

CSCI 6620

Homework 6 – Poster Presentation

Due: Mon. 03/05/2025 by *email* [11:00pm] (Scholars Week Participants) **AND**
Mon. 03/24/2025 *electronically (assignment system)* [11:00pm] (Everyone)

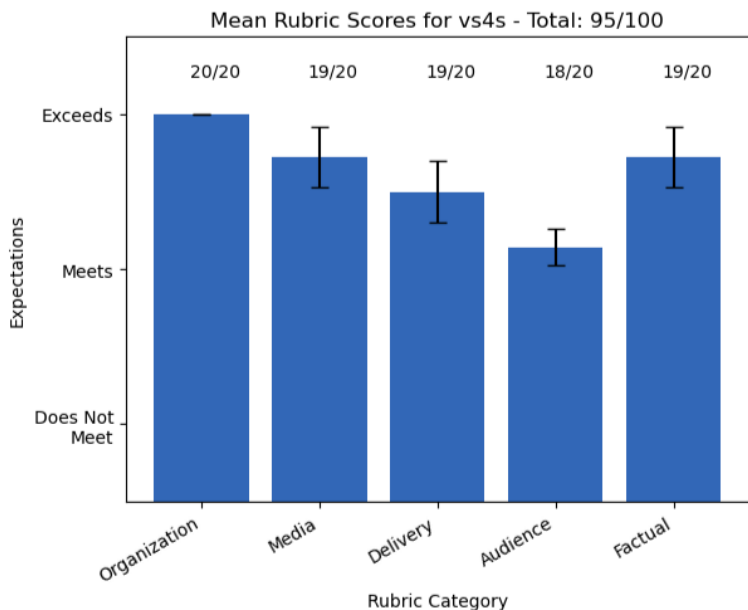
General criteria:

1. You should construct your poster as a single PDF slide: **48 inches (width) x 36 inches (height)**.
2. All main poster text (including captions and figure legends) should be in a **≥ 24 point sans** (without) serif font.
3. Exceptions: references, acknowledgments, and funding sections may be in a smaller (i.e. **≥ 12 point**) sans serif font.
4. Your poster *should* contain a references section.
5. Prepare a **4 minute** oral presentation to deliver in class on **Mon. 03/31/2025**.
6. Create and submit your PDF document to the course dropbox (<https://jupyterhub.cs.mtsu.edu/azuread/services/csci6620-assignments/>) by the final due date specified at the top of this page.

Use the example posters from the **course website** as a guide for how you *might* structure your poster.

Grading Rubric – 100 pts total

- 20 pts – Formatting
 - Does your poster use legible font?
 - Did you include relevant title and subtitle?
 - Did you arrange the poster images well?
- 40 pts – Poster Materials
 - Does your poster provide a concise summary of the research?
 - Does your poster provide a concise description of the methodology?
 - Does your poster provide a concise description of the results?
 - Does your poster provide a concise description of the conclusions?
- 40 pts – Oral Component
 - Does your presentation provide a concise summary of the research?
 - Does your presentation provide a concise description of the methodology?
 - Does your presentation provide a concise description of the results?
 - Does your presentation provide a concise description of the conclusions?



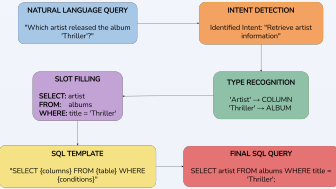
Optimizing Text-to-SQL Generation: A Dynamic Feedback Approach

Vamsi Saripudi
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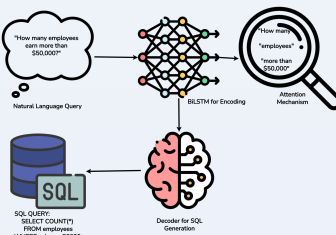
ABSTRACT

