

NaturalLI: Natural Logic for Common Sense Reasoning

Gabor Angeli, Chris Manning

Stanford University

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Common Sense Reasoning

Cats play with yarn

Cats play with computers

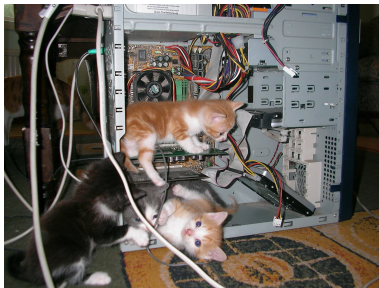


Common Sense Reasoning

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Cats play with computers



Common Sense Reasoning for Vision

Dogs drive cars



People drive cars



Common Sense Reasoning for Vision

Dogs drive cars



People drive cars



Baseball is played underwater



Baseball is played on grass



Natural Logic

A cat ate a mouse $\stackrel{?}{\Rightarrow}$ *No carnivores eat animals*

First-Order Logic

Start with text: *A cat ate a mouse*



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All men are mortal.

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Natural Logic for Knowledge Base Completion

Input: A query fact and a corpus of text snippets

Output: The truth of the query

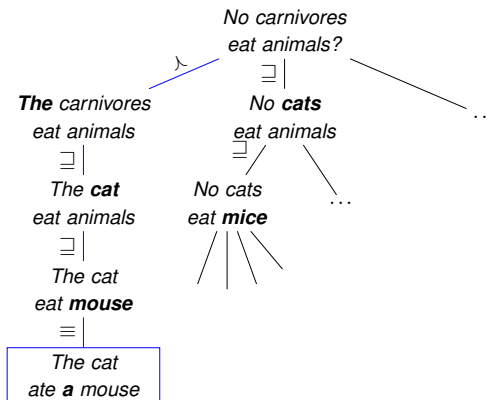


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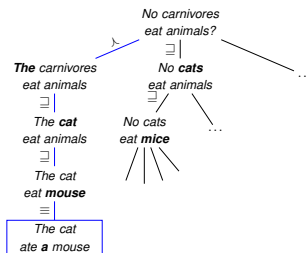
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Search over mutations from query:



Natural Logic for Knowledge Base Completion

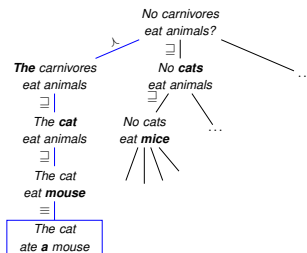


Each mutation has a cost c

- **Low cost:** *some cats have tails* \Rightarrow *some felines have tails*
- **High cost:** *some cats have tails* \Rightarrow *some dogs have tails*



Natural Logic for Knowledge Base Completion



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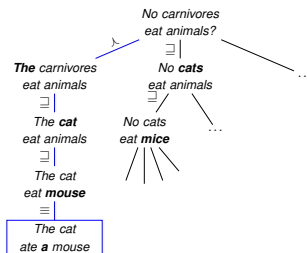
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Search gets better as we learn

Looking for Applications!



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- 12% recall → 48% recall @ 93% precision



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- Checks logical entailment, not just *fuzziness*
- Support doesn't have to be lexically similar



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Sometimes even a bit clever



Thanks!

