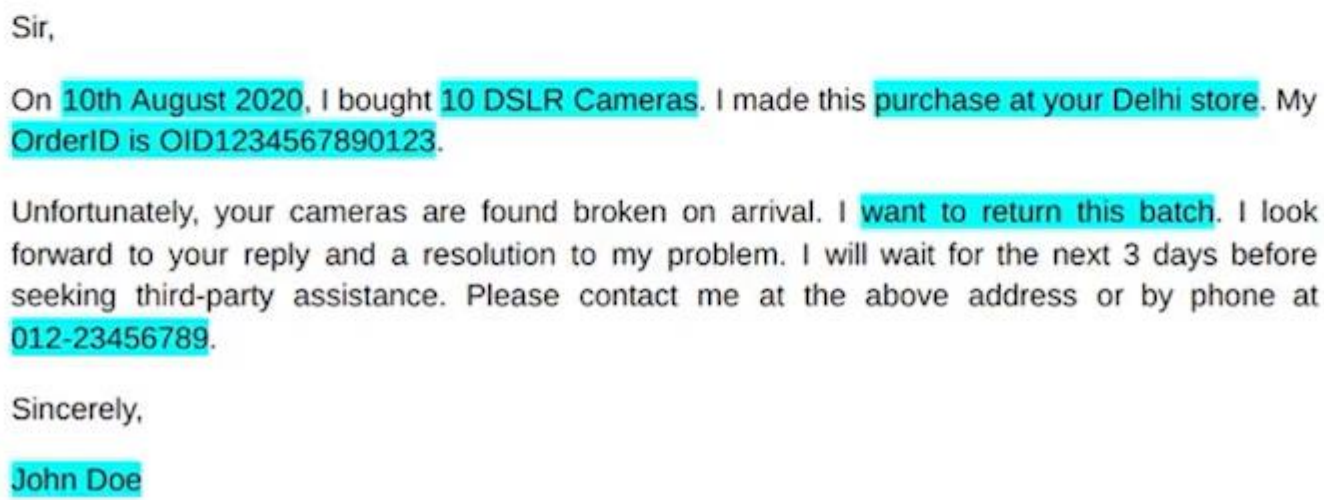
- Scanning Email and Chat Conversations



Sir,

On 10th August 2020, I bought 10 DSLR Cameras. I made this purchase at your Delhi store. My OrderID is OID1234567890123.

Unfortunately, your cameras are found broken on arrival. I want to return this batch. I look forward to your reply and a resolution to my problem. I will wait for the next 3 days before seeking third-party assistance. Please contact me at the above address or by phone at 012-23456789.

Sincerely,

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# Applications of Information Extraction

