

Sample Exam Question, AC295/CS287

Full Name :

Natural Language Inference

Natural Language Inference is a popular NLP task that takes as input pairs of input sentences, the first sentence is referred to as the “premise”, and the second sentence is the “hypothesis”. The task is to determine which of the following three relationships best describes each pair: contradiction (i.e., the hypothesis is false), neutral (i.e., undetermined), or entailment (i.e., hypothesis is true).

Example of “contradiction” (C):

- Premise: A man inspects the uniform of a figure in some East Asian country.
- Hypothesis: The man is sleeping.

Example of “neutral” (N):

- Premise: An older and younger man smiling.
- Hypothesis: Two men are smiling and laughing at the cats playing on the floor.

Example of “entailment” (E):

- Premise: A soccer game with multiple males playing.
- Hypothesis: Some men are playing a sport.

As for the data, let’s say we have a corpus of 100,000 sentence pairs, and each pair has 5 distinct annotated labels. That is, 5 humans annotated every pair of sentences, so for a given example, your labels may have a variety of labels (e.g., Sentence Pair 1’s labels may be E, E, N, E, N). You can assume the data looks similar to the examples above. 70% of the sentence pairs are designated to be used as training, 20% for development, and 10% for testing. The distribution of the labels is uniform, yielding approximately an equal number of examples of all three labels.

Baseline Model

Develop a simple, fair baseline model that should yield reasonable (but not necessarily good) results and can serve as a useful reference point for your future modelling ideas. If you wish to make any simplifying assumptions, that is perfectly fine. Please state them here (e.g., all sentences are of length N, or all text was collected from resource X).

Assumptions:

1. Describe your baseline model and its architecture in 2-3 sentences
2. What is the name of your loss function? Write out the loss equation.
3. How long do you think it will take your baseline model to fully train? (e.g., 10 seconds, 10 minutes, 1 hour, 10 hours, etc)
4. What is your accuracy metric?
5. What would you estimate your training and testing accuracies to be (a scalar value)?
6. What type of errors do you think your model might make? Why? (1-2 sentences)
7. What type of examples do you think your model will get correct? Why? (1-2 sentences)

Improved Model

Here, you will develop a **neural network** that offers significant improvements over your baseline model. This model represents what you think should yield the highest accuracy possible. If you wish to make any simplifying assumptions, that is perfectly fine. Please state them here (e.g., all sentences are of length N, or all text was collected from resource X)

Assumptions:

1. What are some ideas you have for improving your baseline model? (e.g., you could mention an architecture change that might make fewer of the the errors that you suspect will be common in the baseline model, or you could add some mechanism that would be better at capturing certain patterns, etc).

2. Describe your new model and its architecture in 2-3 sentences

3. Draw your model's architecture. If drawing a complex architecture (e.g., transformer), you can simply draw a high-level version of it; no need to get super fine-grained. That is, do not try to illustrate how key, query, and value vectors relate to one another. Rather, you should draw the main components of a Transformer Encoder. If you want to use multiple Encoders, then you should illustrate such.

4. Will you use the same loss and accuracy metric as you did in your baseline model? Explain the reason for your decision (1-2 sentences).

5. How long do you think it will take your baseline model to fully train? (e.g., 10 seconds, 10 minutes, 1 hour, 10 hours, etc)

6. What would you estimate your training and testing accuracies to be?

7. What type of errors do you think your model might make? Why? (1-2 sentences)

8. What type of examples do you think your model will get correct? Why? (1-2 sentences)