

EMNLP 2021 Tutorial

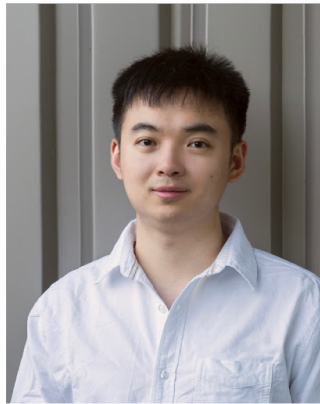
Knowledge-Enriched Natural Language Generation



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This part: General principles and methodologies for integrating knowledge into NLG

Overview:

- Knowledge-enhanced **model architectures**
 - Attention/copy mechanisms
 - Graph neural models
- Knowledge-enhanced **learning**
 - Auxiliary **loss/tasks**
 - Reinforcement learning with knowledge-informed **rewards**
 - Learning with knowledge **constraints**
- Knowledge-enhanced **inference**
 - Steered decoding
 - Prompts

Knowledge-enhanced inference



- Integrate knowledge during the text decoding process
- Can be applied to pretrained language models (e.g., GPT-2/3, T5) for knowledge-enhanced NLG

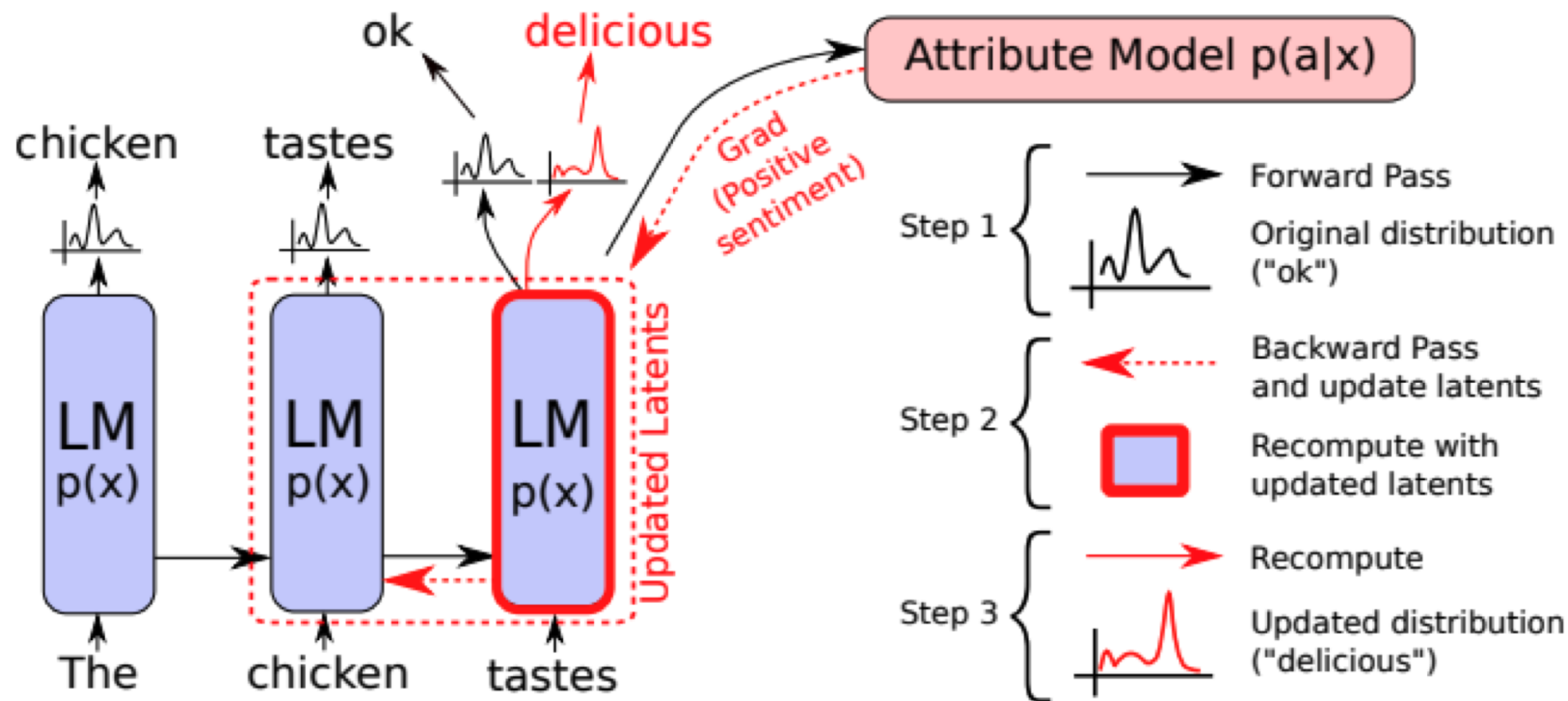
Inference (I): Steered decoding



- Guide the decoding by changing the generation distribution
- Controlling LMs with another (relatively smaller) model trained for desired attributes
- Examples: PPLM, GeDi, DeLorean, DExperts, FUDGE, MoFE

Inference (I): Steered decoding

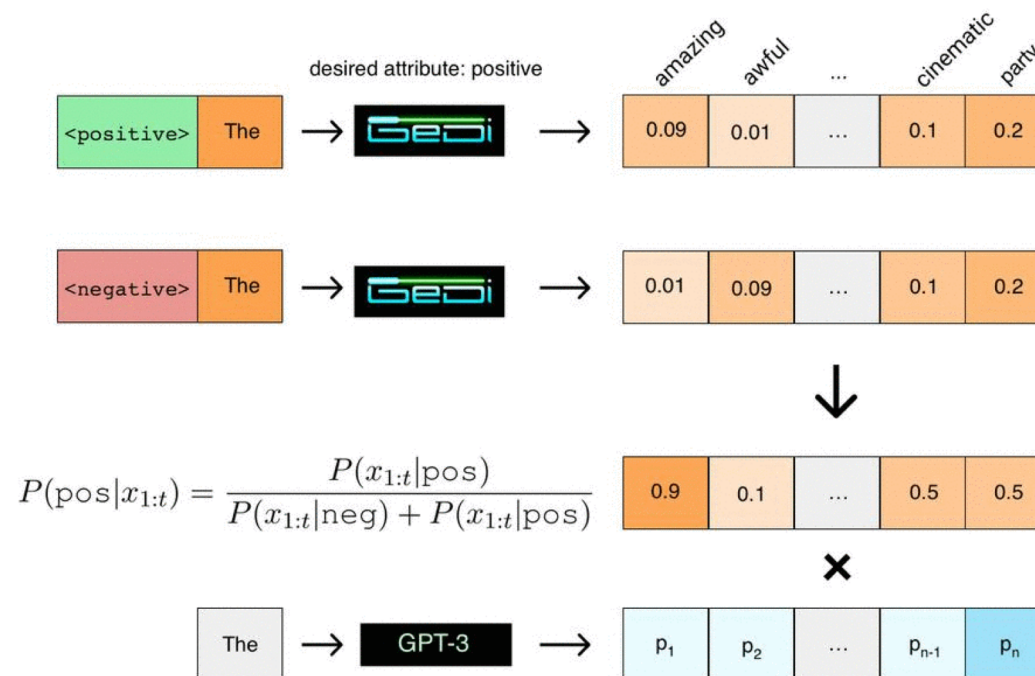
- Use a single-layer discriminative classifier as the guide



