
LAB3 REPORT

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1 EX1 LEXICAL ANALYSIS

1. POS tag the sentence

Sentence: Steel is an alloy of iron and carbon, and sometimes other elements. Because of its high tensile strength and low cost, it is a major component used in buildings, infrastructure, tools, ships, automobiles, machines, appliances, and weapons.

Steel(NNP) is(VBZ) an(DT) alloy(NN) of(IN) iron(NN) and(CC) carbon(NN) ,(,) and(CC) sometimes(RB) other(JJ) elements(NNS) .(.) Because(IN) of(IN) its(PRP\$) high(JJ) tensile(NN) strength(NN) and(CC) low(JJ) cost(NN) ,(,) it(PRP) is(VBZ) a(DT) major(JJ) component(NN) used(VBN) in(IN) buildings(NNS) ,(,) infrastructure(NN) ,(,) tools(NNS) ,(,) ships(NNS) ,(,) automobiles(NNS) ,(,) machines(NNS) ,(,) appliances(NNS) ,(,) and(CC) weapons(NNS) .(.)

2. Identify the pronominal co-references

Co-references are "its" and "it".

2 Ex2 C-STRUCTURES

1. Plot the constituency (phrase) structure: Sentence: 'Steel is an alloy of iron and carbon, and sometimes other elements'.

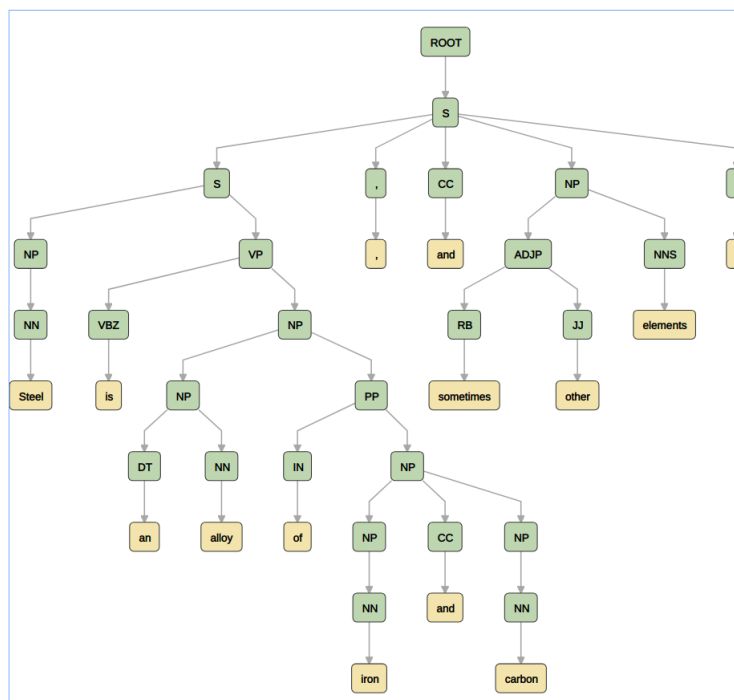


Figure 1: Constituency Parse Plot

2. List the nominal phrasal nodes (NPs) correspond to 'molecules of meaning' for that sentence

NP: Steel, an alloy, iron, carbon, iron and carbon, an alloy of iron and carbon, sometimes other elements.

3. List the coordinations within that sentence.

CC: and(iron and carbon), and(and sometimes other elements)

3 EX3 DEPENDENCIES - EXPLORING NEW TERRITORIES

1. What is the difference between dependency and constituency?

Dependency parsing: A dependency parse connects words according to their relationships. Each vertex in the tree represents a word, child nodes are words that are dependent on the parent, and edges are labeled by the relationship.

Constituency parsing: A constituency parse tree breaks a text into sub-phrases. Non-terminals in the tree are types of phrases, the terminals are the words in the sentence, and the edges are unlabeled.

2. What is emphasised by each representation?

Dependency parsing: Emphasising the dependency relationships between words.

Constituency parsing: Emphasising sub-phrases within the sentence.

3. Draw the dependency structure of the following sentence: 'Steel is analloy of iron and carbon'.

nsubj: nominal subject

cop: copula

det: determiner

nmod: nominal modifier

case: prepositions, postpositions and other case markers

cc: coordinating conjunction

conj: conjunct



Figure 2: Dependency Parse Structure

4 EX4 OPENIE - SEMANTICS

1. Use openIE to extract the predicate-argument structure of:

(1) "Steel is an alloy":

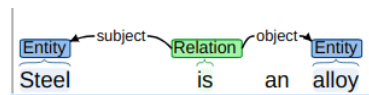


Figure 3: OpenIE result for 'Steel is an alloy'

(2) "Steel contains carbon":

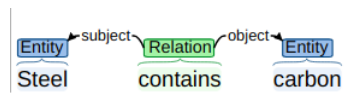


Figure 4: OpenIE result for 'Steel contains carbon'

(3) "Steel contains iron":

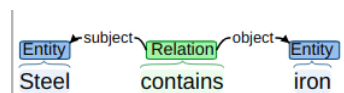


Figure 5: OpenIE result for 'Steel contains iron'