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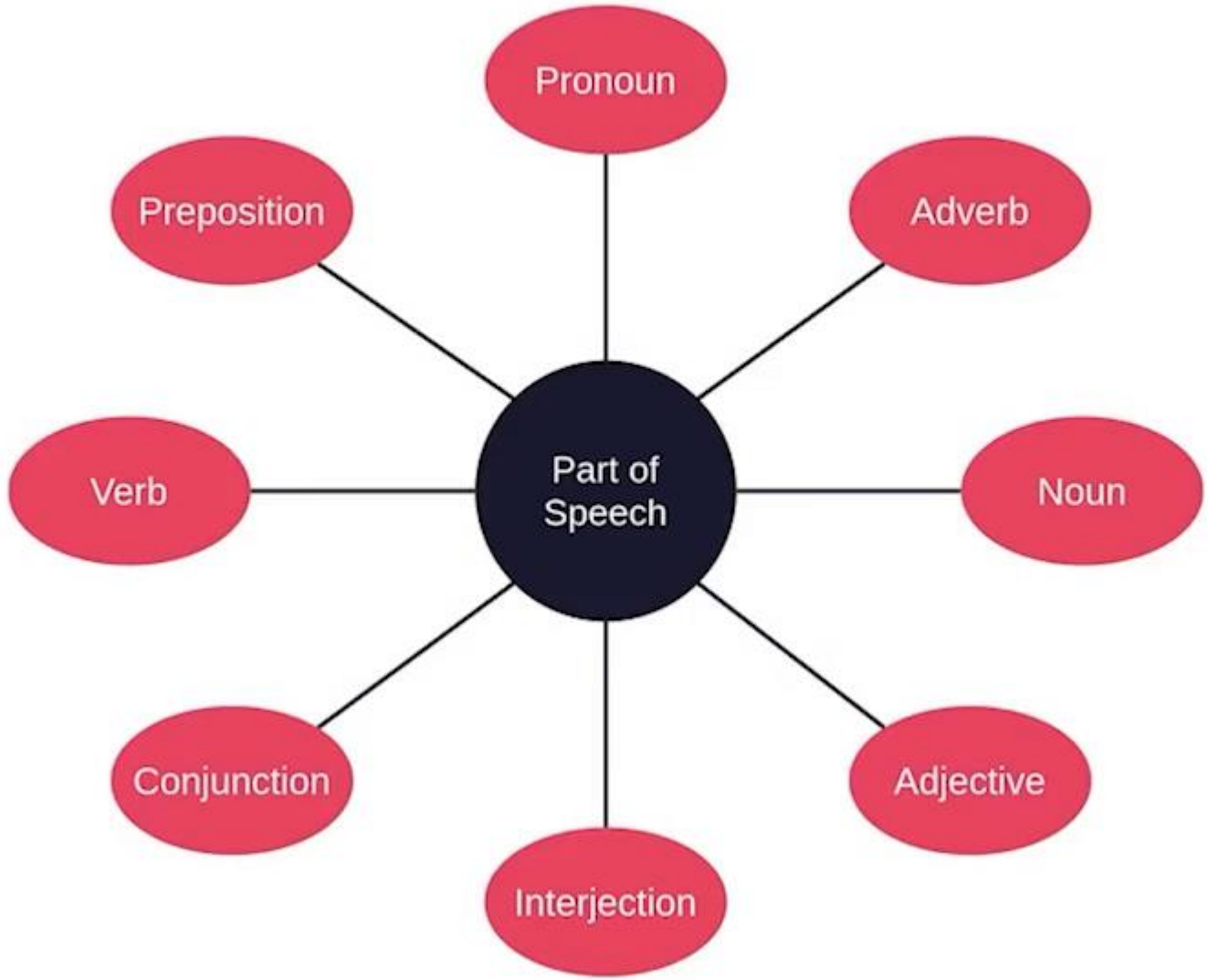
- Extracting Research Findings

# Part-of-Speech (POS) Tagging

# Part of Speech



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  PROPN: Proper Noun => John, Netflix, Amazon

  DET: Determiner => a, an, the

  NUM: Numerals => 1, two, III
- Example, Usain Bolt is the fastest man on earth.

# Types of POS Tags

1. Universal POS Tags:
   a. Used in Universal Dependencies version 2
   b. Core Part-of Speech tags for various languages

   E.g., ADJ: Adjective
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2. Detailed POS tags:
   a. Language-specific
   b. Division of Universal POS Tags into multiple tags

   E.g., PROPN: Proper Noun, e.g., Americans, Airlines, Google, Microsoft
   NNP: Singular Proper Noun, e.g., Microsoft, Google
   NNPS: Plural Proper Noun, e.g., Americans, Airlines

# Dependency Parsing

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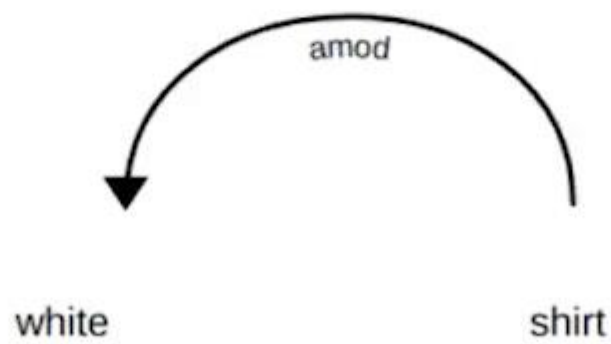
- Analyze the grammatical structure of a sentence
- Based on dependencies between the words in a sentence
- Dependency tags represent relationship between words
- Example,



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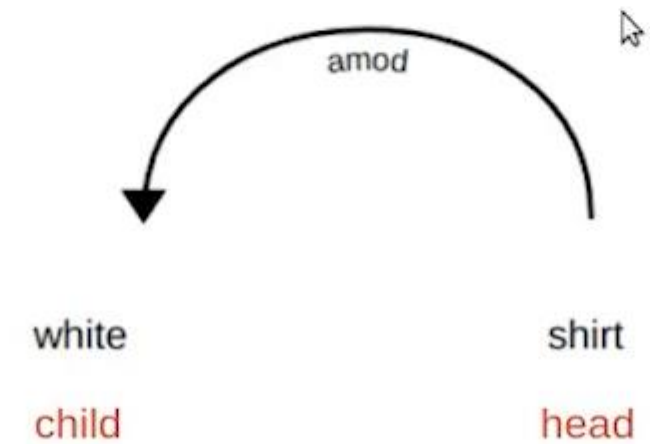

