Judging an LLM on judging LLM-generated Microservice Documentation: A Supplemental Study and Observations

Dawn Mai, 25R50028
Supervised by Takashi Kobayashi, School of Computing

Agenda

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Background, Motivation

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Proposed framework, working with repositories

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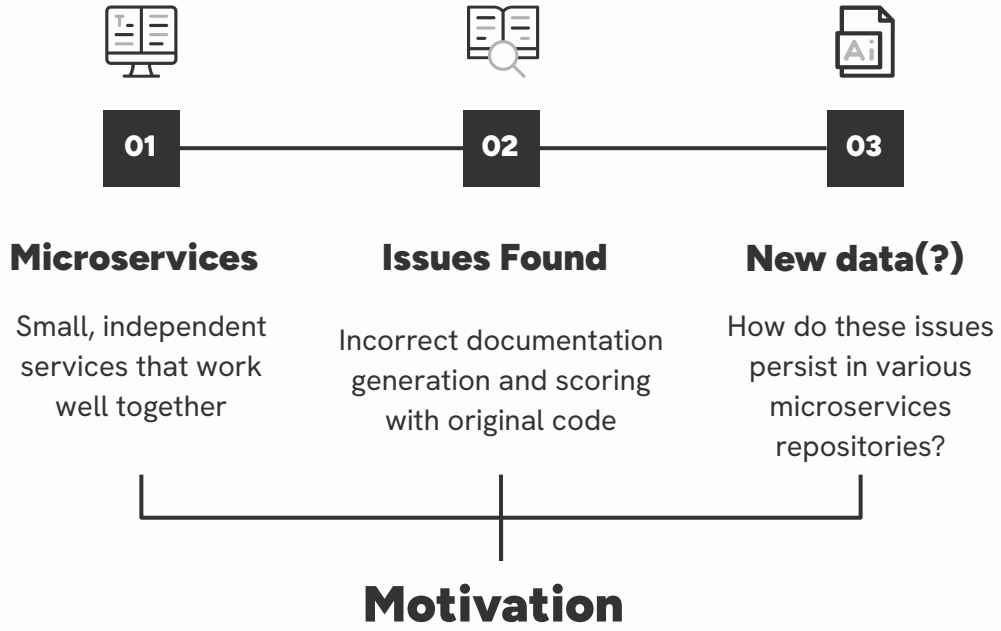
Background