Inference (I): Steered decoding

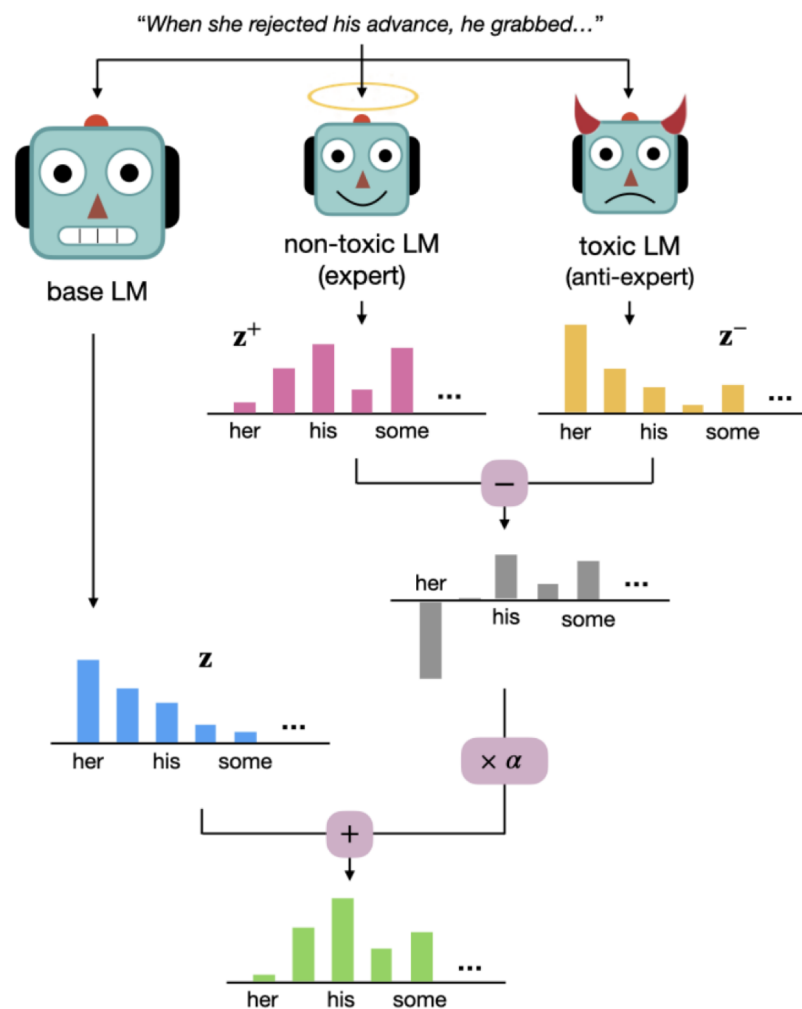


- Use another LM as a generative discriminator to guide decoding
- Examples: GeDi (Krause et al., '20) and FUDGE (Yang et al., '21)



