Natural Language Processing

Assignment- 6

TYPE OF QUESTION: MCQ

Number of questions: 10 **Total mark: 10 X 1 = 10**

Question 1 : Which of the following is/are true?

1. Phrase structures explicitly represent structural categories
2. Dependency structure explicitly represent functional categories
3. Minimum spanning tree is one of the dependency parsing method
4. In dependency structure, dependencies usually form a tree

Answer: 1, 2, 4
Solution:
Please follow lecture 27 of week 6

Question 2: Assume you are learning a classifier for the data-driven deterministic parsing for the sentence 'I like generative model' . Assume five features are defined for this learning. The POS tags are PRON, VERB and NOUN respectively. The size of the feature vector for any configuration is:

1. 4
2. 3
3. 5
4. It depends on no. of features defined and no. of possible oracle transitions.

Answer: 4

Solution: The size of the feature vector for any configuration always depends on no. of features defined and no. of possible oracle transitions. Refer transition based parsing lecture

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Question 3: Consider the sentence: "Ramesh scored a brilliant century". What is the type of the following relation?

century -> brilliant

1. Endocentric
2. Exocentric
3. Both endocentric and exocentric
4. None of the above

Answer: 1

Solution :

Refer lecture 27 of week 6

Question 4: Which of the following is /are false?

1. In the dependency tree each vertex has exactly one incoming arc.
2. A dependency tree is said to be projective if few arcs in the tree are projective.
3. Stack is used in transition based parsing
4. A major advantage of dependency grammars is their ability to deal with languages that are morphologically rich

Answer: 1, 2

Solution:
Except the root node each vertex has exactly one incoming arc in the dependency tree. All arcs should be projective to make dependency tree projective.

Question 5: Suppose you write down the sequence of actions that generate the parse tree of the sentence "I prefer NPTEL course" using Arc-Eager Parsing. The number of times you have to use Right Arc, Left Arc, Reduce, Shift is:

Format of the answer is [a, b, c, d] corresponding to the 4 values in the order specified in the query.

1. [3, 0, 2, 1]
2. [1, 2, 1, 3]
3. [1, 2, 0, 3]
4. [1, 2, 0, 2]

Answer: 3
Solution: Please refer lecture

Question 6: Correct sequence of actions that generates the parse tree of the sentence "I prefer NPTEL course" using Arc-Eager Parsing is:
Note: Right Arc (RA), Left Arc(LA), Reduce(RE), Shift(SH)

1. SH->LA->SH->SH->LA->RA
2. SH->LA->SH->RE->LA->RA
3. SH->LA->SH->SH->RA->LA
4. SH->LA->RE-->SH->SH->LA

Answer: 1

Solution: Solve by arc-eager parsing, Refer lecture 29

Question 7: Suppose you are training MST Parser for dependency and the sentence, "I prefer NPTEL course" occurs in the training set. The POS tags for these words are Pronoun, Verb, PropNoun and Noun, respectively. Also, for simplicity, assume that there is only one dependency relation, "rel". Thus, for every arc from word wi to wj, your features may be simplified to depend only on words wi and wj and not on the relation label.

Below is the set of features

f1: pos(wi) = Verb and pos(wj) = Noun|Pronoun

f2: wi = Root | wi occurs before wj in the sentence

f3: wi = Root and pos(wj) = Verb

f4: wj occurs before wi in the sentence

The feature weights before the start of the iteration are: [5,20,15,12]

Suppose you are also given that after applying the Chu-Liu Edmonds, you get the following parse tree {Root → like, like → I, I → online, online → exam}

What would be the weights after this iteration?

1. [6, 19, 14, 13]
2. [6, 19, 15, 13]
3. [6, 19, 13, 13]
4. [6, 19, 15, 12]

Answer: 2
Solution: Please refer lecture 30

Question 8: If n is the length of the input sentence, the worst-case time complexity of the arc-eager parsing, stack-based algorithm is

1. O(logn)
2. $O(n^4)$
3. O(n)
4. $O(n^2)$

Answer: 3
Solution:
Assuming that the oracle and transition functions can be computed in some constant time, the worst-case running time is bounded by the maximum number of transitions in a transition sequence C0,m for a sentence x = (w0, w1, ... , wn). Since a SHIFT transition decreases the length of the buffer β by 1, no other transition increases the length of β, and any configuration where β = [ ] is terminal, the number of SHIFT transitions in C0,m is bounded by n. Moreover, since both LEFT-ARCl and RIGHT-ARCs l decrease the height of the stack by 1, only SHIFT increases the height of the stack by 1, and the initial height of the stack is 1, the combined number of instances of LEFT-ARCl and RIGHT-ARCs l in C0,m is also bounded by n. Hence, the worst case time complexity is O(n).

Question 9: Assume that you are learning a classifier for the data-driven deterministic parsing and the sentence 'I prefer NPTEL course' is a gold-standard parse in your training data. You are also given that 'NPTEL' and 'course' are 'Nouns', 'I' is a 'Pronoun' while the POS tag of 'prefer' is 'Verb'. Obtain the dependency graph for this sentence on your own. Assume that your features correspond to the following conditions:

1. **The stack is empty.**
2. **Top of stack is Noun and Top of buffer is Verb.**
3. **Top of stack is Pronoun and Top of buffer is Verb.**
4. **The word at the top of stack occurs before word at the top of the buffer in the sentence**

The initial weights of your features are
[2,2,2,2 | 3,3,3,2| 2,2,2,2 | 2,2,2,2] where the first four features correspond to LA, and then to RA, SH and RE, respectively

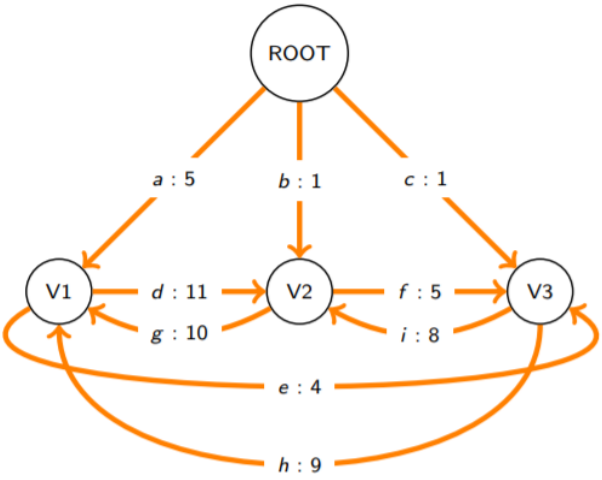
Use this gold standard parse during online learning. What will be the weights after completing two iteration of Arc-Eager parsing over this sentence:

1. [2,2,2,2 | 3,3,3,2| 2,2,2,2 | 2,2,2,2]
2. [2,2,3,2 | 2,3,2,1| 3,2,2,2 | 2,2,2,2]
3. [2,2,3,3 | 2,3,2,1| 3,2,2,2 | 2,2,2,2]

4. [2,2,3,3 | 3,3,2,1| 3,2,2,2 | 2,2,2,2]

Answer: 3
Solution: Refer lecture 29 of week 6

Question 10: Consider the following graph with a root node and 3 other vertices. The edge weights between all the pair of modes have been provided. Suppose you use Chu-Liu-Edmonds algorithm to find the MST for this graph. Which pair of nodes will have to be contracted to form a single vertex during the algorithm?



1. (V2, V3)
2. (V1, V3)
3. All these pairs will get contracted at different times in the algorithm
4. (V1, V2)

Answer: 4
Solution: Solve by applying Chu-Liu-Edmonds Algorithm