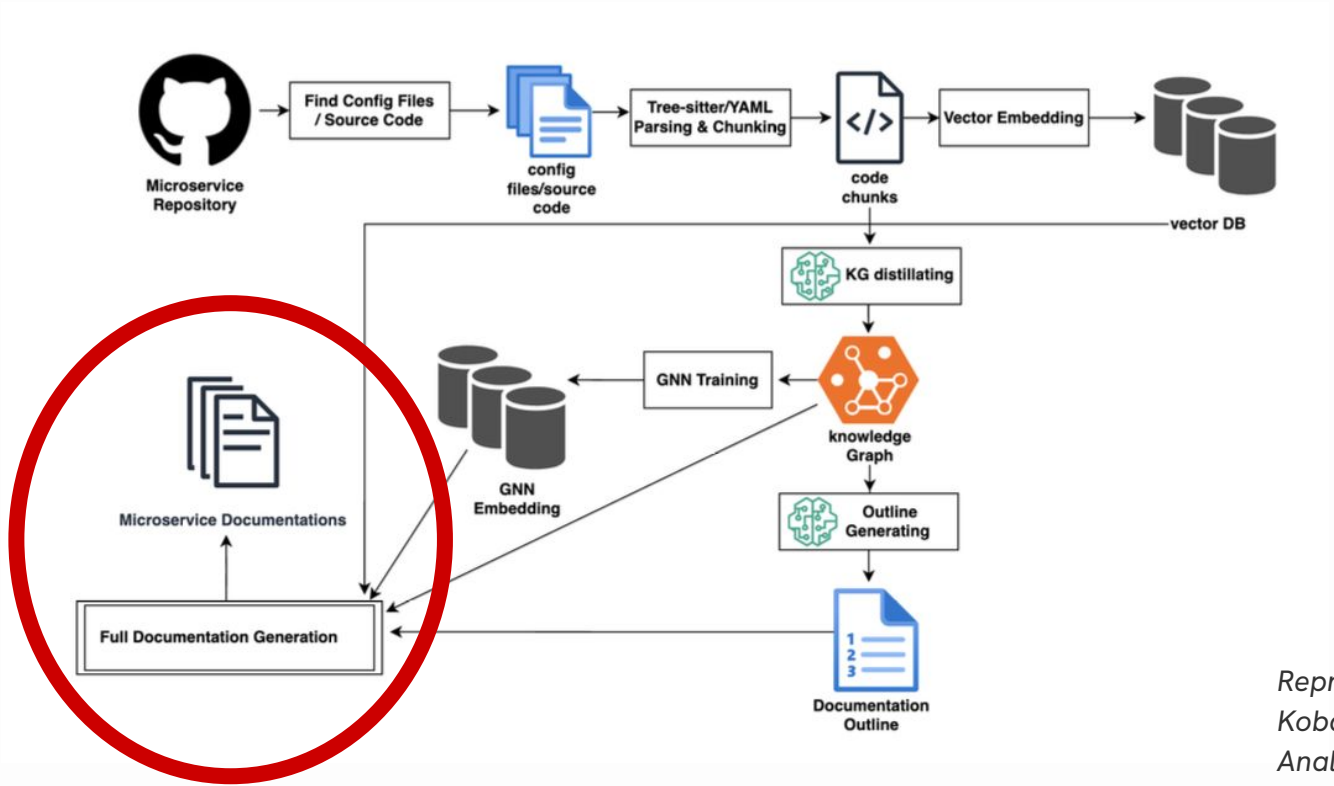
Research goal

- Improve the pre-existing, original code from the provided thesis to correctly evaluate and rank the generated documentation for a new, partially-derived dataset from the original repositories.

- Enforce the ideal ranking:
  - KG/GNN → 3+
  - RAG → 1 - 3
  - Baseline → < 2

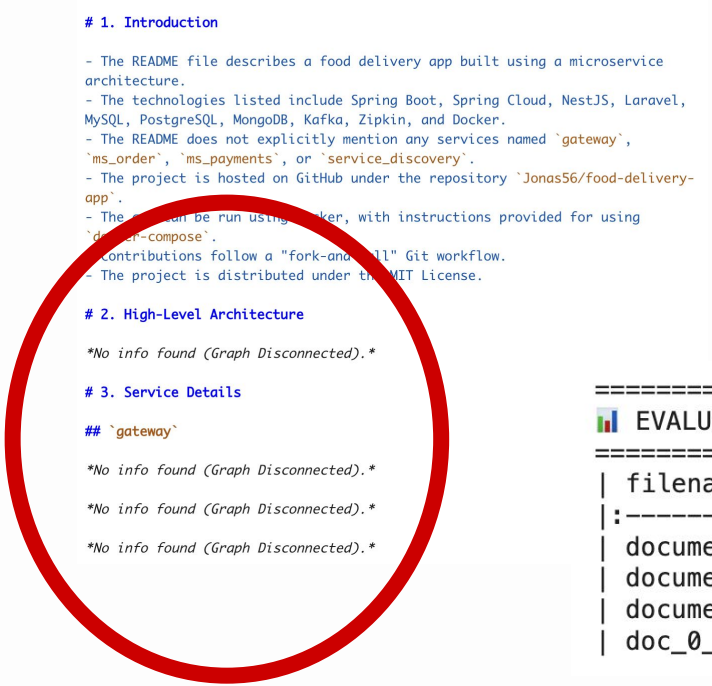


Current Framework

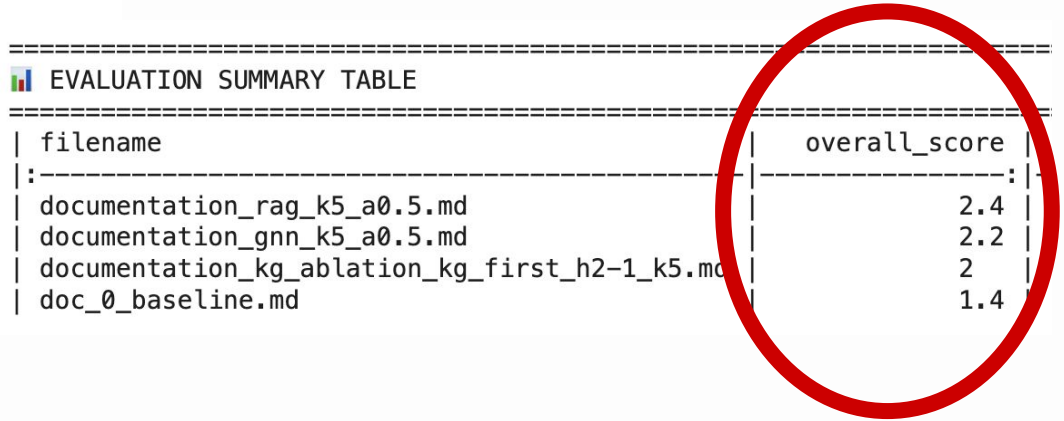


Reproduced from QIAO Lin, Kobayashi Software Analytics Group [5]