The usage of natural language interfaces for databases has gained a huge amount of traction, especially in text-to-SQL generation. This study focuses on developing a text-to-SQL generation pipeline using Google AI's Gemini 2.0 Flash Thinking Experimental 01-21 model. It aims to extend the prior methodologies by using bi-directional schema linking, context augmentation, and query selection. It integrates a dynamic feedback loop for iterative refinement of the queries for better error analysis. The proposed pipeline will be benchmarked against the Spider dataset using execution accuracy, valid efficiency score, strict recall, and non-strict recall as key metrics to test the performance of text-to-SQL generation. It explores the impact of using dynamic feedback in place of static feedback loops for iterative refinement of erroneous queries. An improvement in performance is anticipated compared to prior studies, as this dynamic feedback loop helps with better contextual understanding and more flexibility in rectifying errors. The outcome of this study may benefit organizations that are developing systems useful for non-technical users to use a database and get insights without the requirement of using SQL syntax. The study may provide useful insights to help people and organizations working on building database AI agents. It will help strengthen the collaboration between artificial intelligence and database management systems.

BACKGROUND

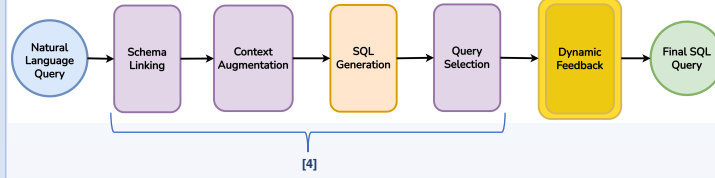


Slot-Filling Process for Text-to-SQL Generation [3]

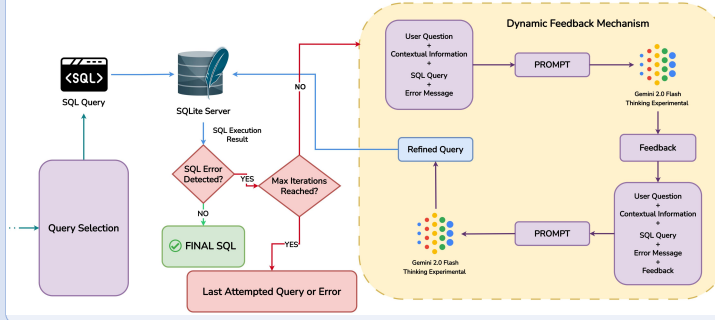


Sequence-to-Sequence Model for Text-to-SQL Generation [2]

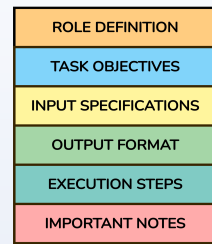
METHODS



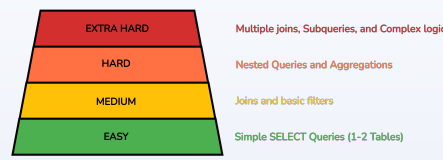
DYNAMIC FEEDBACK



PROMPT TEMPLATE STRUCTURE



SPIDER DATASET QUERY CLASSIFICATION [1]



EXTRA HARD LEVEL QUERY

User Question: What is the average life expectancy in the countries where English is not the official language?

```

SELECT AVG(life_expectancy) FROM country
WHERE name NOT IN
(SELECT T1.name FROM country AS T1
JOIN country_language AS T2
ON T1.code = T2.country_code
WHERE T2.language = "English" AND T2.is_official = "F");
  
```

ANTICIPATED RESULTS

Dynamic Feedback approach is expected to improve query accuracy by adapting to errors more effectively, and ensures better contextual understanding compared to static feedback.

User Query: "Find the average salary of employees working on at least 2 active projects in the Finance department."

Initial SQL Query:

```

SELECT e.name, AVG(e.salary)
FROM employees e
JOIN projects p ON e.id = p.emp_id
WHERE e.department = 'Finance';
  
```

Lacks filtering for active projects and project count.

Static Feedback Refined Query:

```

SELECT e.name, AVG(e.salary)
FROM employees e
JOIN projects p ON e.id = p.emp_id
WHERE e.department = 'Finance'
AND p.status = 'active';
  
```

Groups correctly but includes all projects.

