



Huawei **Scientist
Committee**

Edinburgh Coffee House

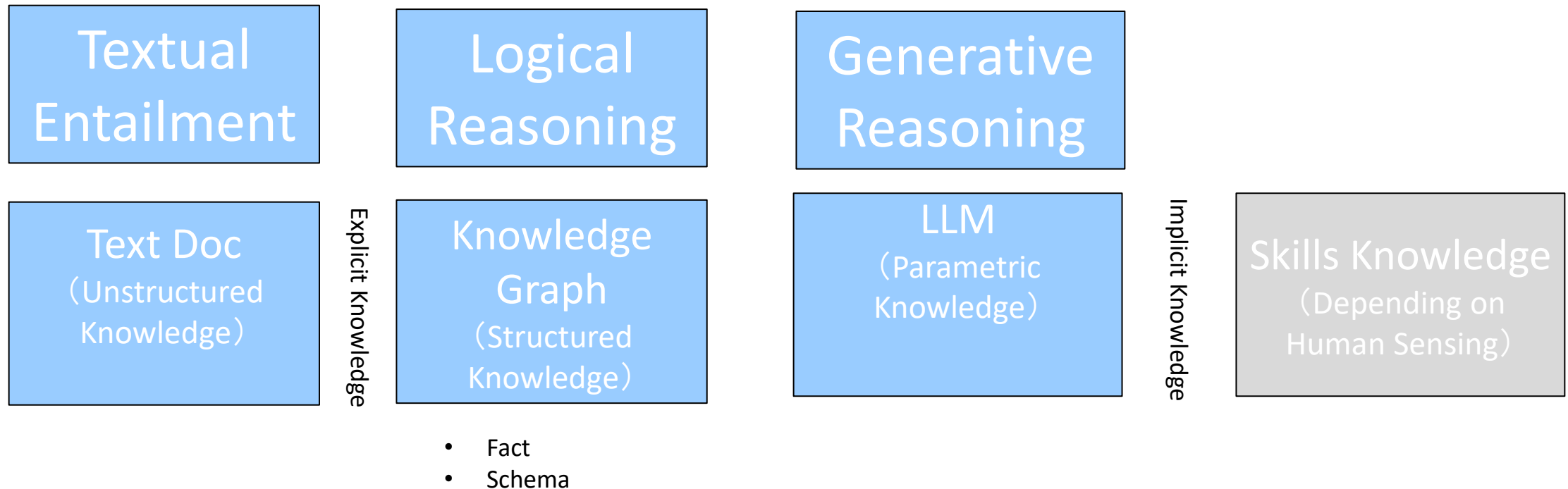
Session: Knowledge Computing

Jeff Pan

(Chair of Knowledge Graph Group at Alan Turing Institute)

What is Knowledge?

- **Verified** belief, opinion, and practical skills (such as playing guitar)
- How to classify knowledge?



Large Language Model (implicit knowledge)

Highlight: Strong associative reasoning ability, able to engage in dialogue, automatically generate text and code, and multitask everything, shifting AI from "behind the scenes" to "spotlights".

Step 1

Collect demonstration data and train a supervised policy.

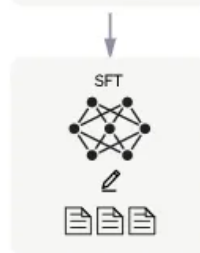
A prompt is sampled from our prompt dataset.



A labeler demonstrates the desired output behavior.



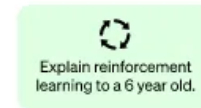
This data is used to fine-tune GPT-3.5 with supervised learning.



Step 2

Collect comparison data and train a reward model.

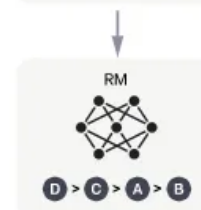
A prompt and several model outputs are sampled.



A labeler ranks the outputs from best to worst.



This data is used to train our reward model.



Step 3

Optimize a policy against the reward model using the PPO reinforcement learning algorithm.

A new prompt is sampled from the dataset.



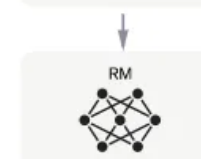
The PPO model is initialized from the supervised policy.



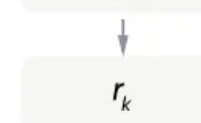
The policy generates an output.

Once upon a time...

The reward model calculates a reward for the output.