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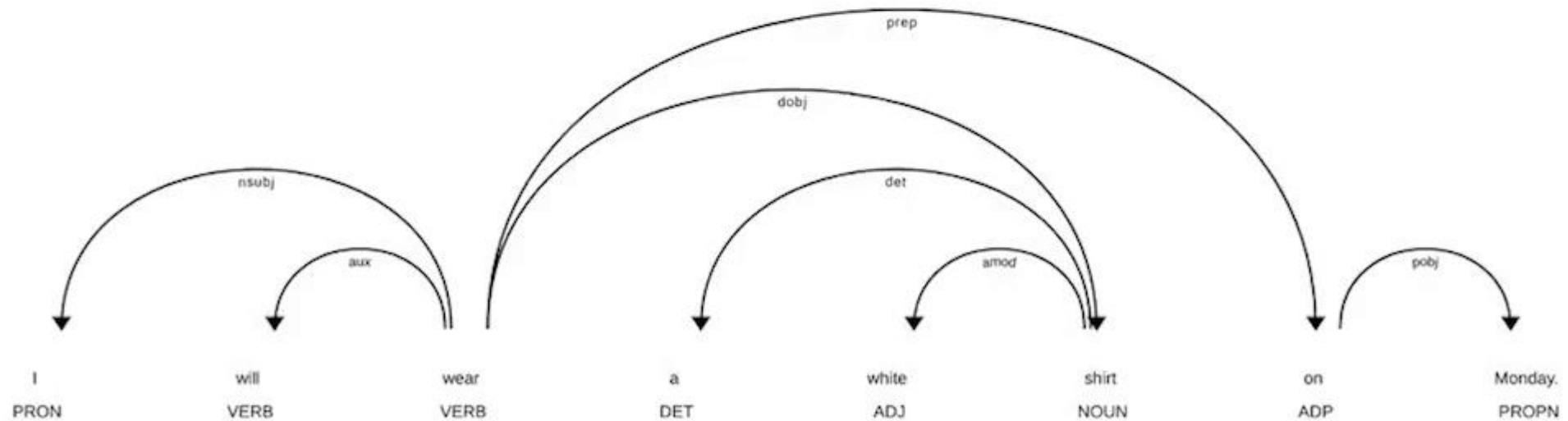

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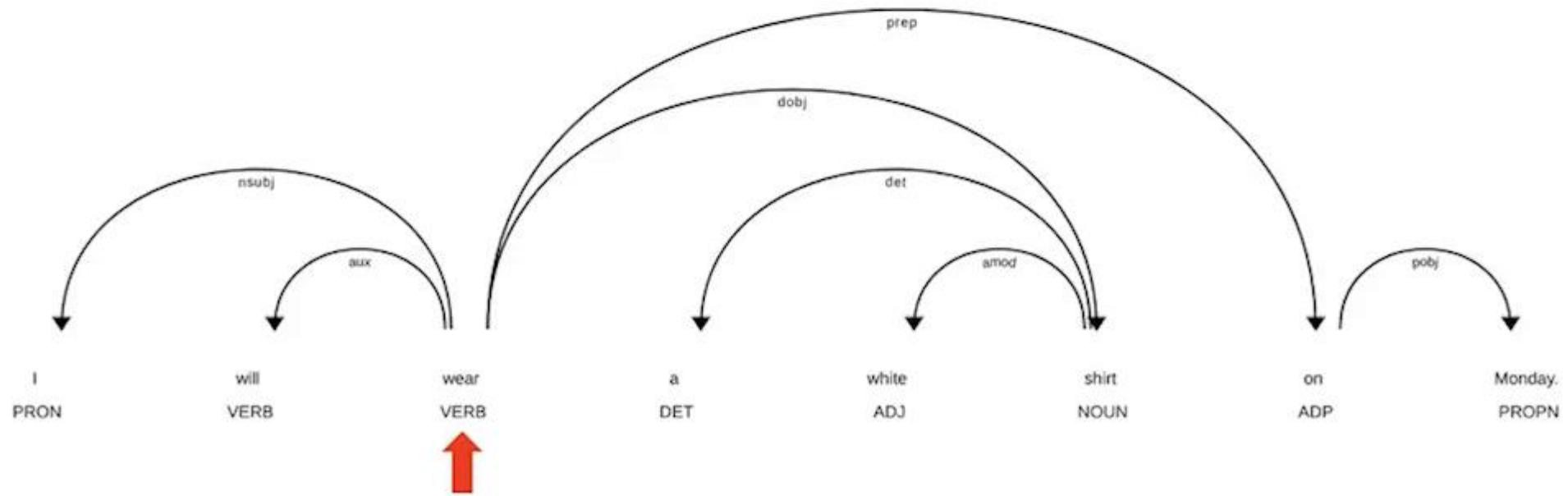