Inference (I): Steered decoding

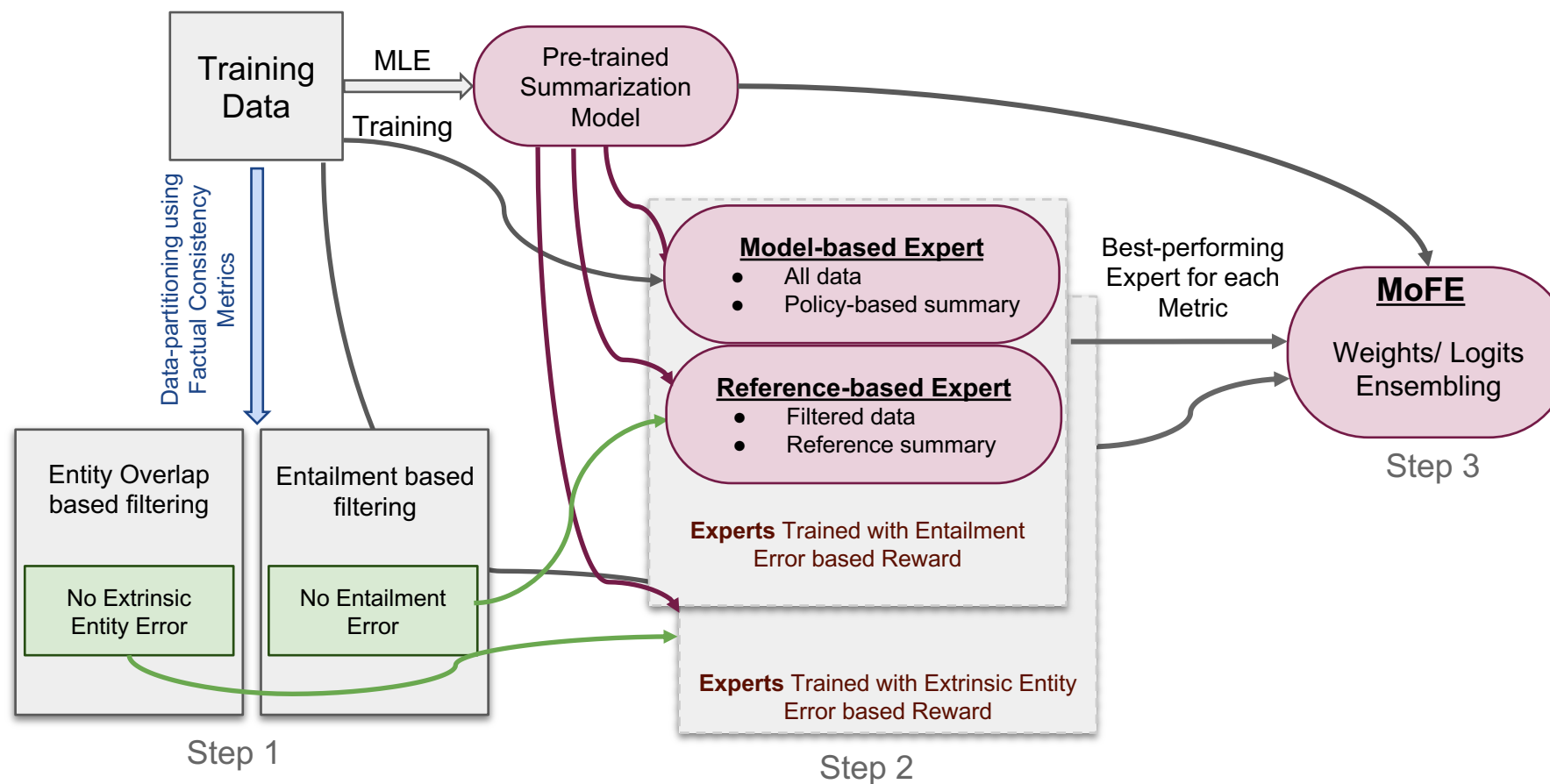
- Use two LMs to constrain decoding



Liu et al., "DExperts"

