A little MPT Tutorial

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Abstract

This is very cool work on an extremely interesting topic.

Keywords: keywords
Word count: X

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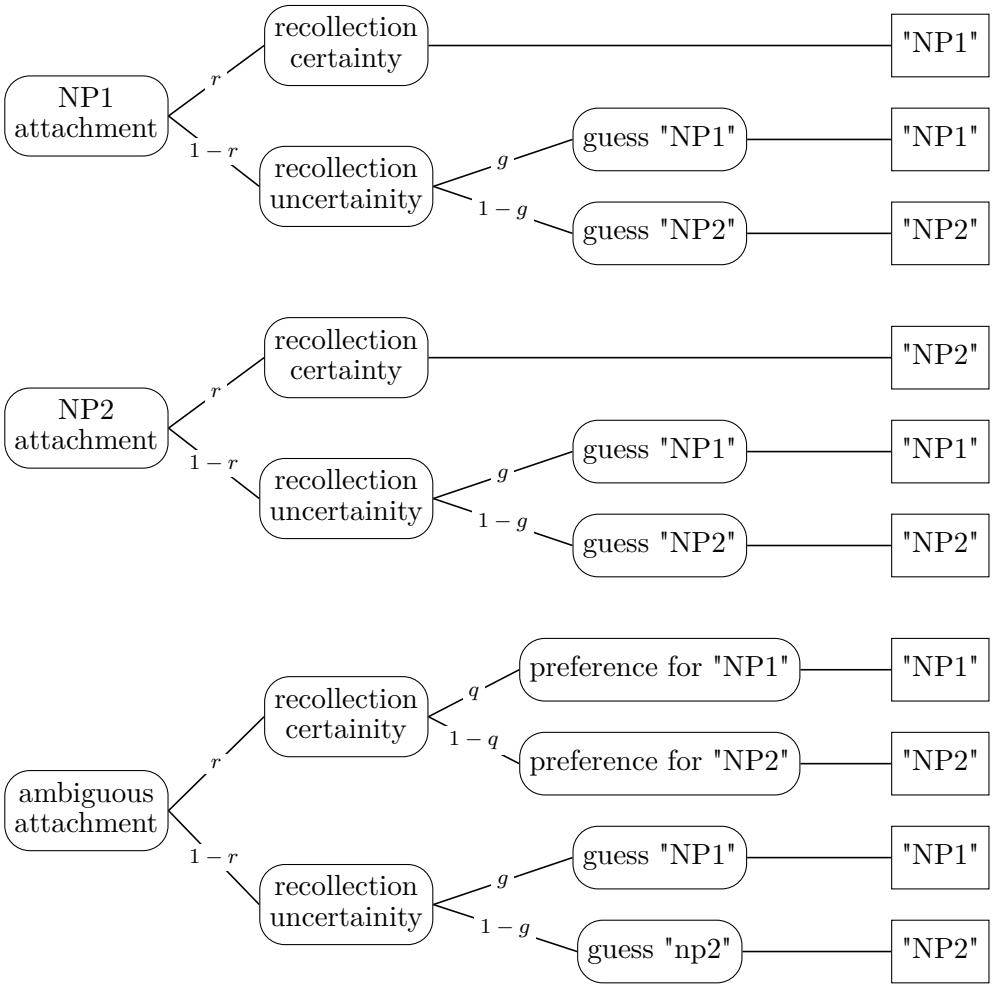
A multinomial processing tree generative model



The model.

The predictions. In equations (1), (2), (3) xxx.

$$P(\text{"}NP1\text{"}|NP1) = r + (1 - r) \cdot g \tag{1}$$

$$P(\text{"}NP1\text{"}|NP2) = (1 - r) \cdot g \tag{2}$$

$$P(\text{"}NP1\text{"}|ambiguous) = r \cdot q + (1 - r) \cdot g \tag{3}$$

Naive estimation, simple conditions.

- Let's use the numbers above as estimates of $P(\text{"}NP1\text{"}|NP1)$, $P(\text{"}NP1\text{"}|NP2)$, and $P(\text{"}NP1\text{"}|ambiguous)$:

$$
\begin{aligned}
0.905 &= r_s + (1 - r_s) \cdot g_s \\
0.227 &= (1 - r_s) \cdot g_s \\
0.668 &= r_s \cdot q_s + (1 - r_s) \cdot g_s
\end{aligned}
$$

- This means:

$$
\begin{aligned}
r_s &= 0.678 \\
g_s &= 0.705 \\
q_s &= 0.650
\end{aligned}
$$

Naive estimation, complex conditions.

- Let's apply the same logic here, too:

$$
\begin{aligned}
0.919 &= r_c + (1 - r_c) \cdot g_c \\
0.241 &= (1 - r_c) \cdot g_c \\
0.750 &= r_c \cdot q_c + (1 - r_c) \cdot g_c
\end{aligned}
$$

- This means:

$$
\begin{aligned}
r_c &= 0.678 \\
g_c &= 0.748 \\
q_c &= 0.751
\end{aligned}
$$

- The parameters q_s and q_c differ by 0.1, which is more than the difference between ambiguous conditions (0.08).
- The fact that g_s and g_c differ substantially is quite certainly a problem.
- Complexity shouldn't influence g, by definition. Are potentially additional mechanisms at work, or is this just sampling error? It's actually not unlikely that this is sampling error, especially due to the fact that spellout.net doesn't properly balance participants across Latin-square lists.

- Can we even compare qs, given this difference in gs?

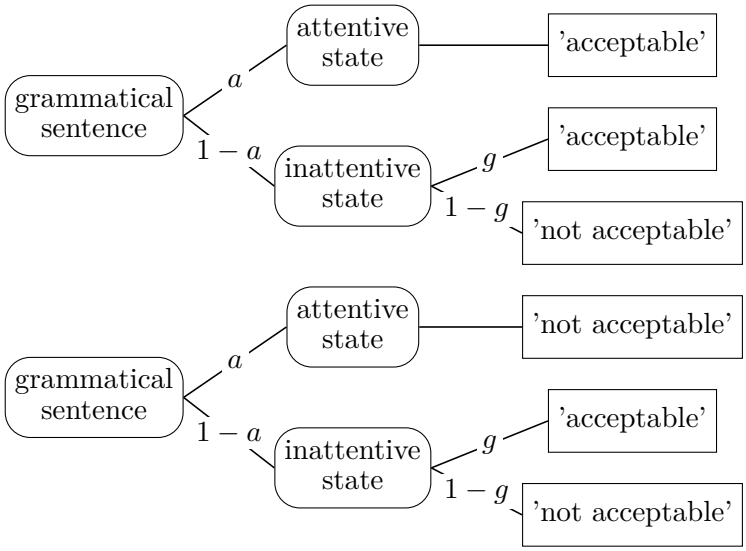


Figure 1. An MPT model of question answering with equal error rates for (i) N1 attachment, (ii) N2 attachment, and (iii) ambiguous sentences.