# Entities and Named Entities

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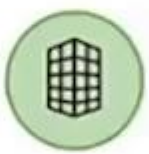
The president will meet the chairman of the company in the capital city

- Named Entities: entities having proper name


People


Places


Companies


Products

Donald Trump will meet the chairman of Google in New York City

# Named Entity Recognition (NER)

# Named Entity Extraction

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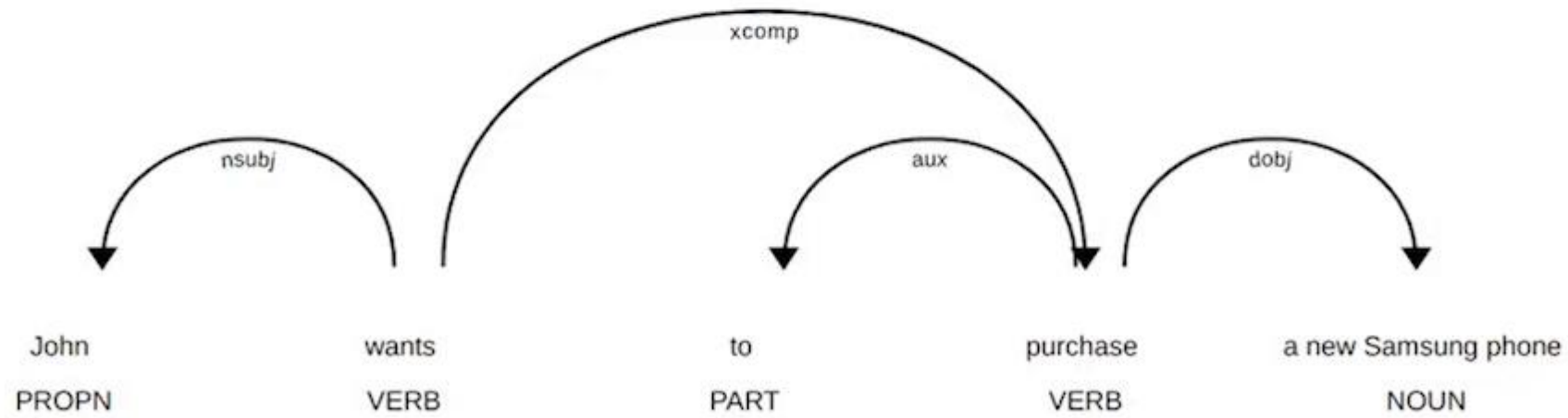