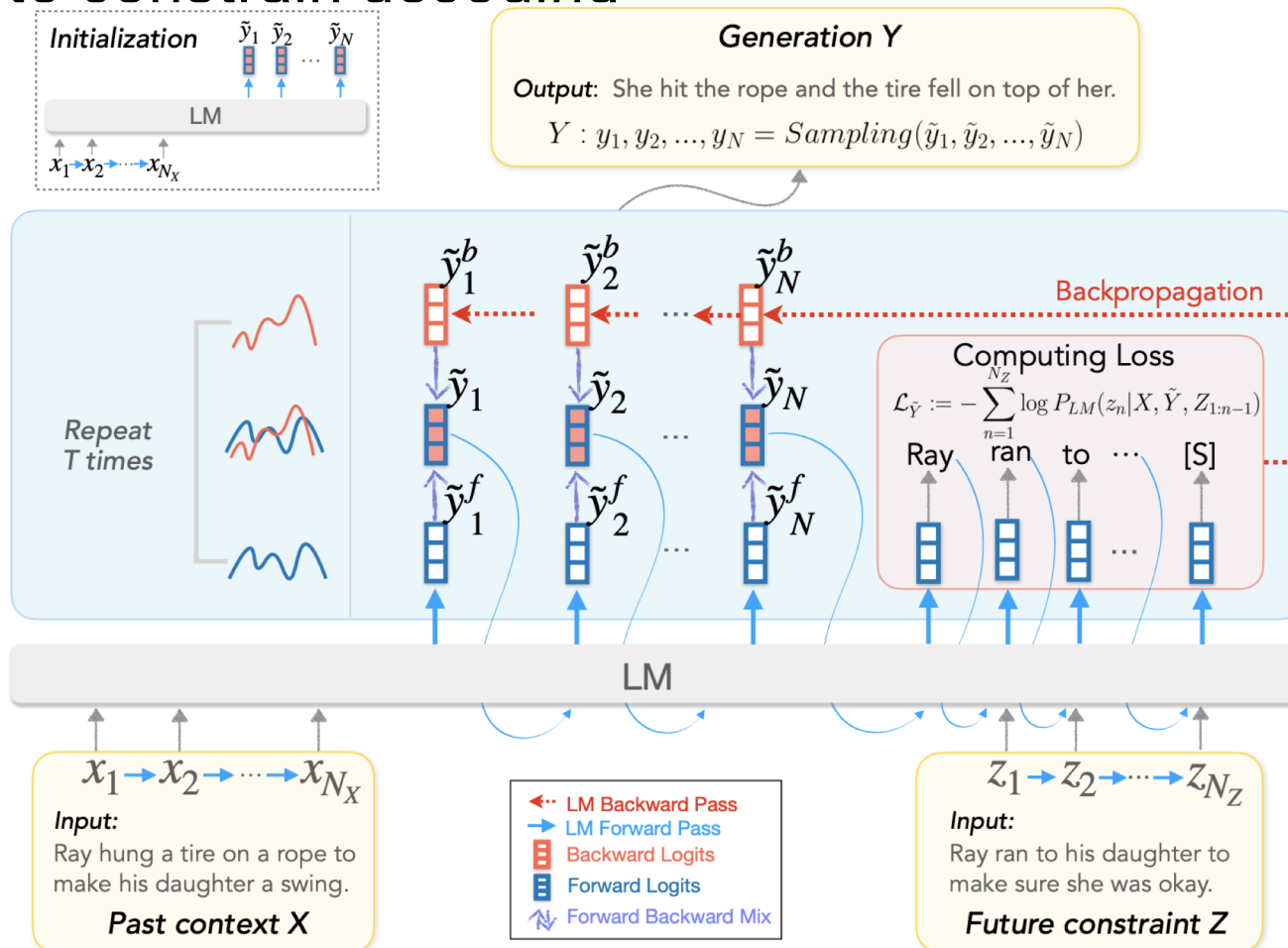
Inference (I): Steered decoding

- Using RL to constrain decoding for factual consistency



Inference (I): Steered decoding

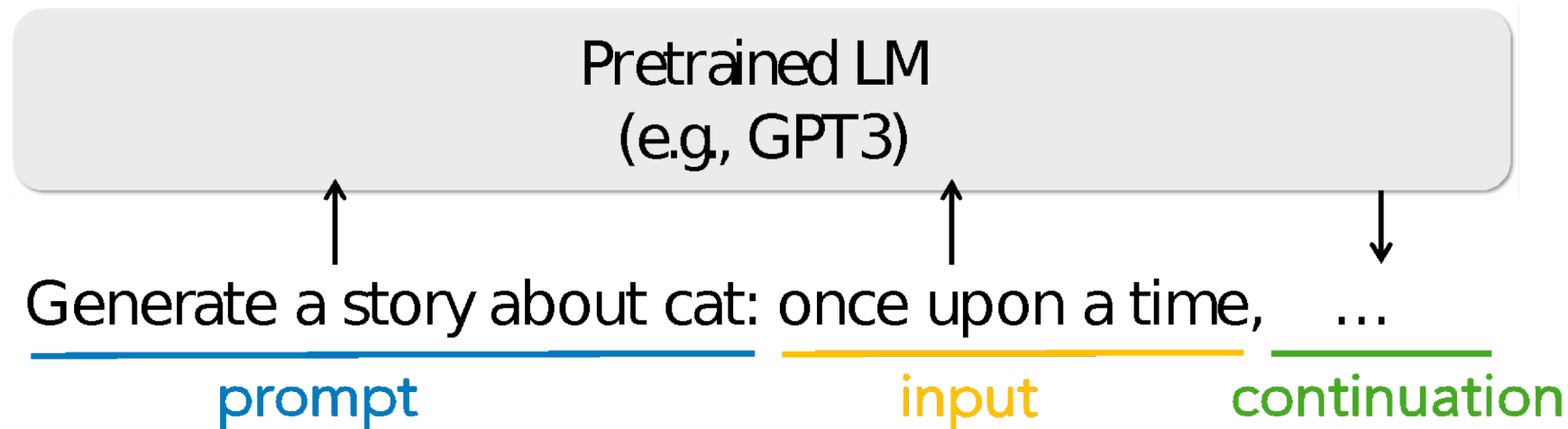
- Using text to constrain decoding



Inference (II): Prompts



- Guide the decoding by changing the generation distribution
- Low parameter alternative to finetuning LMs