Dynamic Feedback Refined Query:

```

SELECT e.name, AVG(e.salary)
FROM employees e
JOIN projects p ON e.id = p.emp_id
WHERE e.department = 'Finance'
AND p.status = 'active'
GROUP BY e.department
HAVING COUNT(DISTINCT p.id) >= 2;
  
```

Now filters employees based on active projects.

Unlike static feedback, which provides the same instructions in every iteration of refinement, the integration of dynamic feedback works by analyzing query errors, incorporating execution results, and generating adaptive refinements allowing the model to respond more effectively to errors.

CONCLUSIONS

- ✦ The anticipated results indicate improvement in **execution accuracy**, **valid efficiency score**, and **recall rates**, resulting in a more robust pipeline for complex queries.
- ✦ Future work involves expanding benchmarking the pipeline across multiple datasets like **ATIS**, **WikiSQL**, **BIRD**, etc.

ACKNOWLEDGEMENTS

I extend my gratitude to Dr. Joshua Phillips and my peers for their constructive feedback and insightful suggestions, which have contributed to the improvement of this study.

REFERENCES

- [1] T. Yu et al., "Spider: A Large-Scale Human-Labeled Dataset for Complex and Cross-Domain Semantic Parsing and Text-to-SQL Task," 2018, "arXiv". doi: 10.48550/ARXIV.1809.09887.
- [2] V. Zhong, C. Xiong, and R. Socher, "Seq2SQL: Generating Structured Queries from Natural Language using Reinforcement Learning," 2017, "arXiv". doi: 10.48550/ARXIV.1709.00103.
- [3] T. Yu, Z. Li, Z. Zhang, R. Zhang, and D. Radev, "TypeSQL: Knowledge-based Type-Aware Neural Text-to-SQL Generation," 2018, "arXiv". doi: 10.48550/ARXIV.1804.09769.
- [4] Z. Cao, Y. Zheng, Z. Fan, X. Zhang, W. Chen, and X. Bai, "RSL-SQL: Robust Schema Linking in Text-to-SQL Generation," 2024, "arXiv". doi: 10.48550/ARXIV.2411.00073.

Presentation Evaluation Form

Name of Presenter:

Saripudi, Vamsi (vs4s)

Evaluator Feedback

What was the strongest aspect of the presentation and *why*?

One of the most substantial aspects of the presentation is how clearly and logically it explains the dynamic feedback approach. The diagrams—especially the ones illustrating the "Dynamic Feedback Mechanism" and the "Prompt Template Structure", does a great job of breaking down complicated ideas in a way that's easy to follow. Including real SQL query refinement examples adds a practical touch, making the overall concept more relatable and applicable.

What was the weakest aspect of the presentation and *how might it be overcome*?

The weakest aspect is the visual density of the text in the abstract and results sections. It may be overwhelming for quick skimming during a poster session. This could be improved by summarizing key points using bullet lists or infographics to enhance readability and visual engagement.

Was the technical content of the presentation of sufficient rigor and *why/why not*?

Yes, the technical content was rigorous. It discussed the integration of dynamic feedback in natural language processing for query generation, referencing datasets like Spider and tools such as WikiSQL. The inclusion of specific SQL transformations and classification of query difficulty levels adds depth and shows a strong understanding of the domain.

Do you have any additional suggestions for improving the speaker's presentation methods (not the project itself)?

The speaker did an excellent job presenting provided various examples during the session.

Evaluation Criteria

Organization of Presentation:

Exceeds Expectations



Effectiveness of Presentation Media:

Exceeds Expectations



Speaker Delivery:

Exceeds Expectations



Relating to Audience:

Meets Expectations



Factual Content:

Exceeds Expectations



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Presentation Evaluation Form

Name of Presenter:

Saripudi, Vamsi (vs4s)

Evaluator Feedback

What was the strongest aspect of the presentation and *why*?

The strongest aspect was the use of diagrams and flowcharts, making complex processes more digestible. The detailed methodology and anticipated results provided a clear roadmap for implementation.

What was the weakest aspect of the presentation and *how might it be overcome*?

There should be some more content with images for understanding. Need some more contents so anyone can easily understand images by reading some points.