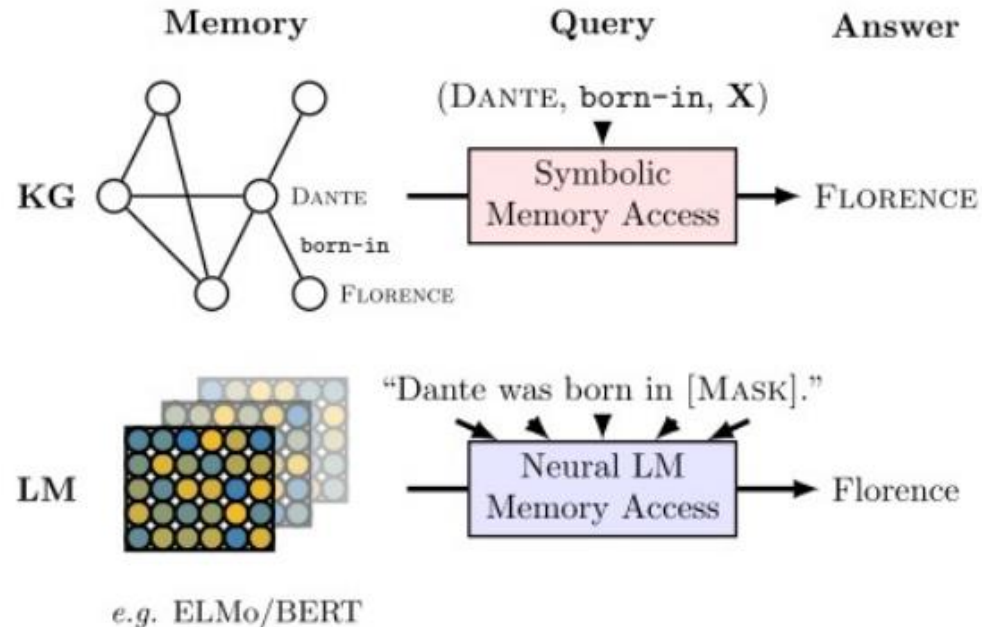
The reward is used to update the policy using PPO.



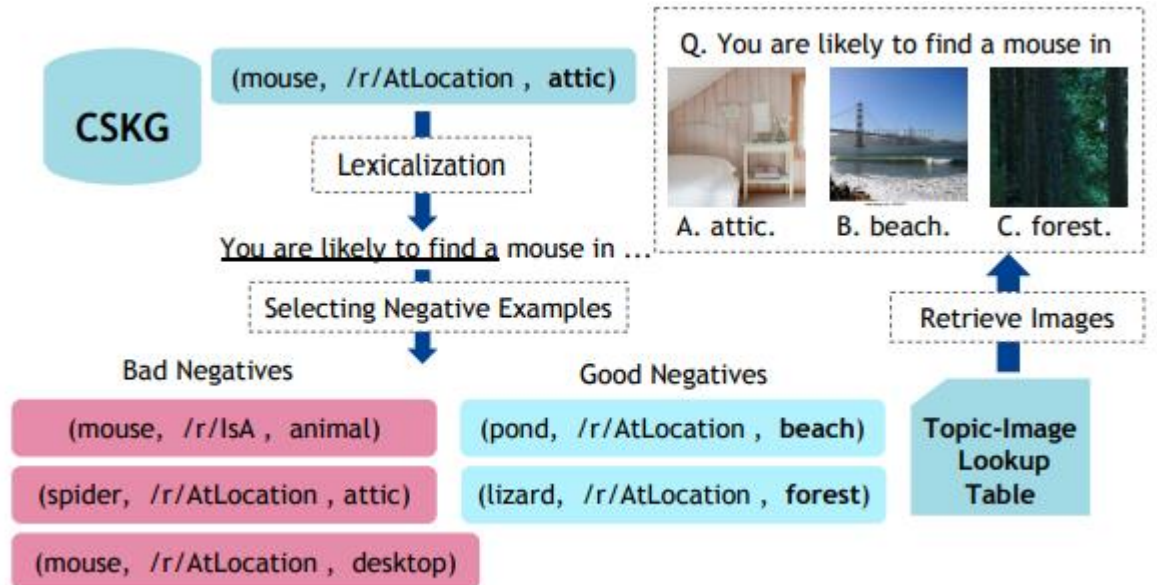
Speedup the Construction of Knowledge Graphs

- Contain more knowledge than people previously expect
- Reduce the need of training data for the knowledge extraction task

