COMPSCI 423/723: Sample Midterm

Date and Time: October 30th, Monday, 2:30-4:45 pm, in class

Closed book and slides

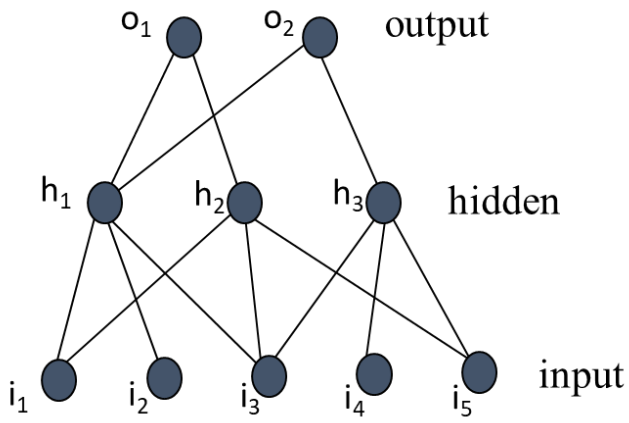
What will be tested:

- Basics (what, how)
- Understanding of the topics (why)

What will NOT be tested:

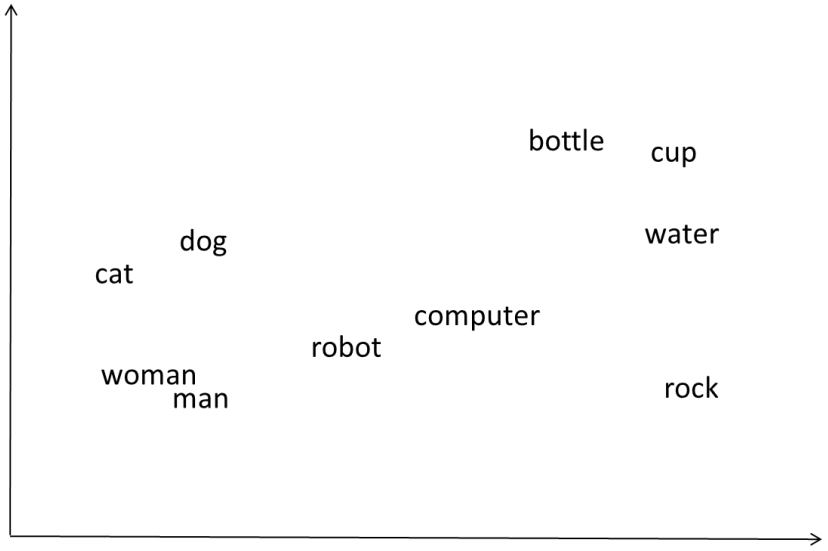
- Python, Gensim, NLTK

1. [3 points] The following is a figure of a neural network, note that it is not fully-connected. When training this neural network, errors from which nodes will be used to compute the error at the node h_2? Updates on which weights will be influenced by the error computed at the node h_2 (answer in terms of edges between which two nodes)?



2. [3 points] The following short passage contains a few occurrences of a previously unseen word "foo". Based on the passage, where will you generally place "foo" in the word embeddings space shown in the following figure? Give the reason for your answer in one or two sentences.

   Passage: "I had recently bought a large blue foo. Yesterday, I was using foo to drink coffee. The cat toppled foo and spilled the coffee."



3. [4 points]

(i) Name the activation function which is best for using on a neural network's output layer when it is to be used for classification? Answer why in one or two sentences. [1 + 1 points]

(ii) Mention one drawback each for very low and very high number of hidden nodes in a neural network. [1 + 1 points]

4. [3 points]

(i) The following phrase has one missing word. Suggest at least three different words to complete the phrase: fat ____ cat [1 point]

(ii) If each of the words from your answer in (i) occurred only in the above phrase whenever it occurred in a large corpus, then comment on their word embeddings which will be obtained using the Skip-gram model trained on that large corpus. Answer in one or two sentences. [2 points]

5. [2 points] What is the task of lemmatization (answer in one sentence)? Give two examples.

6. [2 points] WordNet can be looked upon as a graph. What are on its nodes which are also WordNet's basic primitive? What form the edges in this graph?

7. [2 points] Based on the following syntactic parse of the sentence “I saw the man on the hill with the telescope”, who was on the hill and who had the telescope?

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(S
  (NP (PRP I))
  (VP
    (VBD saw)
    (NP (NP (DT the) (NN man))
      (PP (IN on) (NP (DT the) (NN hill))))
    (PP (IN with) (NP (DT the) (NN telescope)))))
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8. [2 points] Why words cannot be directly used in neural networks? What is done to use make neural networks work with words? Answer briefly in 1 or 2 sentences.

9. [4 points] An NLP task requires disambiguating the word “bank” out of three senses: river bank, financial bank, and bank used as a verb. A neural network model is to be built for this task using three words before it and three words after it in a sentence as the features. Each word is represented using a word embedding vector of size 100. What should be the inputs and outputs of the neural network model and how many nodes each will have? What should be the activation function on the output layer and what error function should be used?