NLP Practical: Part III

Simone Teufel

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Procedure/Timeline

- Today's Practical Session
  - Practical Session Nov 21: Text understanding
  - Nov 21: Early submissions get feedback on their Report 1
  - Nov 30: Submit Reports 2 and 3

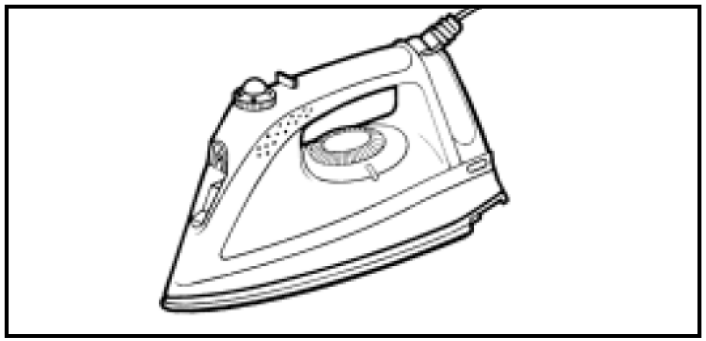
Entirely new Topic: IELTS Text Understanding Questions

- IELTS = International English Language Testing System
- Serious level of language understanding for L2 speakers:
  - Read text
  - Answer non-trival questions (understanding of literal text plus inference necessary)
- Possible automatically?
- Since 2015: Tokyo University + NII working on a system that automatically passes the University entry level test in various disciplines
- Important: Explanation (intermediate steps) necessary.
- You will here play through some scenarios and design a system that does this for one particular type of understanding questions

What a test question might look like

- Question: What sort of water are you advised to use?

YOUR MOULEX IRON



A Filling the reservoir

Your iron is designed to function using tap water. However, it will last longer if you use distilled water.
- Always unplug the iron before filling the reservoir.
- Always empty the reservoir after use.

Possible NLP ways of answering this

- POS-tagging ("to water the plants" is not relevant for this question).
- Word sense disambiguation ("iron" = tool here, not metal)
- Parsing – in particular finding all modifications of "water", in all situations where the water is the direct object of "use".
- Pronoun Resolution ("water" might occur in the form of "it")
- Lexical inference (similarity in semantic space? WordNet?): Instead of "use", a similar verb such as "employ" or "take" might be used
- Treatment of question string – what type of answer is expected: Yes/no question/ wh-question?

In this particular case

- "What kind of" implies subtype of water
- So look for noun compounds with "water" as head
- particularly in contexts with "use"
- Two are found: "using tap water" and "use distilled water"
- Brilliant! All you need to do is use the parser output to read this off (**your Task 1**).
- Heuristic: If two seemingly good contexts appear, choose the later one (or how could we do this in a better way? (**Open-ended; your Task 4**))
- Of course, the trick is to do anything you do, in such a way that it generalises to as many questions as possible.

Next question!

- "What should you do if your iron starts to drip water?"

B Temperature and steam control

Your Moulex iron has two buttons which control the intensity of heat produced by the iron. You can, therefore, adjust the temperature of the iron and the amount of steam being given off depending upon the type of fabric being ironed.
- Turn the steam control to the desired intensity.
- Turn the thermostat control to the desired temperature.

Important: *If your iron produces droplets of water instead of giving off steam, your temperature control is set too low.*

Two further problems with this question

1. "drip" is not mentioned anywhere in the text ("droplet" is the closest in meaning).
   - **Your Task 2**: use word2vec similarity and a Wordnet search to find closest words to question words
2. The information of what to do is physically removed from the description of the situation, and requires some inference (but let's ignore that for now)

Your four tasks for Report 3

- **Task 1**: Starting from the parsed versions of Question 1 from Text 1, (and all of Text 1 as potential answer), describe how to use the information from the parser to narrow down the set of sentences that might contain answer material – in the right syntactic form. Then perform this task for Question 12 from Text 2. (250 words)
- **Task 2:** In case the question words don't occur in the text explicitly, describe how today's NLP tools (e.g. Wordnet, word2vec embeddings) could be used to rank candidates. Perform this (semi-)manually for two examples, namely question 3 from Text 1 ("droplets") and at least one other question of your choice. Describe your findings in 250 words.

Your four tasks for Report 3

- **Task 3**: Describe the inference chain that connects question 5 of Text 1 with its answer in the text. Are all parts automatable? What is the hardest part? (250 words)
- **Task 4:** What do you think the main other obstacles are for answering general questions of the IELTS type automatically? If you were given the task of building a system now with today's NLP components in, say, 2 person years, how would you go about? (250 words or more)
- In all answers, please demonstrate knowledge from applicable lectures of NLP.