2. Represent the triples above using Prolog:

```
alloy(X) :- steel(X).
containsCarbon(X) :- steel(X).
containsIron(X) :- steel(X).
```

3. Represent the triples above using RDF:

```
<Steel> <is an> <alloy>.
<Steel> <contains> <carbon>.
<Steel> <contains> <iron>.
```

4. Formalise the axioms using Description Logics:

$$\begin{aligned}
 &Steel \sqsubseteq Alloy \\
 &Steel \rightarrow \exists Contain. Carbon \\
 &Steel \rightarrow \exists Contain. Iron
 \end{aligned}$$

5. Analyse what happens when getting "Steel is an alloy of iron and carbon.":

There are two relations in terms of "Steel"(subject), one is relation "is" (i.e. Steel is an alloy), the other is relation "an alloy of" (i.e. Steel 'is an alloy of' iron), and the objects are "alloy" and "iron" respectively.

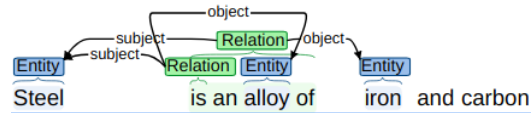


Figure 6: OpenIE result for 'Steel is an alloy of iron and carbon'

5 EX5 COMPLEX OPENIE, RHETORICAL STRUCTURES

Sentence: 'As the carbon percentage content rises, steel has the ability to become harder and stronger through heat treating; however, it becomes less ductile.'

1. Identify the nucleus and the satellites

nucleus: "however, it becomes less ductile."

satellites: "As the carbon percentage content rises, steel has the ability to become harder and stronger through heat treating;"

2. Draw the diagram with the rhetorical relations

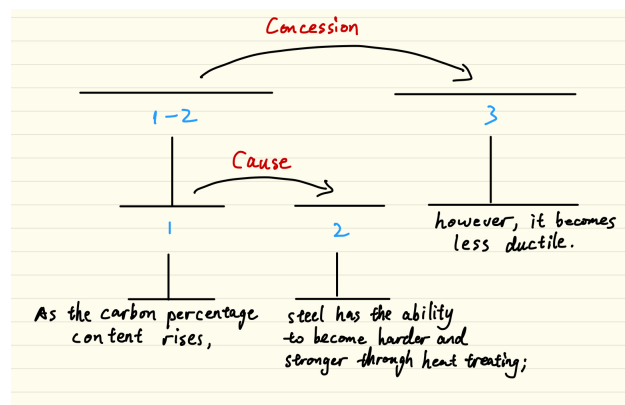


Figure 7: rhetorical relation diagram

3. Which relations are hypotactic or paratactic?

The "concession" and "cause" are both hypotactic.

4. Write the output for that sentence using the RDF-NL notation of Graphene

```
1f497d3e35c4444b8ee59f56324c1dd2      0      Steel has the ability to become harder and stronger through heat
L:IDENTIFYING_DEFINITION      5d0d33a368c14bb4b28ea91efade7107
L:BACKGROUND      897a6ad5e7ce408bb2d64141957c3645
L:CONTRAST      b8fe76aa010147a6ade42eb18c7e267f

6dade54fe4cf41648e4a0e1b310be9c5      1      Heat is treating
7353d9045d81411aa00e4b3c3b069ba0      1      The carbon percentage content rises
11fb7e370fee44488e1841b26a3cfa51      0      It becomes less ductile
L:CONTRAST      735d81fbb9d9408ea38f1edfb67b37fa
```

Figure 8: output from Graphene

6 Ex6 TAXONOMIES, THESAURI

1. List the WordNet glosses for 'martensite' and 'austenite'

martensite: a solid solution of carbon in alpha-iron that is formed when steel is cooled so rapidly that the change from austenite to pearlite is suppressed; responsible for the hardness of quenched steel.

austenite: a solid solution of ferric carbide or carbon in iron; cools to form pearlite or martensite.

2. List the Taxonomic/Hypernym chain up to the top for these two terms

martensite/austenite -> solid solution, primary solid solution -> solution -> mixture -> substance ->

(1) matter -> physical entity -> entity

(2) part, portion, component part, component, constituent -> relation -> abstraction, abstract entity -> entity

3. List their sibling terms: ferrite, double salt

4. For the word 'temper':

(1) how many synsets do we have? 9 synsets.

(2) Which senses are related to steel?

- * the elasticity and hardness of a metal object; its ability to absorb considerable energy before cracking

- * bring to a desired consistency, texture, or hardness by a process of gradually heating and cooling

- * harden by reheating and cooling in oil

(3) What are its synonyms? (n)toughness; (v)anneal, normalize; (v)harden

(4) Would you consider these perfect or near-synonyms?

For anneal and normalize, I think they are perfect, but for toughness and harden, they are near-synonyms. Because for anneal and normalize, they are very specific and mean exactly the same thing, but for toughness, I think it is more a similar meaning not exactly the same.

7 Ex7 FRAME SEMANTICS - EXPLORING FURTHER

8 Ex8 ONTOLOGIES - DESCRIPTION LOGICS

9 Ex9 INDUCTIVE & DEDUCTIVE REASONING