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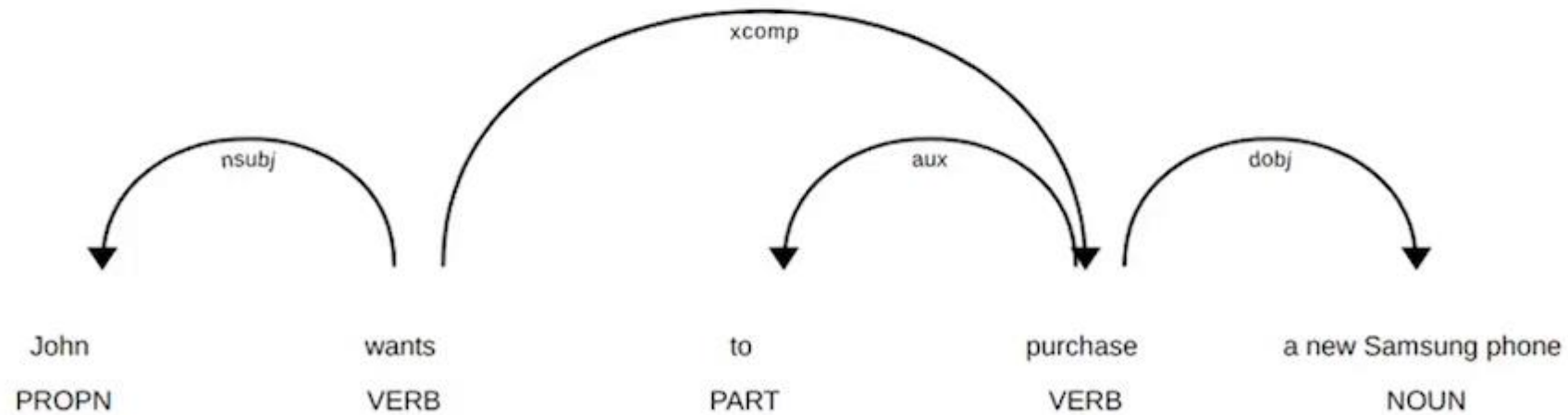

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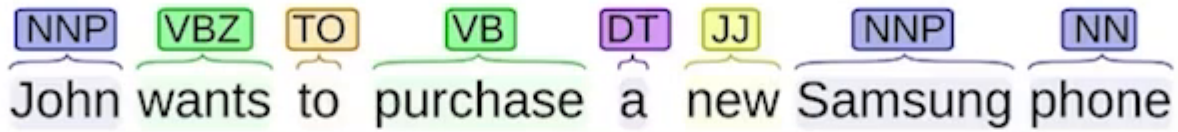


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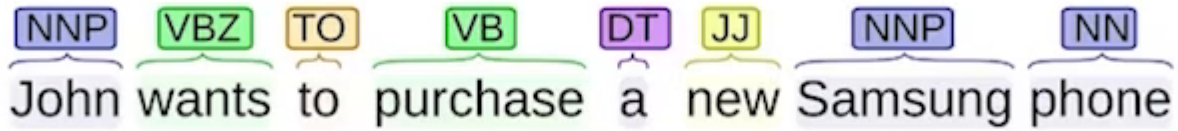


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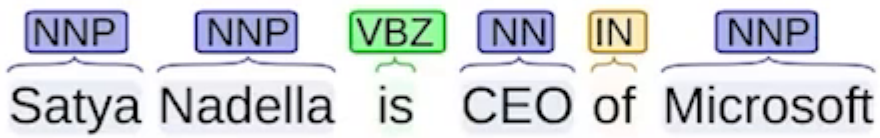


Named Entities: Satya Nadella, Microsoft

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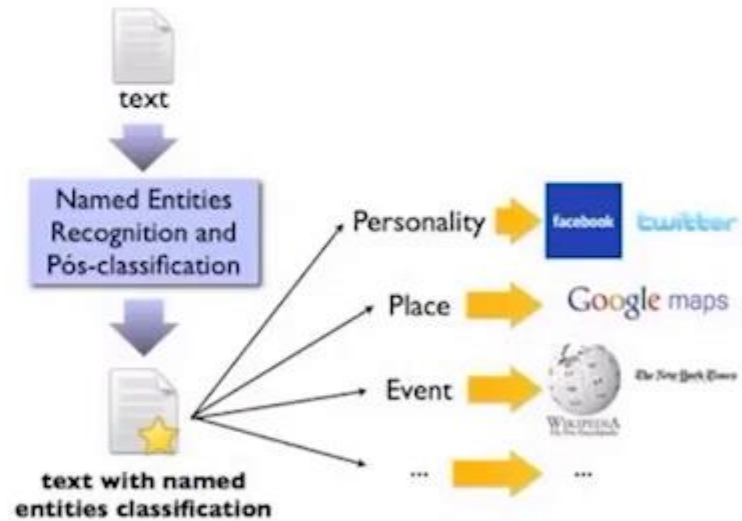

