**Tutorial 7**

**Natural Language Processing**

1. “Parts of speech” are the basic types of words that English has. Most grammar books say that there are eight parts of speech: nouns, verbs, adjectives, adverbs, pronouns, conjunctions, prepositions and interjections.

Decide which parts of speech are the underlined words.

* 1. You have to believe in yourself if you ever expect to be successful at something. **\_pronoun\_\_**
  2. We left for the mountain just before six in the morning**. \_verb\_\_**
  3. We first went to the store to buy a few things. **\_\_preposition\_**
  4. We had a breakfast at a café near the rail station. **\_noun\_\_**
  5. My friend wasn't strong enough to lift his heavy rucksack. **\_\_adjective**\_
  6. I helped him carry it. **\_pronoun\_\_**
  7. The weather was very cold. **\_adverb\_\_**
  8. My friend said, "Oh! What a cold weather!" **\_\_interjections\_**
  9. We didn't spend the night there. **\_preposition\_\_**
  10. We got back home late at night but we didn't go to sleep immediately. We were very hungry. **\_conjunction\_\_**

[ 20 marks]

1. Discuss the differences of NLP tasks such as *morphology*, *syntax* and *semantic*. You can use one or more sentences from the question 1 above as a reference.

[ 30 marks]

* **Morphology – how words are constructed from more basic meaning units called *morpheme*, the primitive unit of meaning in a language. For example, the word *yourself* is formed by combining the word *your* + *self***
* **Syntactic – how words can be put together to form correct sentences and determines what structural role each word plays in the sentence and what phrases are subparts (eg. POS) of what other phrases. For example*,* “*I helped him carry it*” can be divided to Noun Phrase (NP) and Verb Phrase (VP) which can be divided to more specific category (e.g. verb, article, noun) which can be used to determine the sentence is in correct order or not.**
* **Semantic – what words mean (lexical semantics) and how these meanings combine in sentences to form larger meaning.Several words have multiple meanings which produce different meaning when used together with other words, sometimes producing what we call as lexical ambiguity. For example, “*We saw her duck*” can be understood as “a group of people saw the girl’s duck” or “a group of people saw her crouching”.**

1. Consider the following context-free grammar:

S -> NP VP N -> dog V -> seesNP -> Det N N -> cat V -> hatesVP -> V N -> mouse V -> sneezesVP -> V NP Det -> the

Which of the following sentences are recognised by this grammar, and why? (Tip: Draw tree structure phrase for grammar understanding)

1. the dog sneezes the cat
2. the mouse hates
3. the cat the mouse hates
4. the mouse hates the mouse

[ 30 marks]

**Only a) and d) meet the requirements. This is because both sentences can be divided to Noun Phrase (NP) and Verb Phrase (VP); NP can be divided to article and noun while VP can be divided to verb and NP which can be divided to article and noun.**

**For b), the sentence lacks the VP which make the sentence incomplete by syntax and semantic, while for c), the VP part is wrong in the order of the sentence (syntax).**

1. Name TWO applications of NLP which you are using in your daily life. Do you know how it works?

[ 20 marks]

**Google Voice and Cortana. Both applications are developed by Google and Microsoft. Both application work by dividing the sentence (in audio form), in form of questions or statements to Noun Phrase and Verb Phrase while recognizing the keywords. For example, “nearest cinema” will be divided into “nearest” + “cinema”. The keyword “nearest” could be understood as “nearest from the user’s location” or “nearest from other points”. By rating the answer given, the applications will add more vocabulary into its database/dictionary while trying to understood the meaning of these words and sentences.**