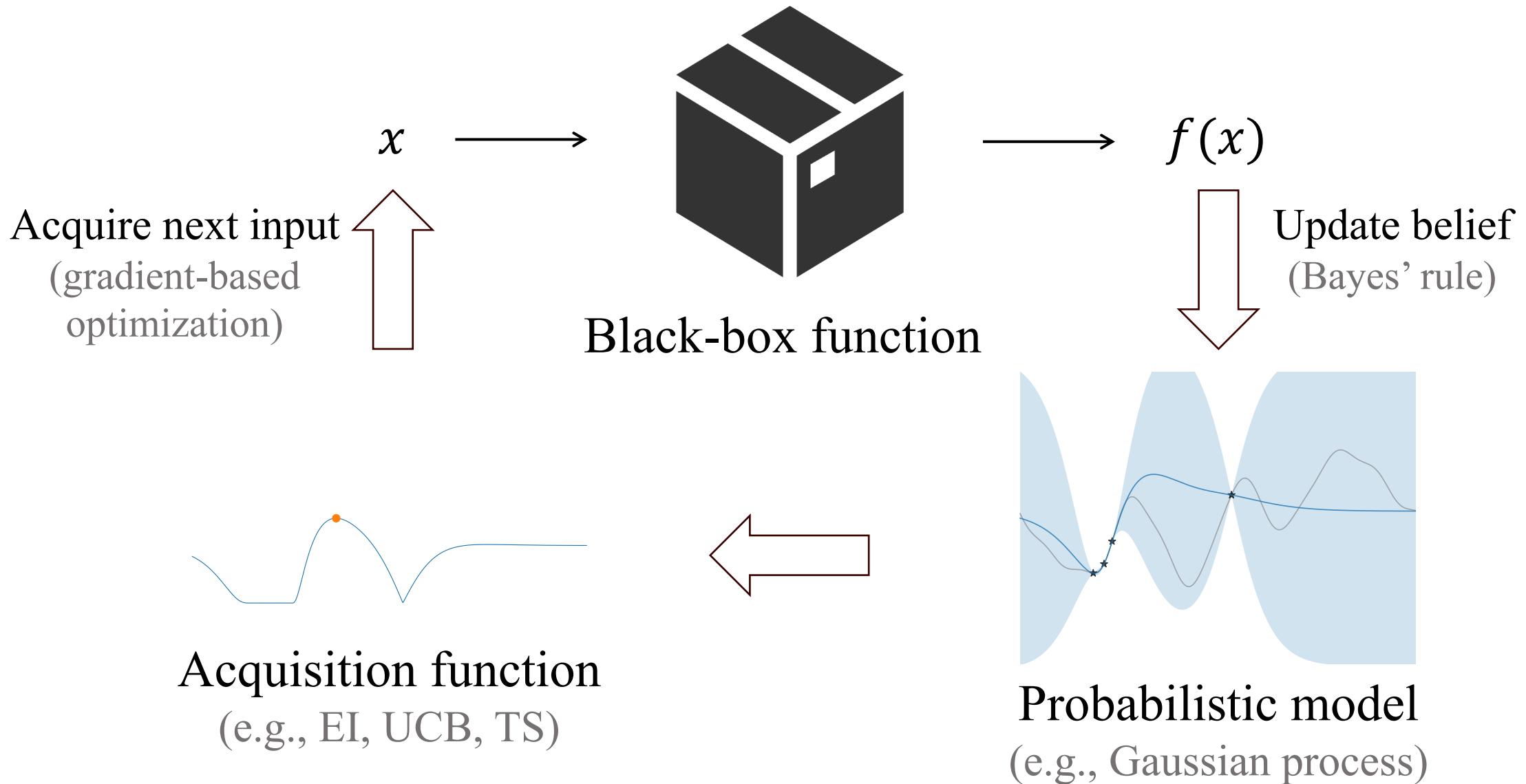
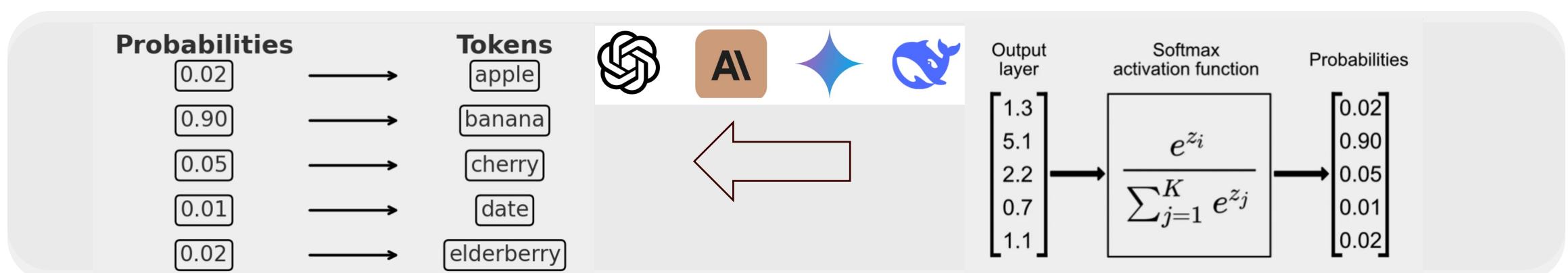
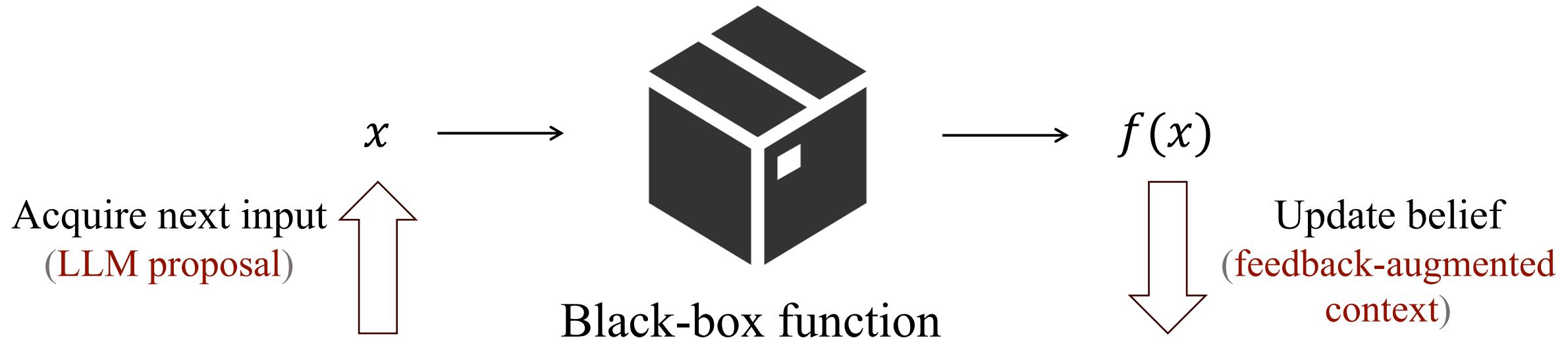