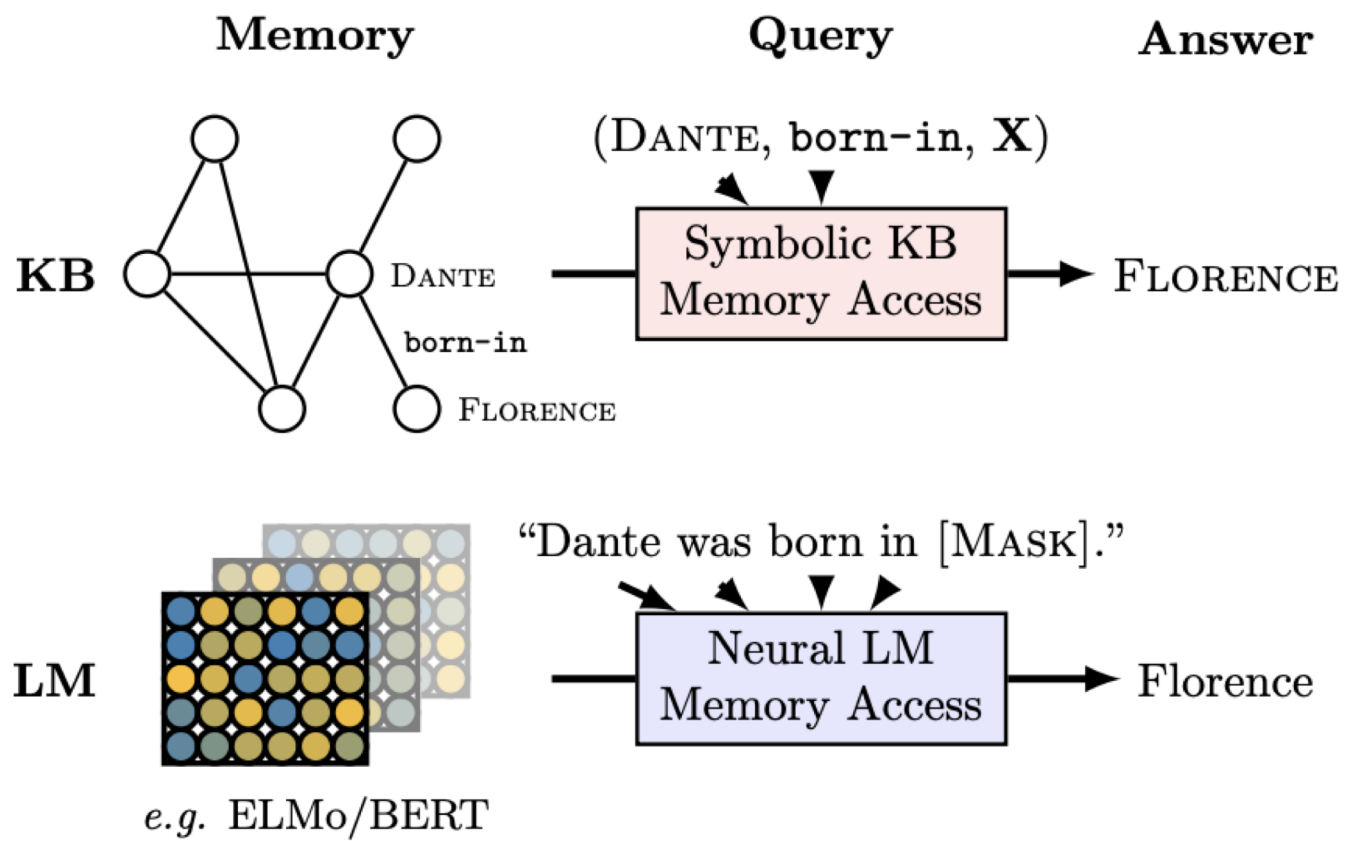


3 broad directions to infer knowledge using prompts:

1. zero-shot, eg: “The capital of Canada is [MASK]”
2. few-shot, eg: “The capital of France is Paris. The capital of Canada is [MASK]”
3. with additional context, eg: “Ottawa sits on the Ottawa River at the border between Quebec and Ontario. The capital of Canada is [MASK].”