Was the technical content of the presentation of sufficient rigor and *why/why not*?

It used a statistical test to analyze the results, which means the study was based on real data rather than just assumptions.

Do you have any additional suggestions for improving the speaker's presentation methods (not the project itself)?

Delivered a good presentation. Explained all points very clearly.

Evaluation Criteria

Organization of Presentation:

Exceeds Expectations



Effectiveness of Presentation Media:

Exceeds Expectations



Speaker Delivery:

Exceeds Expectations



Relating to Audience:

Meets Expectations



Factual Content:

Meets Expectations



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Presentation Evaluation Form

Name of Presenter:

Saripudi, Vamsi (vs4s)

Evaluator Feedback

What was the strongest aspect of the presentation and *why*?

The explanation of the background was the strongest aspect, as there was a lot of research done.

What was the weakest aspect of the presentation and *how might it be overcome*?

The anticipated result part was skipped. Having this added, even if it is just anticipated result would give the presentation a better, not so abrupt, finish.

Was the technical content of the presentation of sufficient rigor and *why/why not*?

It was really well explained. What made it stand out where the examples that were really well used.

Do you have any additional suggestions for improving the speaker's presentation methods (not the project itself)?

Talking a little bit slower would have made it easier to follow.

Evaluation Criteria

Organization of Presentation:

Exceeds Expectations

**Effectiveness of Presentation Media:**

Exceeds Expectations

**Speaker Delivery:**

Meets Expectations

**Relating to Audience:**

Meets Expectations



Factual Content:

Exceeds Expectations



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Presentation Evaluation Form

Name of Presenter:

Saripudi, Vamsi (vs4s)

Evaluator Feedback

What was the strongest aspect of the presentation and *why*?

The strongest part of this presentation was the clear explanation about how the dynamic feedback approach works. Also , all the technical aspects were broken down into easy steps using the visuals effectively. I personally liked the real-world example, which was more relatable to the topic.

What was the weakest aspect of the presentation and *how might it be overcome*?

The weakest part was the pacing while delivering the speech because at some point I felt a bit rushed, especially in the middle section (in figures). To overcome this , a few seconds of pause could be effective.

Was the technical content of the presentation of sufficient rigor and *why/why not*?

Although the topic was challenging , the technical content was up to the mark because the diagrams , datasets, and rectifying the query examples added very good rigor.

Do you have any additional suggestions for improving the speaker's presentation methods (not the project itself)?

None

Evaluation Criteria

Organization of Presentation:

Exceeds Expectations



Effectiveness of Presentation Media:

Exceeds Expectations



Speaker Delivery:

Meets Expectations



Relating to Audience:

Exceeds Expectations



Factual Content:

Exceeds Expectations



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Presentation Evaluation Form

Name of Presenter:

Saripudi, Vamsi (vs4s)

Evaluator Feedback

What was the strongest aspect of the presentation and *why*?

The strongest aspect of the presentation was the factual content and the clarity of the work completed. Vamsi effectively showcased the project output and demonstrated his technical skills with confidence. His responses to questions showed a solid understanding of the subject.

What was the weakest aspect of the presentation and *how might it be overcome*?

The poster had slightly more text than necessary, which made it a bit visually dense. This can be improved by balancing text with more visuals such as diagrams, charts, or bullet points to make the content easier to scan and more engaging.

Was the technical content of the presentation of sufficient rigor and *why/why not*?

Yes, the technical content was appropriate and rigorous. The presenter discussed key aspects of the project and provided clear explanations of the methodology and results, showing that the work was well-executed and well-understood.

Do you have any additional suggestions for improving the speaker's presentation methods (not the project itself)?

Vamsi delivered the presentation confidently, which was great. For improvement, he could work on summarizing longer explanations into concise key points to maintain the audience's attention more effectively throughout.

Evaluation Criteria

Organization of Presentation:

Exceeds Expectations



Effectiveness of Presentation Media:

Meets Expectations



Speaker Delivery:

Exceeds Expectations



Relating to Audience:

Meets Expectations



Factual Content:

Exceeds Expectations



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