Recap: Bayesian Optimization



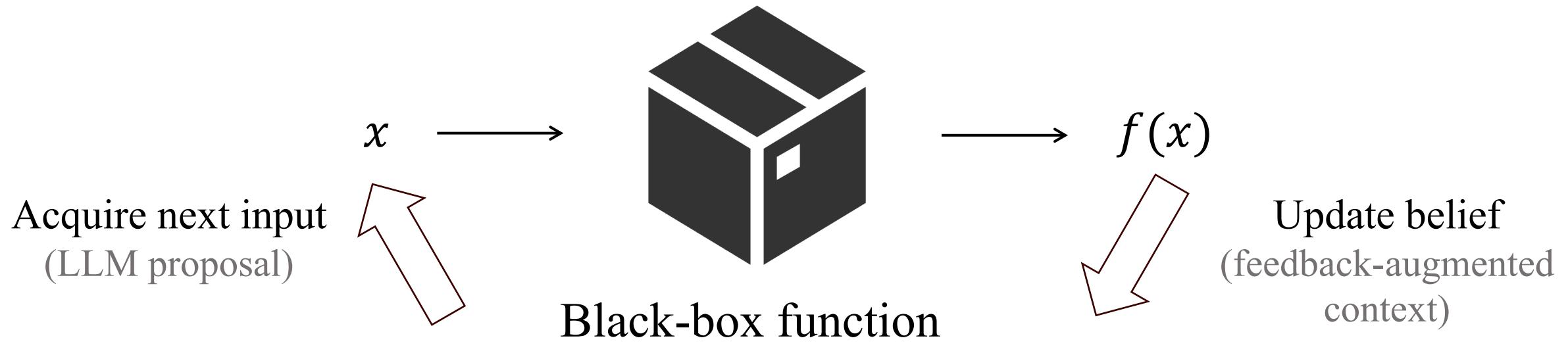
Ongoing: LLM-Driven Black-Box Optimization



Acquisition function
(e.g., Softmax sampling)

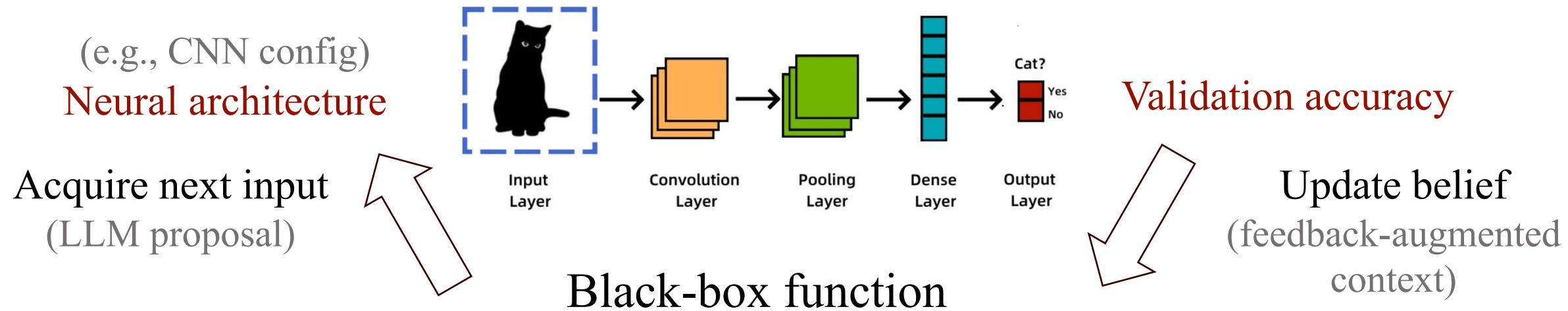
Probabilistic model
(e.g., autoregressive model)

Ongoing: LLM-Driven Black-Box Optimization



Large language model

Existing LLM-Driven Method: GENIUS



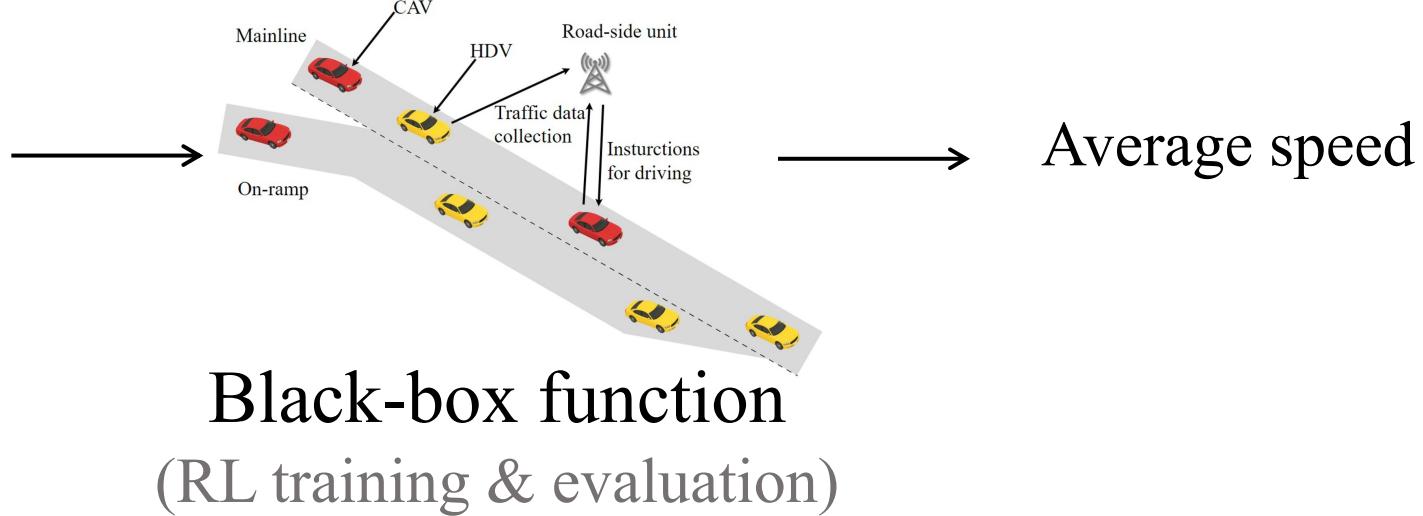
ChatGPT

Large language model

Challenge: Diverse Data Sources in RL

Mixed-autonomy traffic control:

Neural architecture
(RL state representation)



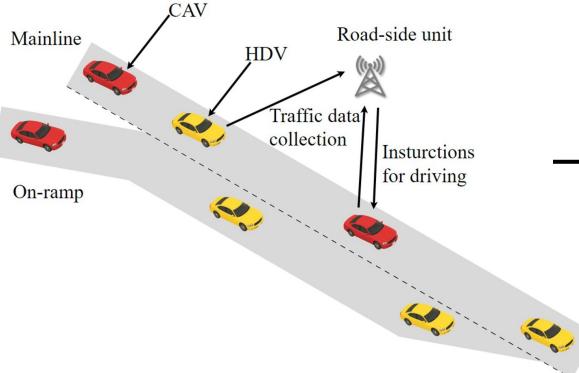
Average speed

Challenge: Diverse Data Sources in RL

Mixed-autonomy traffic control:

Composite neural architecture (FFN & Transformer config)

for vector & time-series data



Black-box function (RL training & evaluation)

- Current traffic state
 - Temporal traffic evolution
 - Vehicle sequence history

Vector

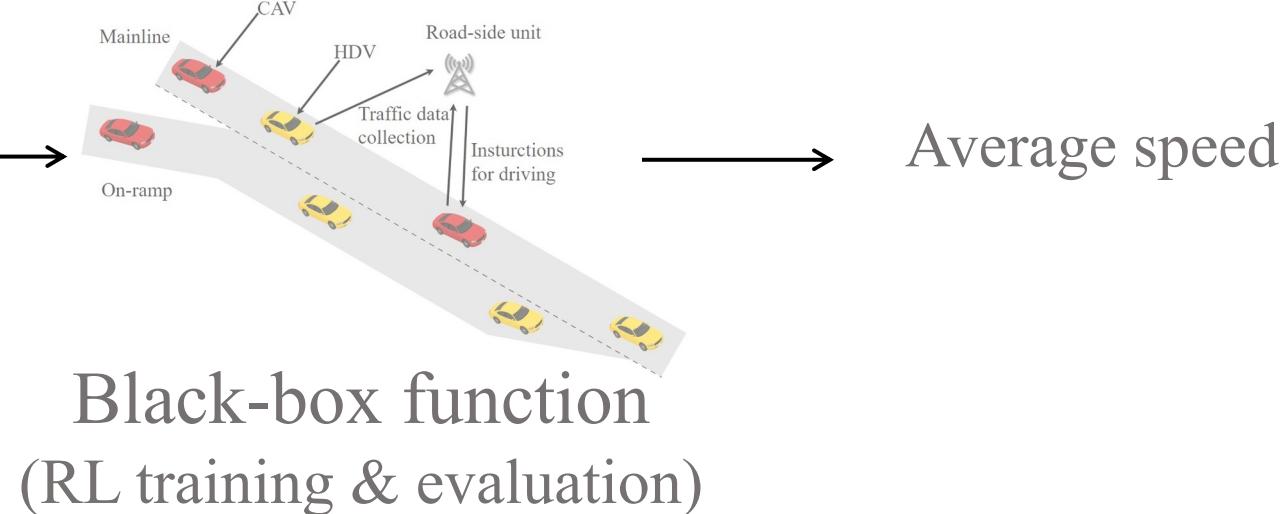
Time-series

Challenge: Diverse Data Sources in RL

Mixed-autonomy traffic control:

Composite neural architecture
(FFN & Transformer config)

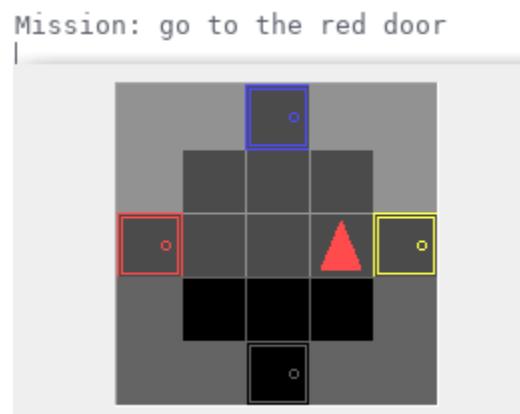
for vector &
time-series data



Goal-oriented tasks:

Composite neural architecture
(CNN & GRU config)

for image & text data



- **Image observation**
- **Textual instruction**

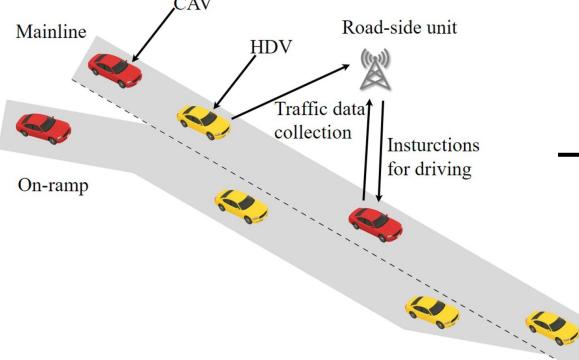
Average speed

Average reward

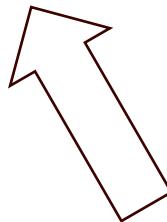
Composite Neural Architecture Search

Mixed-autonomy traffic control:

Composite neural architecture



Acquire next input
(LLM proposal)

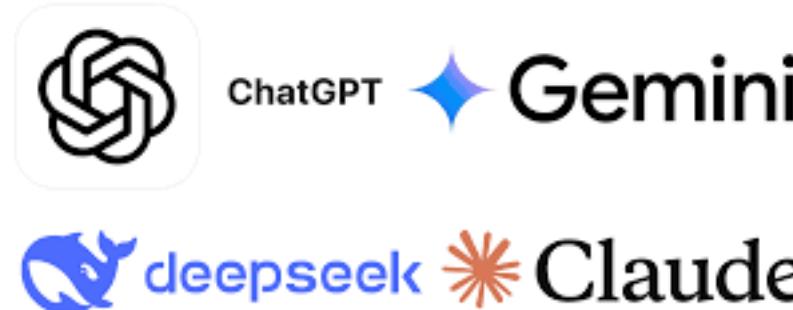


Black-box function
(RL training & evaluation)

Average speed

Update belief
(feedback-augmented context)

Can side info help?



Large language model

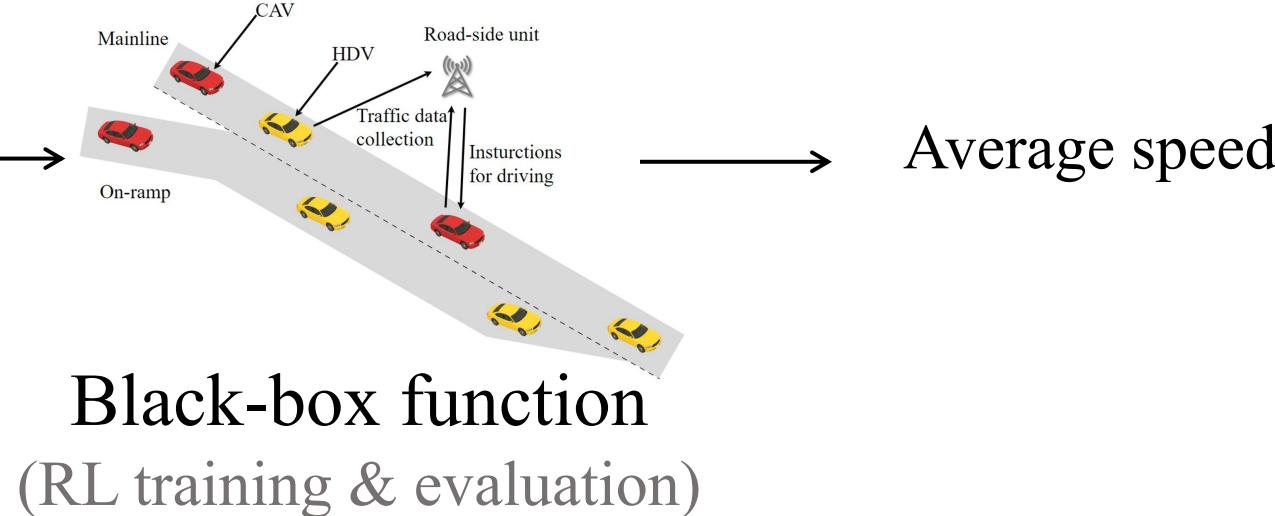
Side Info: Representation Quality

Mixed-autonomy traffic control:

Joint work with Yu Yu and Li Jin (SJTU)

Composite neural architecture
(FFN & Transformer config)

representation quality?



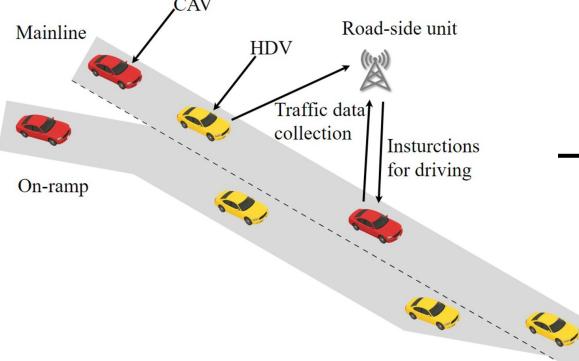
- Current traffic state Vector
- Temporal traffic evolution
- Vehicle sequence history] Time-series

Our LLM-Driven Method: Incorporate Side Info

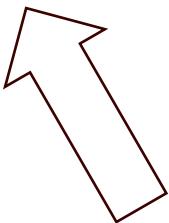
Mixed-autonomy traffic control:

Joint work with Yu Yu and Li Jin (SJTU)

RL state representation



Acquire next input
(LLM proposal)



Black-box function
(RL training & evaluation)

Average speed

Update belief
(feedback-augmented context)

performance metric +
representation quality



ChatGPT



deepseek



Claude

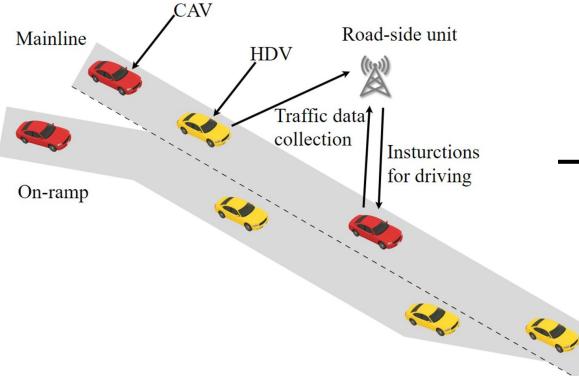
Large language model

Our LLM-Driven Method (LACER) vs Baselines

Mixed-autonomy traffic control:

Joint work with Yu Yu and Li Jin (SJTU)

RL state representation



Average speed

