Shri Ramdeobaba College of Engineering and Nagpur

Department of Computer Science and Engineering

Natural Language Processing Lab

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Importing the Dependencies

```
import spacy
```

```
# Initializing the spacy model

nlp = spacy.load('en_core_web_sm')
```

```
# Loading the text

kalam = """A. P. J. Abdul Kalam was an Indian aerospace scientist and politician who served as the 11th President of India from 200

kalam
```

```
"A. P. J. Abdul Kalam was an Indian aerospace scientist and politician who served as the 11th President of India from 2002 to 200
```

Entity Detection

```
kalam_nlp_model = nlp(kalam)
```

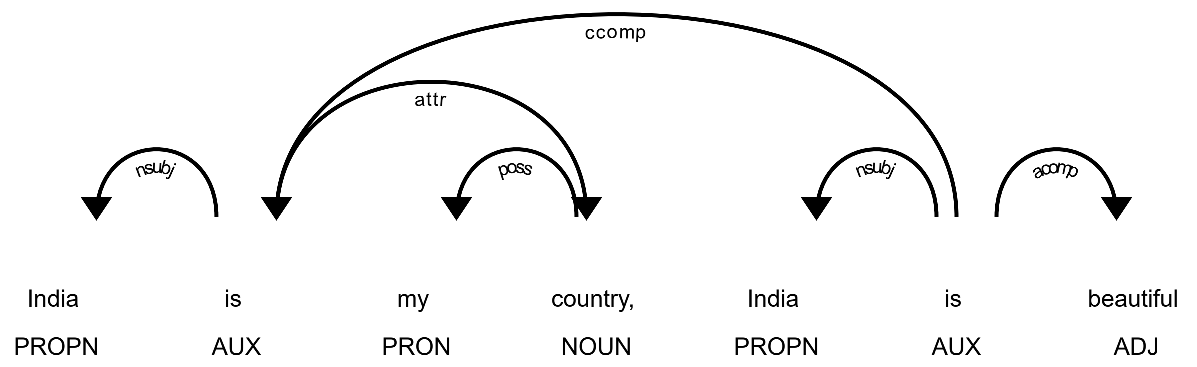
```
# Printing the entities
print(f"{'Entity'.ljust(50)} {'Label'}" + '\n' + '-' * 60)
for entity in kalam_nlp_model.ents:
    print(entity.text.ljust(50), entity.label_)
```

```
Entity                                             Label
------------------------------------------------------------
A. P. J. Abdul Kalam                               PERSON
Indian                                             NORP
11th                                               ORDINAL
India                                              GPE
2002                                               DATE
2007                                               DATE
Rameswaram                                         GPE
Tamil Nadu                                         PERSON
the next four decades                              DATE
the Defence Research and Development Organisation  ORG
Indian Space Research Organisation                 ORG
India                                              GPE
```

Dependency Parsing

```
dep_nlp = nlp('India is my country, India is beautiful')
```

```
spacy.displacy.render(dep_nlp, style='dep', jupyter=True, options={'distance': 90})
```



```
import spacy
from spacy import displacy

text = "When Sebastian Thrun started working on self-driving cars at Google in 2007, few people outside of the company took him ser

nlp = spacy.load("en_core_web_sm")
doc = nlp(text)
displacy.render(doc, style="ent")
```

When Sebastian Thrun PERSON started working on self-driving cars at Google ORG in 2007 DATE , few people outside of the company took him seriously.

Part A

```
text = """
Shivaji Bhosle was born on February 19, 1630 to Shahaji Bhosle and Jijabai in the fort of Shivneri, near the city of Junnar of the

Shivaji turned out to be a born leader from a very young age. An active outdoorsman, he explored the Sahayadri Mountains surroundir
"""
```

```
text_nlp = nlp(text)
```

Part A.1 Entity Detection

```
# Printing the entities
print(f"{'Entity'.ljust(50)} {'Label'}" + '\n' + '-' * 50)
for entity in text_nlp.ents:
    print(entity.text.ljust(50), entity.label_)
```

```
Entity                                             Label
--------------------------------------------------
Shivaji Bhosle                                     PERSON
February 19, 1630                                  DATE
Shahaji Bhosle                                     PERSON
Jijabai                                            GPE
Shivneri                                           PRODUCT
Junnar                                             GPE
Shivaji                                            PERSON
Shahaji                                            PERSON
the Bijapuri Sultanate - a tripartite              ORG
Bijapur                                            GPE
Ahmednagar                                         GPE
Golconda                                           ORG
Jaigirdari                                         NORP
Pune                                               GPE
Shivaji                                            PERSON
Jijabai                                            GPE
Sindkhed                                           NORP
Lakhujirao Jadhav                                  PERSON
```

```
# Making tuple of entities and their relations

entity_relations = [(i, i.label_, i.label) for i in text_nlp.ents]
```

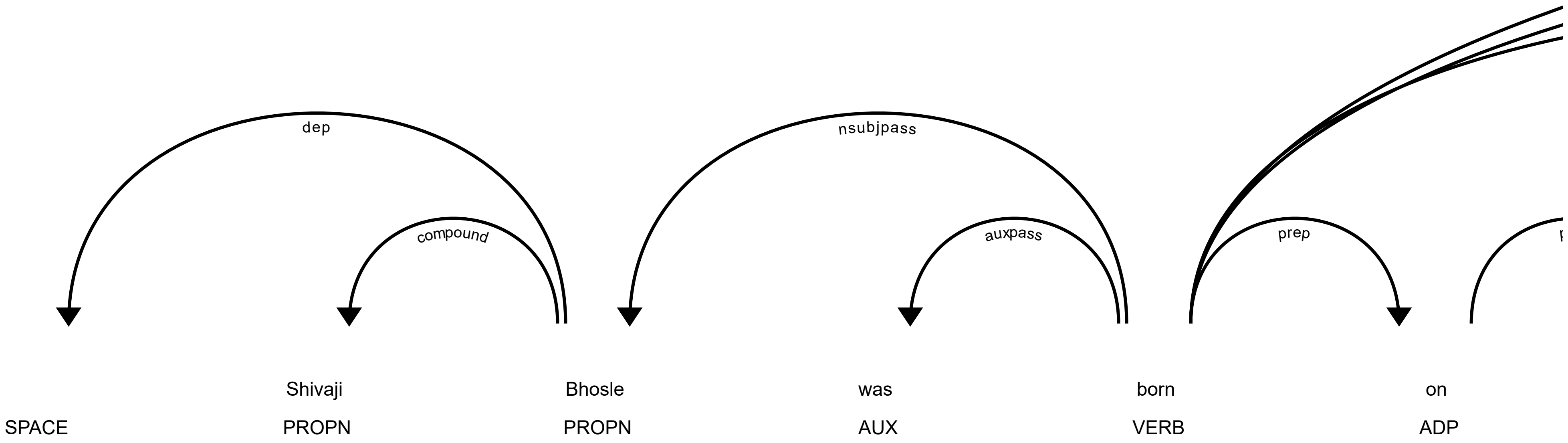
```
[(Shivaji Bhosle, 'PERSON', 380),
 (February 19, 1630, 'DATE', 391),
 (Shahaji Bhosle, 'PERSON', 380),
 (Jijabai, 'GPE', 384),
 (Shivneri, 'PRODUCT', 386),
 (Junnar, 'GPE', 384),
 (Shivaji, 'PERSON', 380),
 (Shahaji, 'PERSON', 380),
 (the Bijapuri Sultanate - a tripartite, 'ORG', 383),
 (Bijapur, 'GPE', 384),
 (Ahmednagar, 'GPE', 384),
 (Golconda, 'ORG', 383),
 (Jaigirdari, 'NORP', 381),
 (Pune, 'GPE', 384),
 (Shivaji, 'PERSON', 380),
 (Jijabai, 'GPE', 384),
 (Sindkhed, 'NORP', 381),
 (Lakhujirao Jadhav, 'PERSON', 380),
 (Shivaji, 'PERSON', 380),
 (Shahaji, 'ORG', 383),
```

```
# Making tuple of two entities and the relation between them
from spacy import displacy

options = {"bg": "#09a3d5", "color": "white", "font": "Source Sans Pro"}

displacy.render(text_nlp, style="ent", jupyter=True, options=options)
```

Shivaji Bhosle PERSON was born on February 19, 1630 DATE to Shahaji Bhosle PERSON and Jijabai GPE in the fort of Shivneri PRODUCT , near the city of Junnar GPE of the Pune district. Shivaji PERSON 's father Shahaji PERSON was in service of the Bijapuri Sultanate - a tripartite ORG association between Bijapur GPE , Ahmednagar GPE , and Golconda ORG , as a general. He also owned a Jaigirdari NORP near Pune GPE . Shivaji PERSON 's mother Jijabai GPE was the daughter of Sindkhed NORP leader Lakhujirao Jadhav PERSON and a deeply religious woman. Shivaji PERSON was especially close to his mother who instilled in him a strict sense of right and wrong. Since Shahaji ORG spent most of his time outside of Pune GPE , the responsibility of overseeing Shivaji PERSON 's education rested on the shoulders of a small council of ministers which included a Peshwa (Shamrao Nilkanth),a Mazumdar (Balkrishna Pant PERSON), a Sabnis (Raghunath Ballal ORG), a Dabir (Sonopant) and a chief teacher (Dadoji Konddeo PERSON). Kanhoji Jedhe PERSON and Baji Pasalkar PERSON were appointed to train Shivaji PERSON in military and martial arts. Shivaji PERSON was married to Saibai Nimbalkar GPE in 1640 DATE .

Shivaji PERSON turned out to be a born leader from a very young age. An active outdoorsman, he explored the Sahayadri Mountains LOC surrounding the Shivneri PRODUCT forts and came to know the area like the back of his hands. By the time he was 15 DATE , he had accumulated a band of faithful soldiers from the Maval GPE region who later aided in his early conquests.

```
displacy.render(text_nlp, style='dep')
```



```
entity_types = ["PERSON", "ORG", "GPE", "PRODUCT", "DATE"]

entities = [(ent.text, ent.label_) for ent in text_nlp.ents if ent.label_ in entity_types]

# Extract the relationships between the entities using dependency parsing and POS tagging
relations = []
for token in text_nlp:
    if token.dep_ == 'ROOT' and token.pos_ == 'VERB':
        for child in token.children:
            if child.ent_type_ in entity_types:
                relations.append((child.text, token.text, child.ent_type_))

# Create tuples for information extraction
tuples = []
for relation in relations:
    for entity in entities:
        if entity[0] == relation[0]:
            tuples.append((entity[0], entity[1], relation[2]))

# Display the extracted tuples
print("Extracted Tuples:")
for t in tuples:
    print("T1({}, {}, {})".format(t[0], t[1], t[2]))
```

```
Extracted Tuples:
T1(Shivaji, PERSON, PERSON)
T1(Shivaji, PERSON, PERSON)
T1(Shivaji, PERSON, PERSON)
T1(Shivaji, PERSON, PERSON)
T1(Shivaji, PERSON, PERSON)
T1(Shivaji, PERSON, PERSON)
T1(Shivaji, PERSON, PERSON)
```