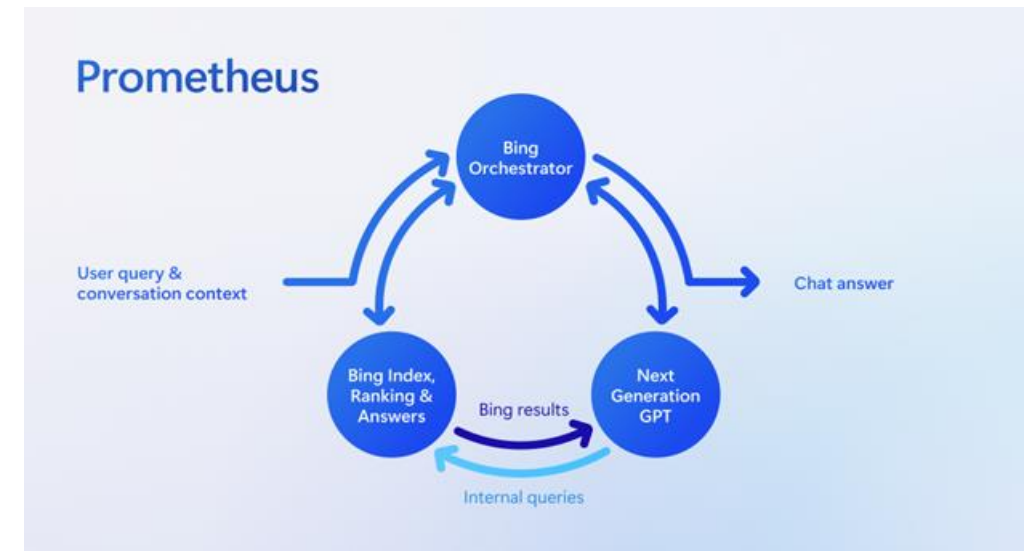
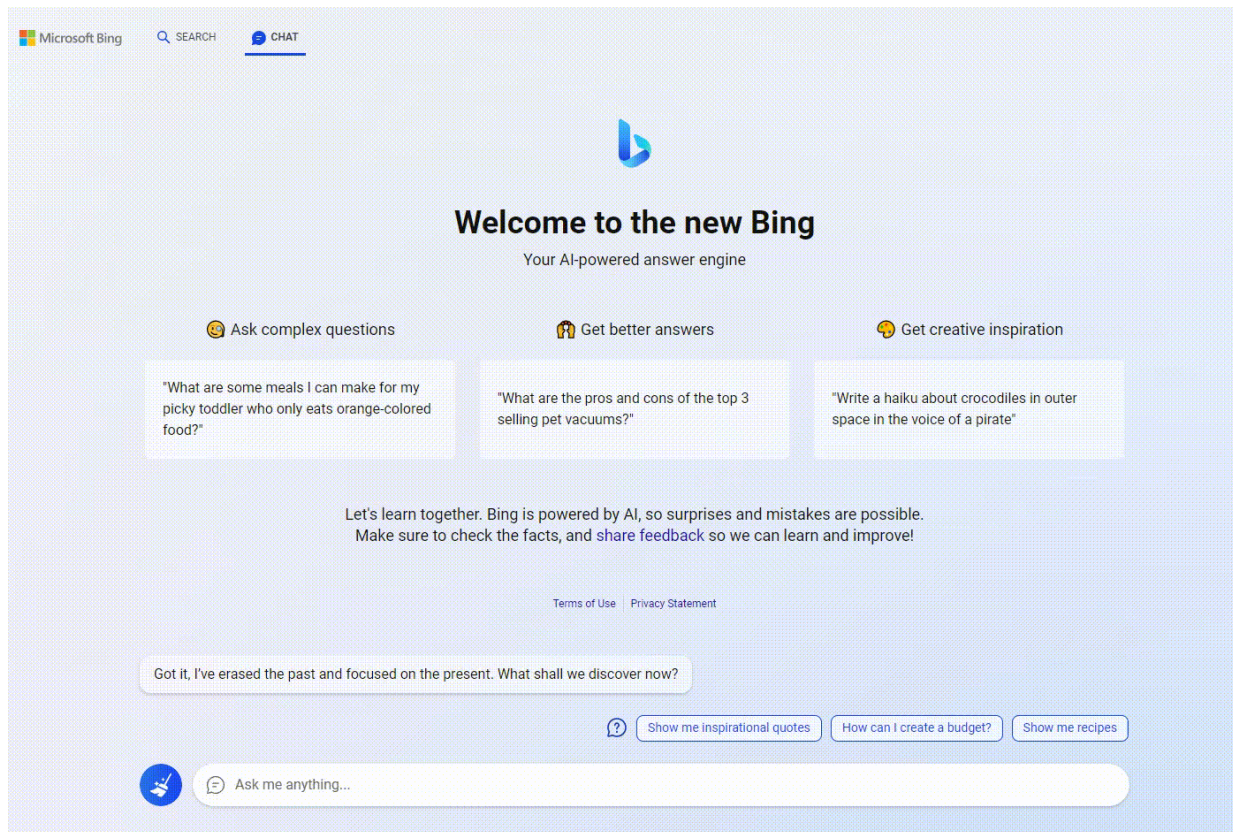
Language Models as Knowledge Bases? (Meta, EMNLP2019)



Are Visual-Linguistic Models Commonsense Knowledge Bases? (ICCL 2022)



Generative Search Engine



Today's Session: Two Technologies to Revolutionise NLP/KC

- Quantum NLP
- Large Language Models



Hybrid Recurrent Architectures for Quantum-Classical NLP



Going beyond the benefits of scale by reasoning about data



Inference in the time of GPT



Nonparametric Language Models: Trading Data for Parameters
(and Compute) in Large Language Models

Round Table Discussion: Large Language Models



Mark Steedman



Edward Grefenstette



Luke Zettlemoyer



Edoardo Ponti



Steve Clark