Inference (II): Prompts

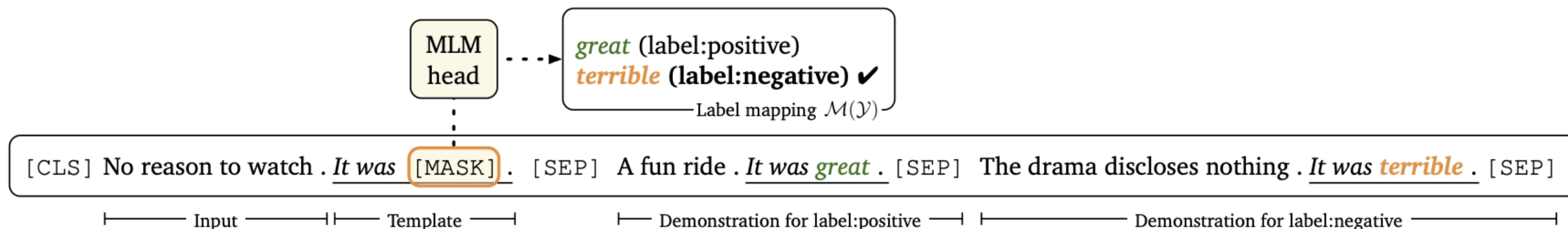
Zero-shot setting



Inference (II): Prompts



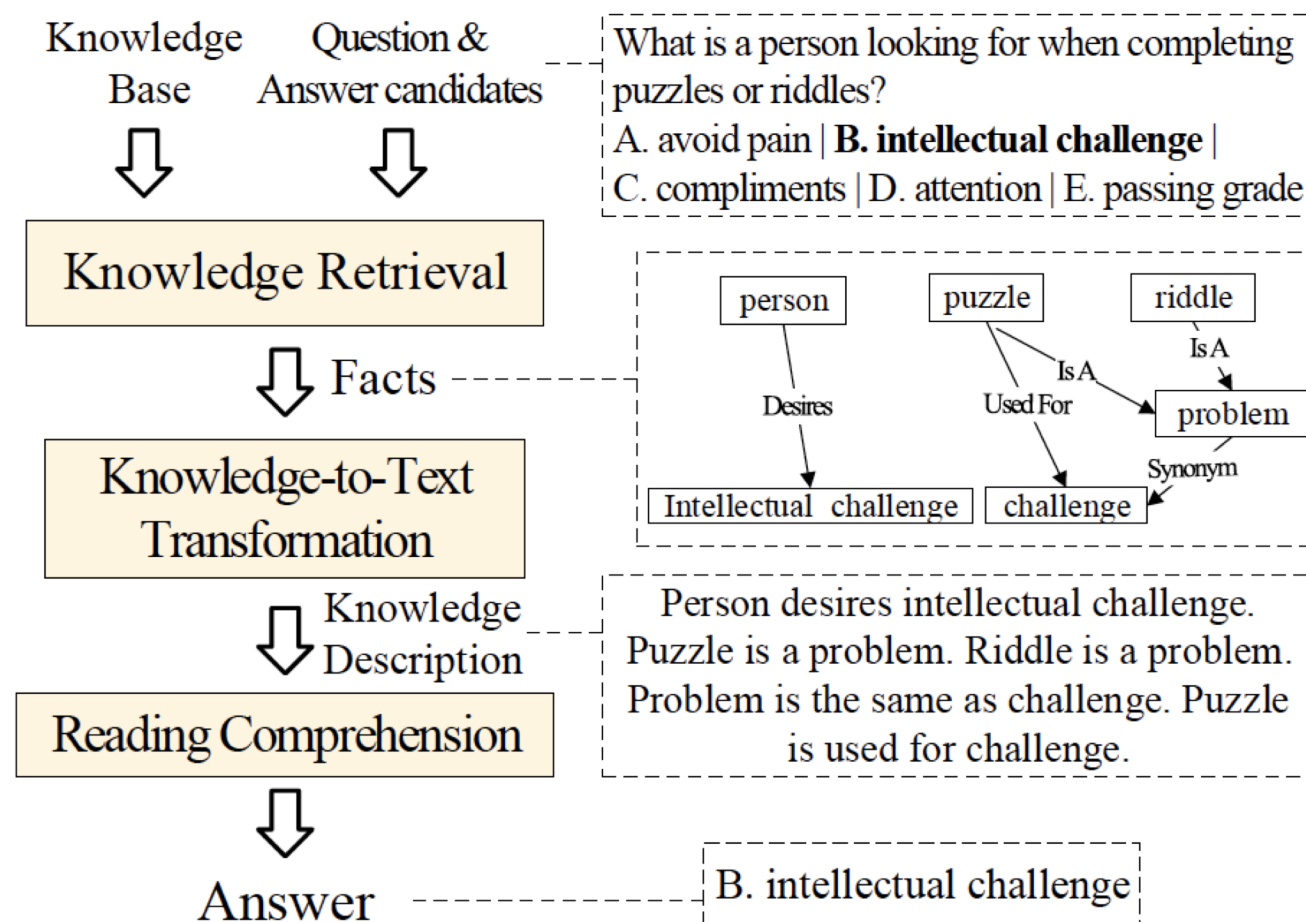
Few-shot setting/ via demonstration



Gao et al., 2021

Inference (II): Prompts

With additional context



This part: General principles and methodologies for integrating knowledge into NLG

- Knowledge-enhanced **model architectures**
- Knowledge-enhanced **learning**
- Knowledge-enhanced **inference**
 - Steered decoding
 - Prompts