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Transformer-Maze:
An Accessible Incremental Processing Measurement Tool

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On crowd-sourcing platforms, **G**(rammatical)**-Maze** (Forester et al. 2009) is more effective than self-paced reading (**SPR**) (Mitchell & Green, 1978) at:

- Detecting differences in processing difficulty
- Localizing these differences

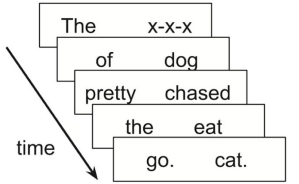


Figure from Boyce et al. (2010)

Problem:
Generating thousands of distractors well-matched to the experimental stimuli is time-consuming and difficult by hand.
→ **A**(uto)**-Maze** (Boyce et al., 2020) automates distractor generation using recurrent neural network (RNN) language models

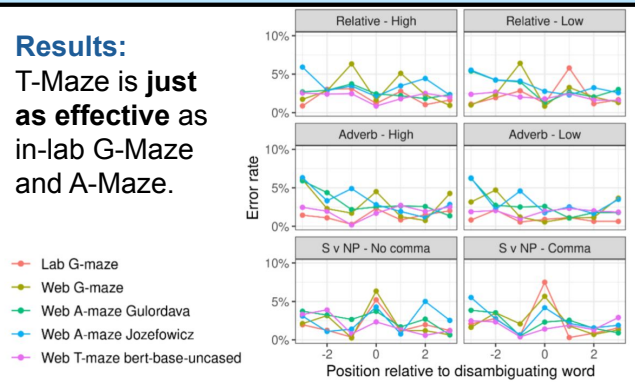
Our solution:
T(ransformer)**-Maze**: automated distractor generation system using Transformer models instead of RNNs because:

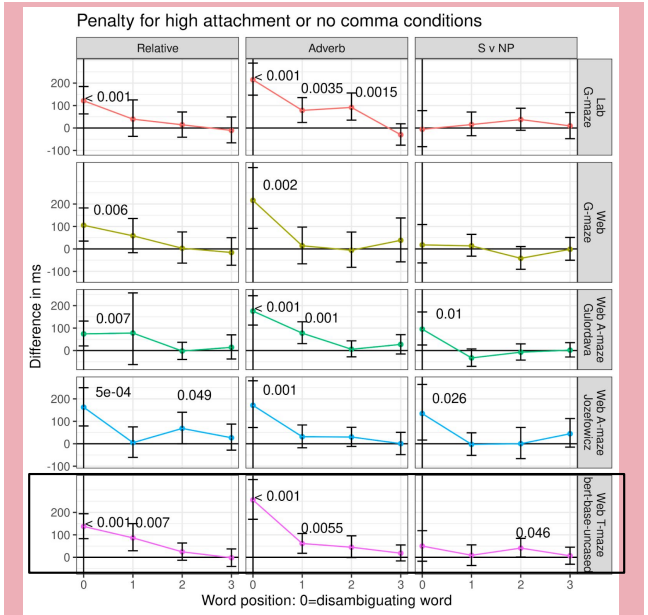
- Transformers = Current NLP state-of-the-art
- Thousands of Transformers pretrained in hundreds of languages available online for free

Methods:
We replicated Boyce et al. (2020)'s validation experiment on Prolific (N=49) with T-Maze generated materials, comparing T-Maze vs in-lab G-Maze (Witzel et al., 2012) vs web G-Maze2 versions of A-Maze on 3 types of ambiguous sentence structures:

Relative clause - Low attachment: (1a) The niece of the fisherman who got *himself* a sailboat learned to sail.
Relative clause - High attachment: (1b) The niece of the fisherman who got *herself* a sailboat learned to sail.
Adverb clause - Low attachment: (2a) Robert will meet the friend he phoned *yesterday*, but he doesn't want to.
Adverb clause - High attachment: (2b) Robert will meet the friend he phoned *tomorrow*, but he doesn't want to.
Sentence vs noun phrase (S v NP) coordination - With comma: (3a) The crowd cheered for the model, and the designer *took* a bow after the show
Sentence vs noun phrase (S v NP) coordination - No comma: (3b) The crowd cheered for the model and the designer *took* a bow after the show.

Results:
T-Maze is **just as effective** as in-lab G-Maze and A-Maze.





References:

Github: https://github.com/annikaheuser/TMaze

Additional Methods Figure: