Automating Prompt Engineering for Forecasting Tasks

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U.C. Berkeley, Master of Information and Data Science Program

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Team

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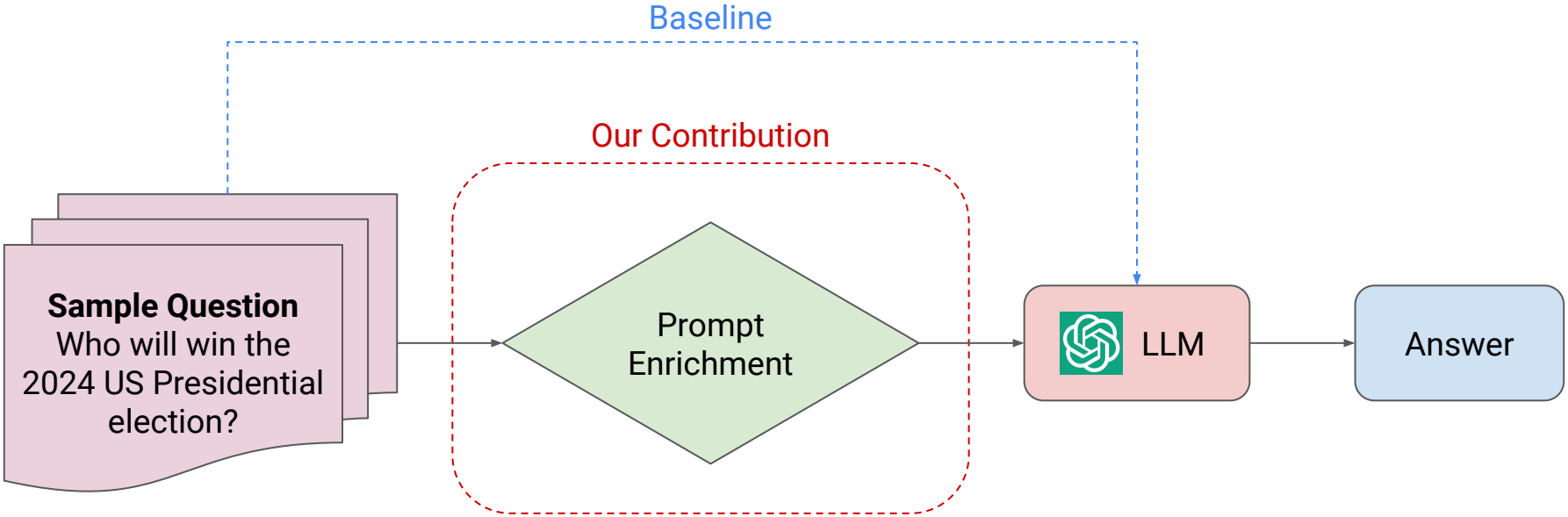
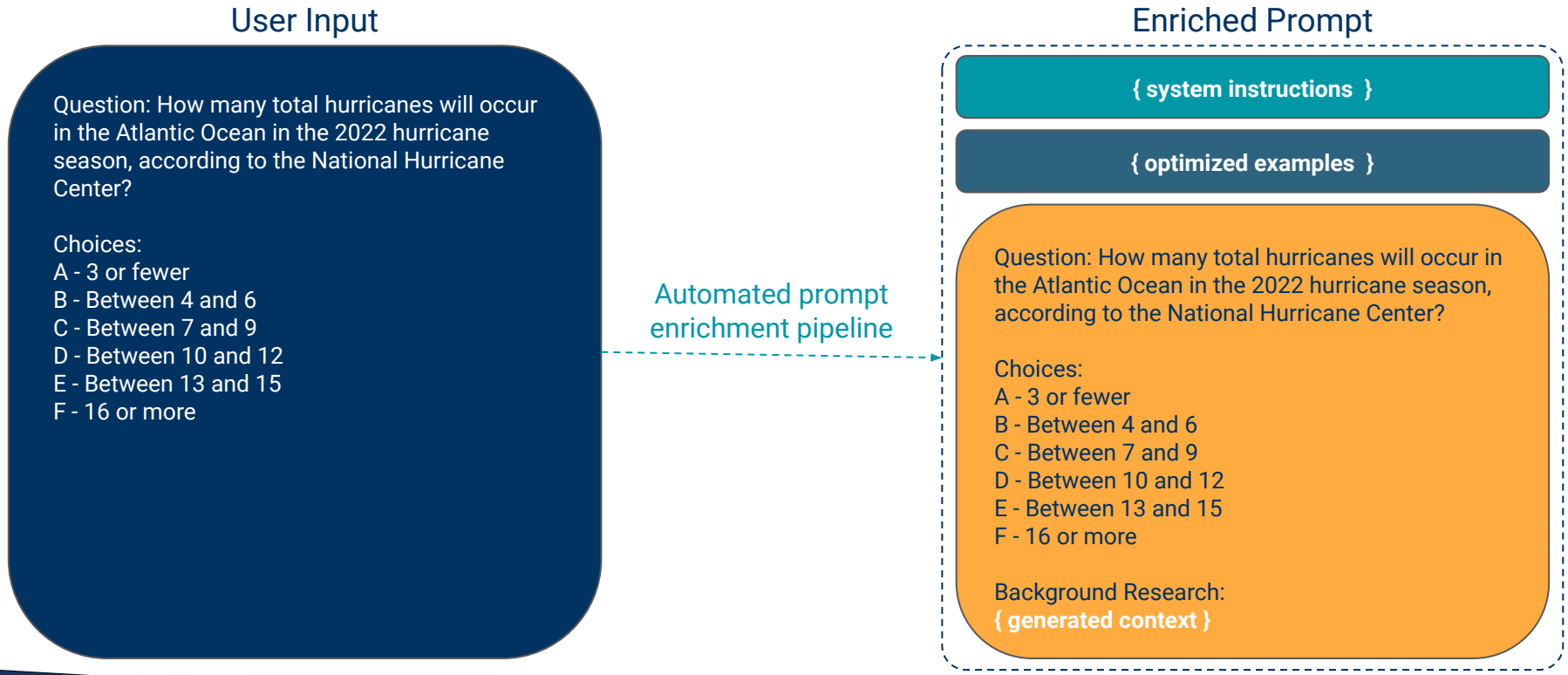
Predicting the Future with LLMs

Predicting future events is both hugely valuable and incredibly difficult. Our goal is to **use large language models to make forecasting easier**. We do this by leveraging existing knowledge embeddings and carefully designed prompts–all without the need for fine-tuning.

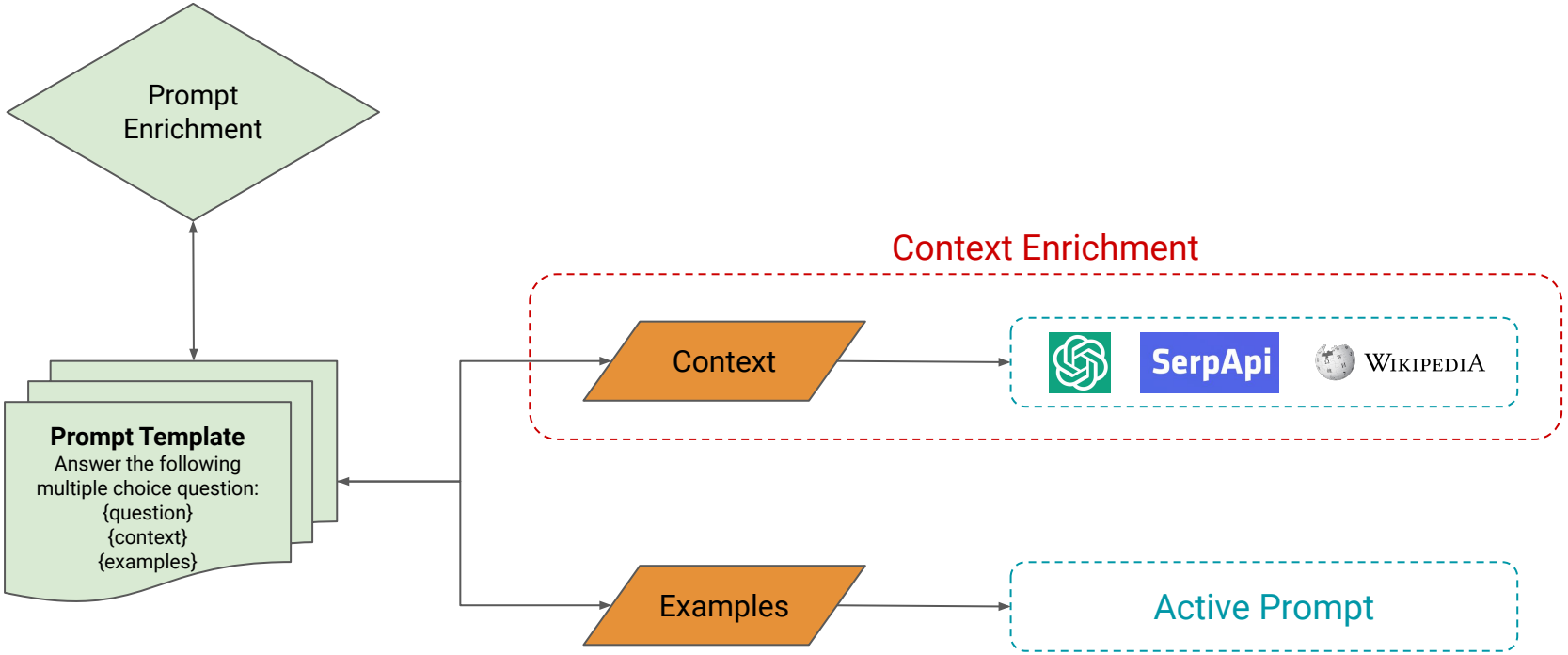
End-to-End LLM Forecasting Pipeline



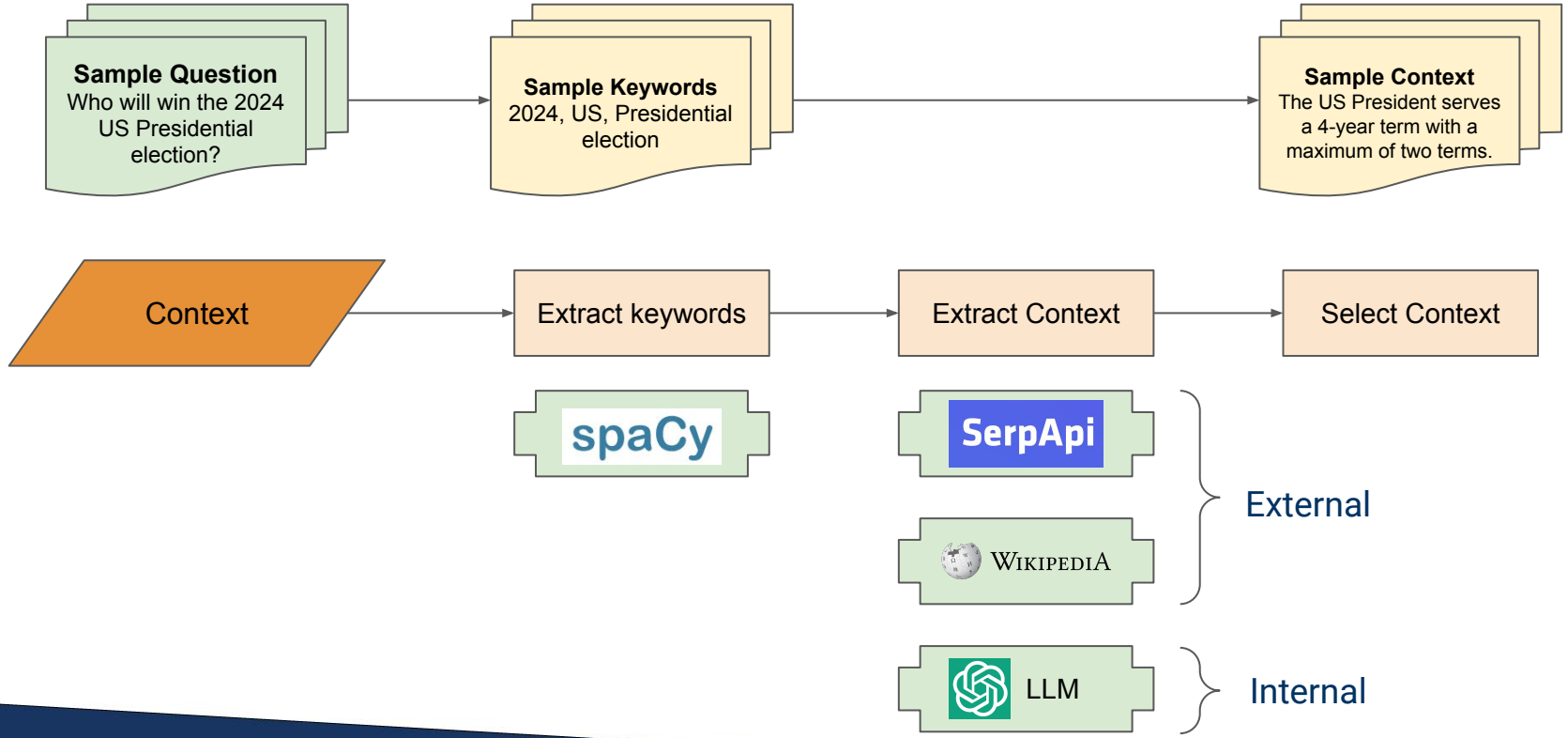
What is Prompt Enrichment?



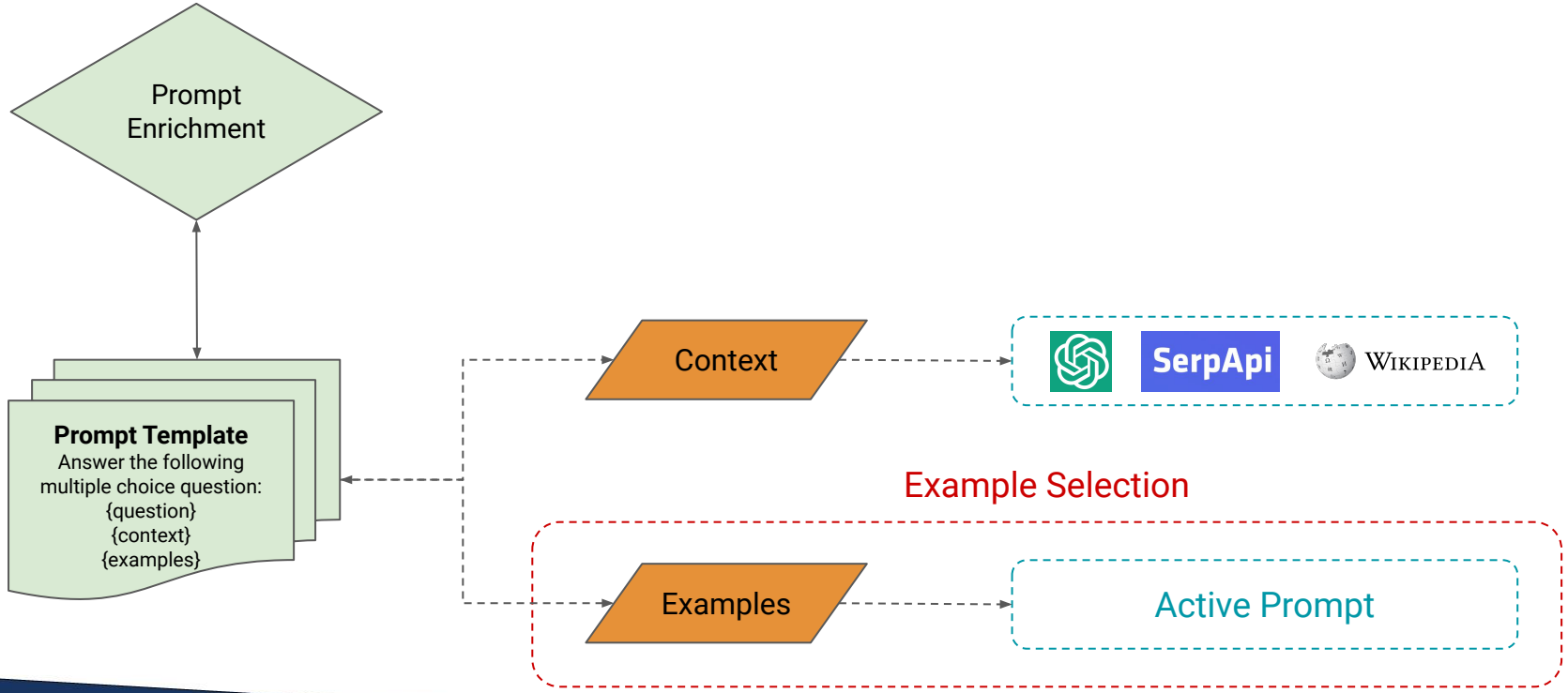
Prompt Enrichment - Context



Prompt Enrichment - Context

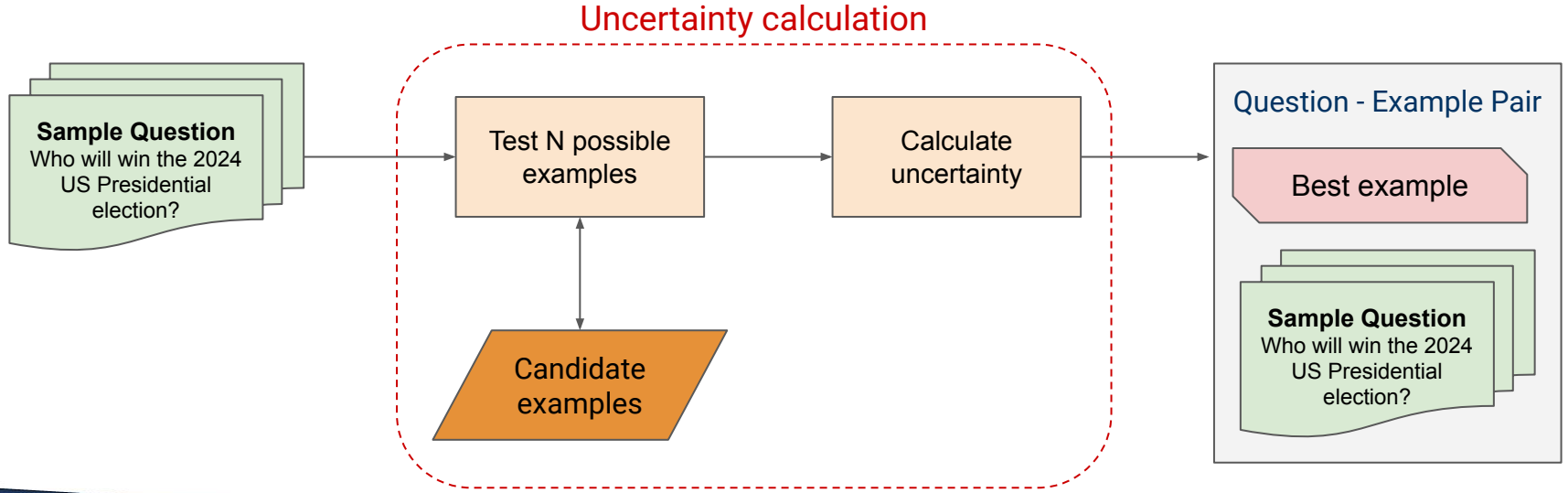


Prompt Enrichment - Example Selection

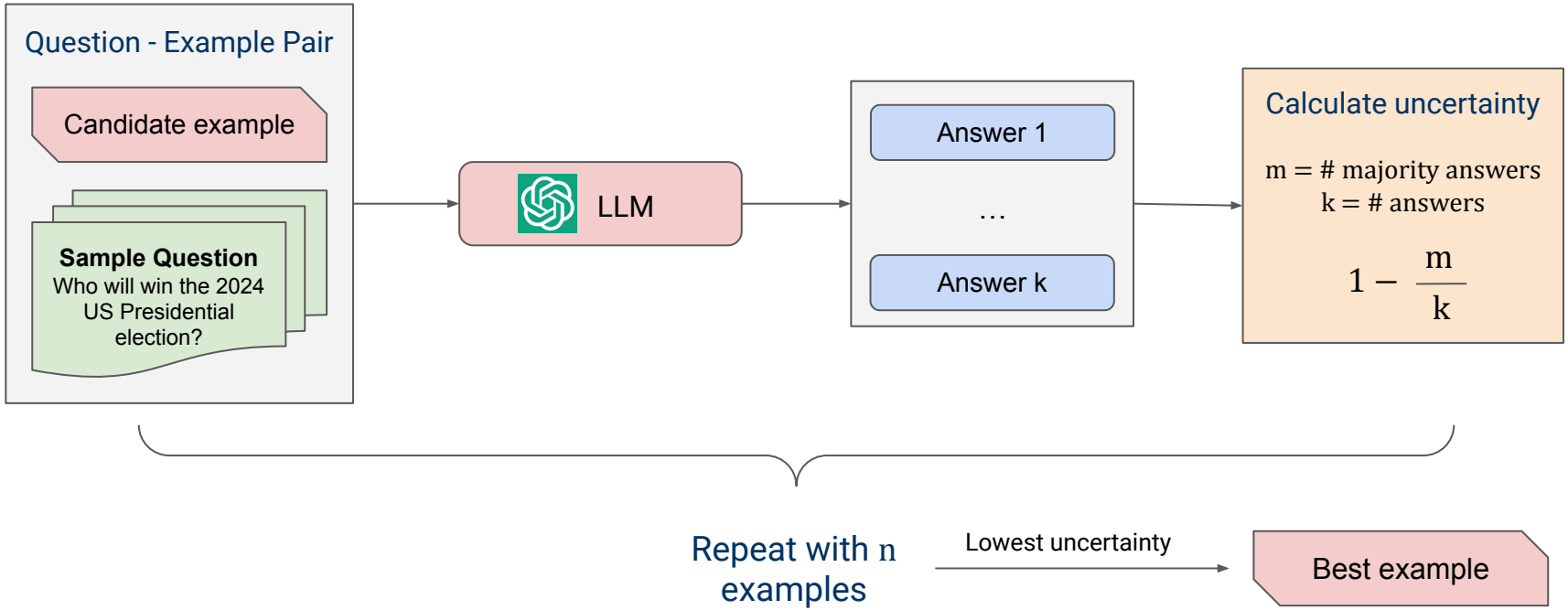


Prompt Enrichment - Active Prompt

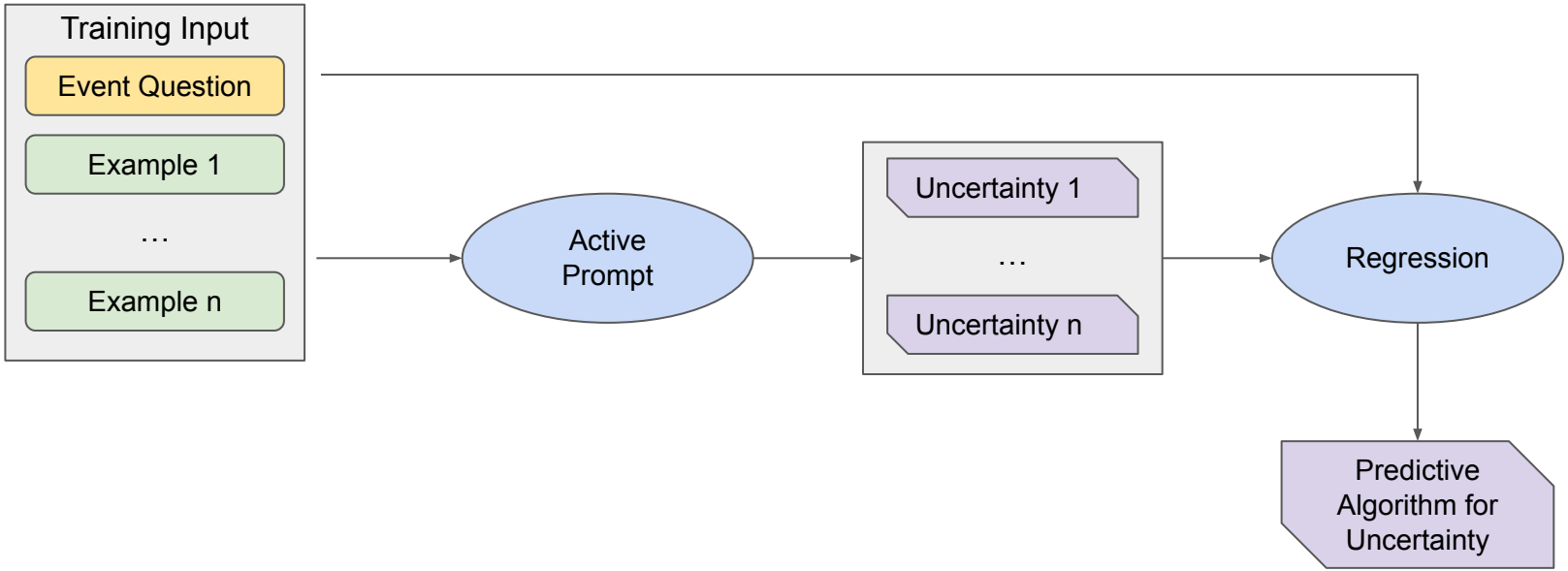
Active prompt lets us **select the best example** for a given question, based on how it **reduces model uncertainty**.



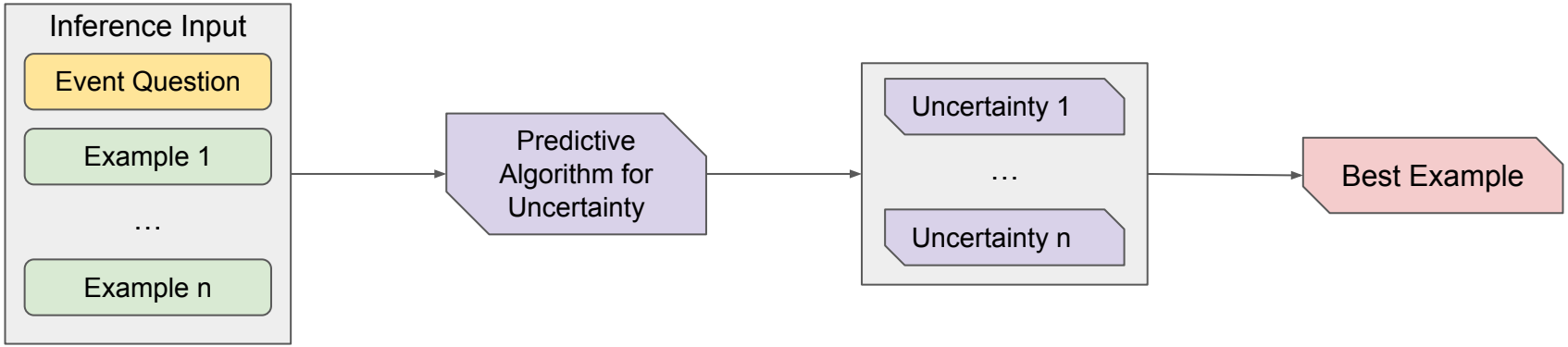
Prompt Enrichment - Active Prompt



Prompt Enrichment - Active Prompt



Prompt Enrichment - Active Prompt

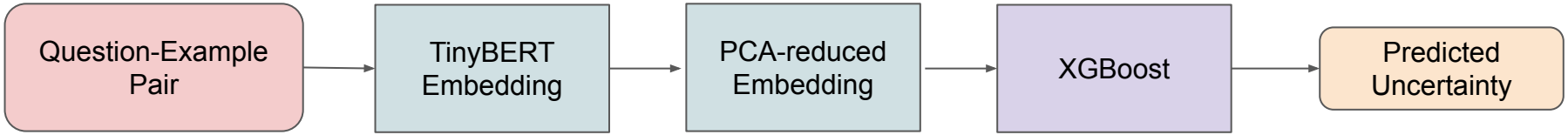


Prompt Enrichment - Active Prompt

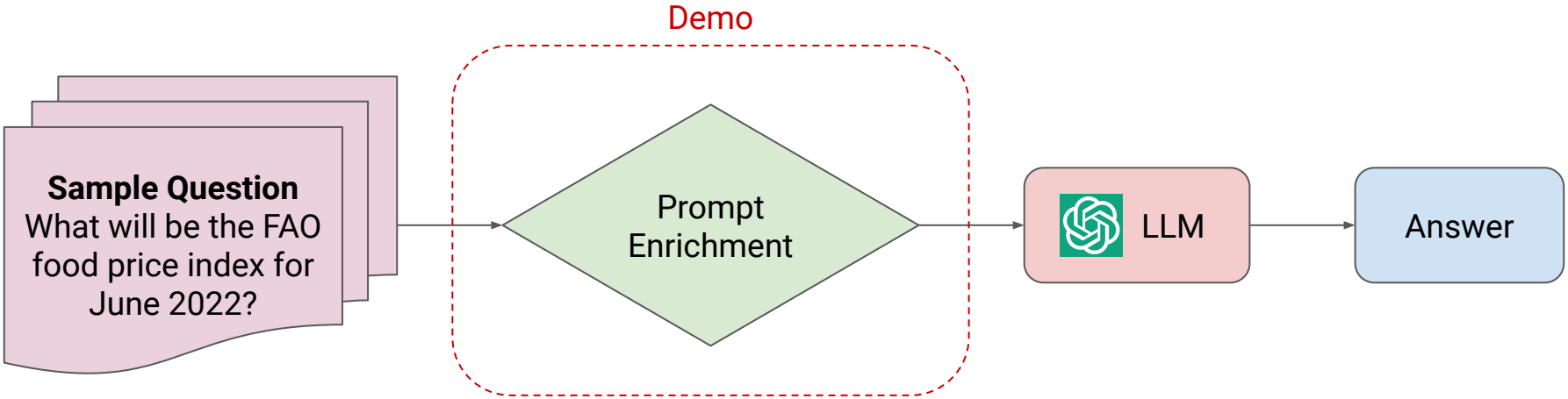
Central Tech Challenge for Regressor:

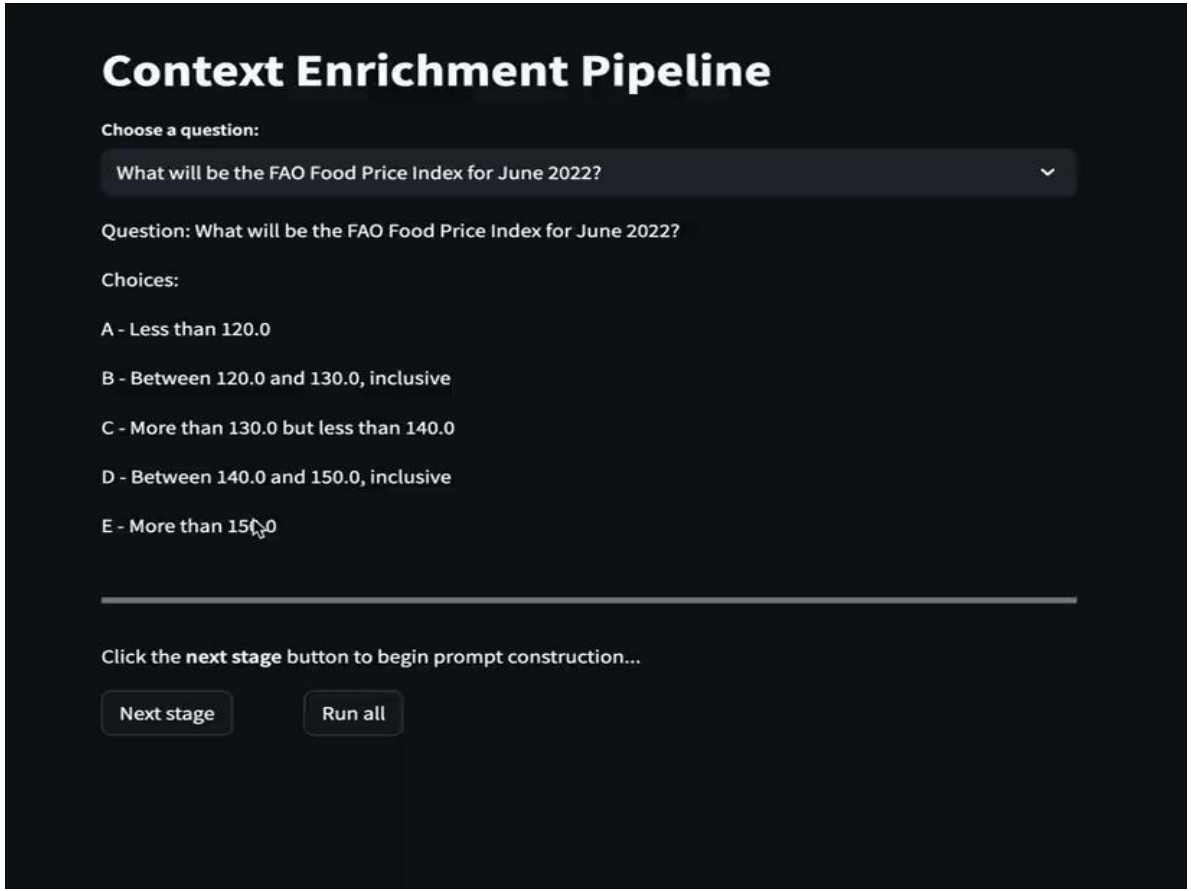
- High dimensionality of input data demands complex model
- Low data volume demands simpler model

Solution:



End-to-End LLM Forecasting Pipeline - Demo




Context Enrichment Pipeline
Choose a question:
What will be the FAO Food Price Index for June 2022?
Question: What will be the FAO Food Price Index for June 2022?
Choices:
A - Less than 120.0
B - Between 120.0 and 130.0, inclusive
C - More than 130.0 but less than 140.0
D - Between 140.0 and 150.0, inclusive
E - More than 150.0
Click the next stage button to begin prompt construction...
Next stage
Run all

Evaluation Dataset

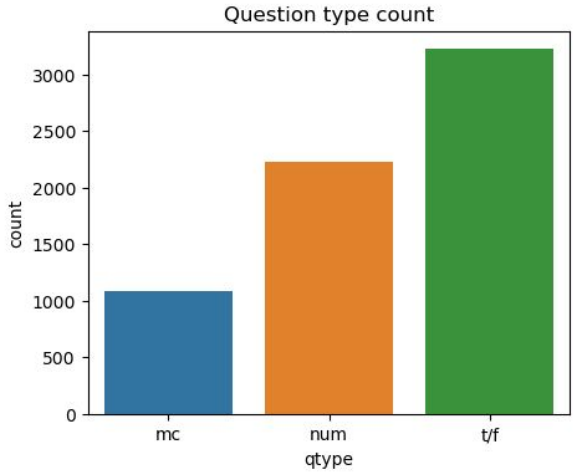
Sample Question:

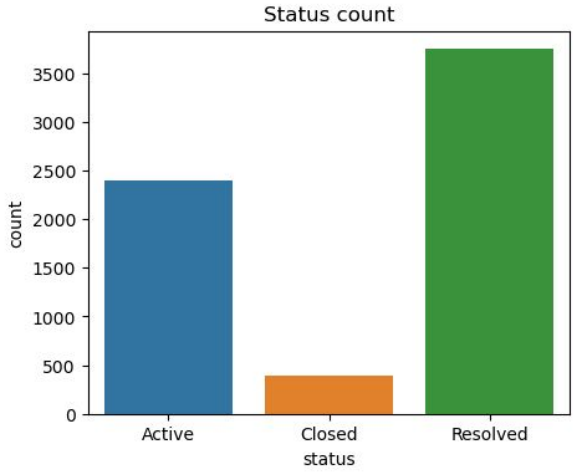
What will the end-of-day closing value for the dollar against the renminbi be on 1 January 2016?

Choices:

[‘Less than 6.30', 'Between 6.30 and 6.35, inclusive', 'More than 6.35 but less than 6.40', '6.40 or more']

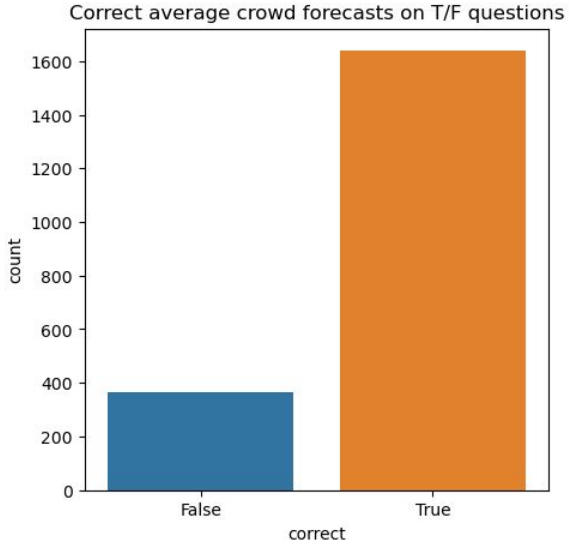
Answer: D

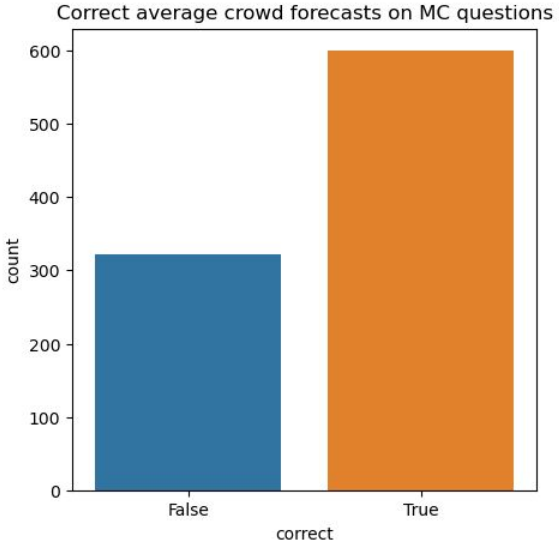




Evaluation Metric

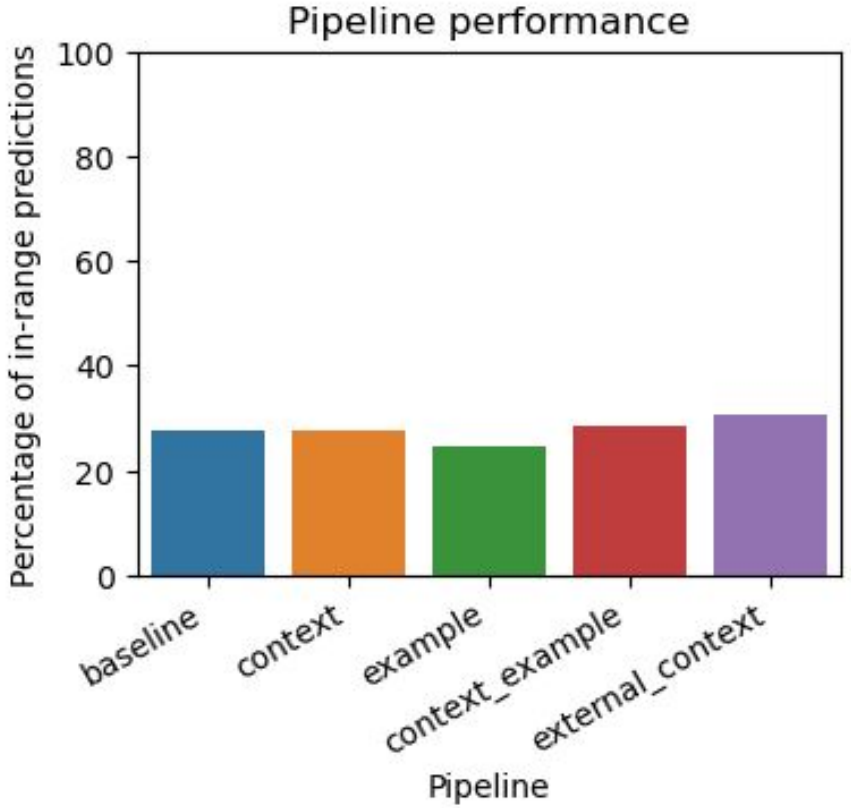
Crowd forecasts are an **imperfect truth proxy**, but still a useful target for our pipeline.





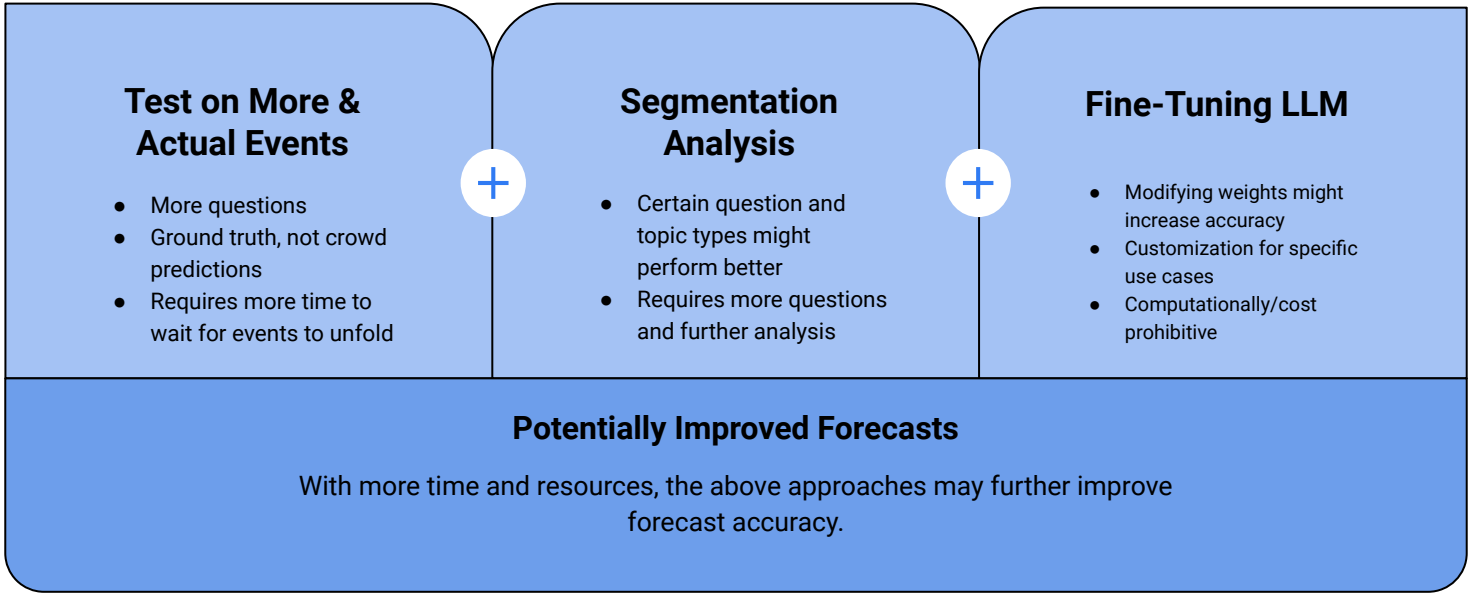
Pipeline Performance

Pipeline	% in-range predictions
Baseline	27.55%
Context	27.55%
External context	30.61%
Example	24.49%
Context + example	28.57%



Future Work

Future endeavors without current time or cost constraints could improve forecasting results.



Conclusion

- Minimal increases in forecasting performance when prompt engineering for **additional context.**
  - Larger sample needed for effective active learning model.
  - Target isn't reliable given the crowd's predictions are not always accurate.
- Putting forecasting aside, we learned the power of **LLMs**, **prompt engineering**, and **automated active learning** given minimal user queries.

Questions?