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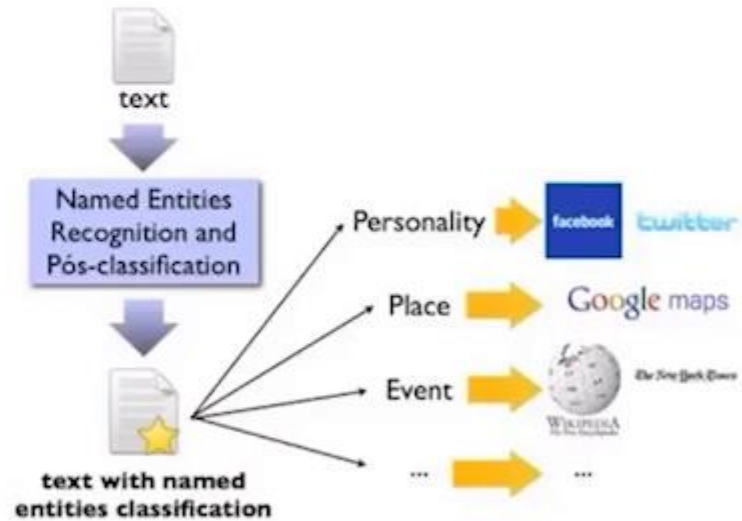

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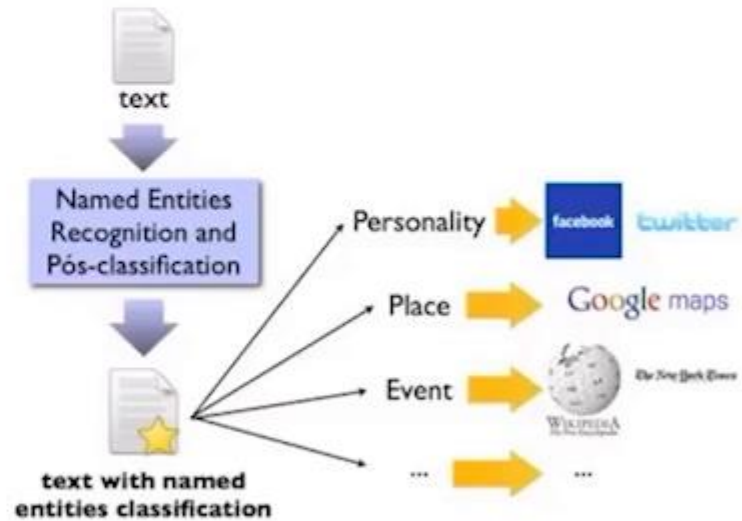

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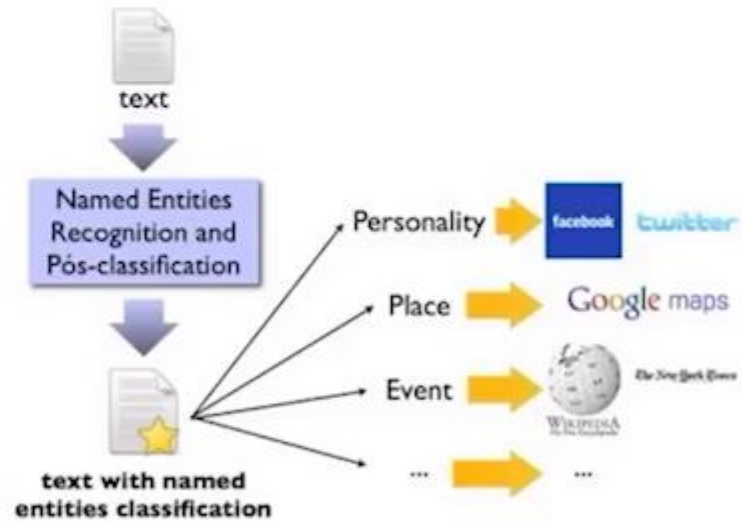

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- Updated Ontologies
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- Non Capitalization

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2. Supervised Relation Extraction:
    a. Consider two entities E1 and E2
    b. Detect if a relation exists between E1 and E2
    c. The task becomes of Relation Detection
    d. Needs a lot of labelled data
    e. Expensive to label data

# Types of Relation Extraction

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    e. Higher Recall than Rule-based Relation Extraction
4. Distantly Supervised Relation Extraction:
    a. Combines the idea of seed with relation detection
    b. Uses a set of tuples from existing knowledge bases
    c. Checks if entities are present in a sentence
    d. Extracts features and trains a classifier
    e. Allows to work with the large labelled dataset
    f. Produces noisy annotation and restricted to the knowledge

# Types of Relation Extraction

5. Unsupervised Relation Extraction:
    a. Also known as Open Relation Extraction
    b. No training data & pre-defined rules required
    c. Extract new relations from the web