Issues (to fix in original code)



```
# 1. Introduction

- The README file describes a food delivery app built using a microservice
architecture.
- The technologies listed include Spring Boot, Spring Cloud, NestJS, Laravel,
MySQL, PostgreSQL, MongoDB, Kafka, Zipkin, and Docker.
- The README does not explicitly mention any services named `gateway`,
`ms_order`, `ms_payments`, or `service_discovery`.
- The project is hosted on GitHub under the repository `Jonas56/food-delivery-
app`.
- The [illegible] be run using [illegible]ker, with instructions provided for using
`d[illegible]-compose`.
- Contributions follow a "fork-and-[illegible]ll" Git workflow.
- The project is distributed under the MIT License.

# 2. High-Level Architecture

*No info found (Graph Disconnected).*

# 3. Service Details

## `gateway`

*No info found (Graph Disconnected).*

*No info found (Graph Disconnected).*

*No info found (Graph Disconnected).*
```



```
================================================================================
📊 EVALUATION SUMMARY TABLE
================================================================================
| filename                                          |   overall_score |
|:--------------------------------------------------|----------------:|
| documentation_rag_k5_a0.5.md                      |             2.4 |
| documentation_gnn_k5_a0.5.md                      |             2.2 |
| documentation_kg_ablation_kg_first_h2-1_k5.md     |             2   |
| doc_0_baseline.md                                 |             1.4 |
```

Experiment

Fix the code!

Run it and manually debug + use Cursor to fix and explain why issues occurred and to adjust the LLM-as-a-judge prompts for more critical judgment

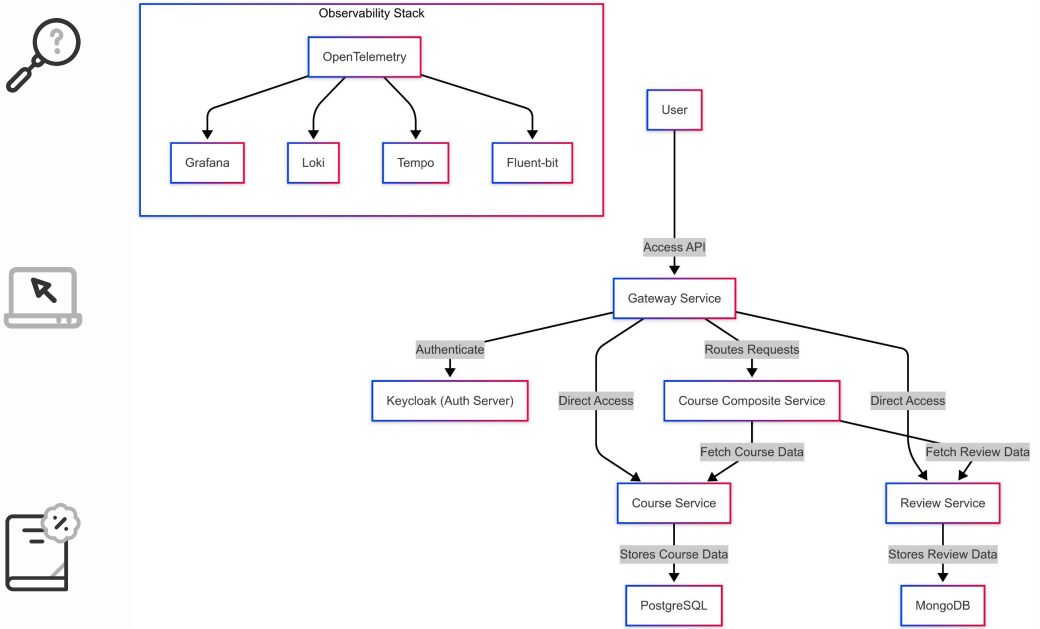
Repository analysis

Three repositories from original thesis experiment + four new ones to further diversity the new dataset

Document generation

Average scores of generated documentation was obtained by running the LLM prompt about 6 times; documentation of each attempt per repository was recorded on Google Sheets

Experiment



Architecture diagram of [Nasruddin/spring-boot-based-microservices]

Changes made:

"No info found (Graph Disconnected)" error messages in the KG-ablation document: this was fixed by forcing the framework to rely on semantic-based fallback and locate the graph instead of relying on an empty list.

Low scores (scores of less than 3) given to KG- and GNN-based LLM-generated documents: this was in part due to LLM hallucination of the presence/absence of services, which can result in documents saying a certain microservice was/wasn't present when the opposite was the case. This was fixed by tightening the “universal architect” prompt to penalize such contradictions, with a lighter penalty if the document in question was still useful. In addition, the “universal architect” prompts were edited to use a more strict, specific criteria, since we were looking for a certain ranking.

RAG-based LLM-generated documents scoring higher than KG- and GNN-based documents: the fixes in 3. were also applied here. No manual boosts were used to interfere with the data and neither the code generating these documents were altered; scoring only used the material of the documents provided and the repository they reported on.

Improvement!

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| documentation_rag_k5_a0.5.md                            |             4.2 |
| doc_0_baseline.md                                       |             1.2 |
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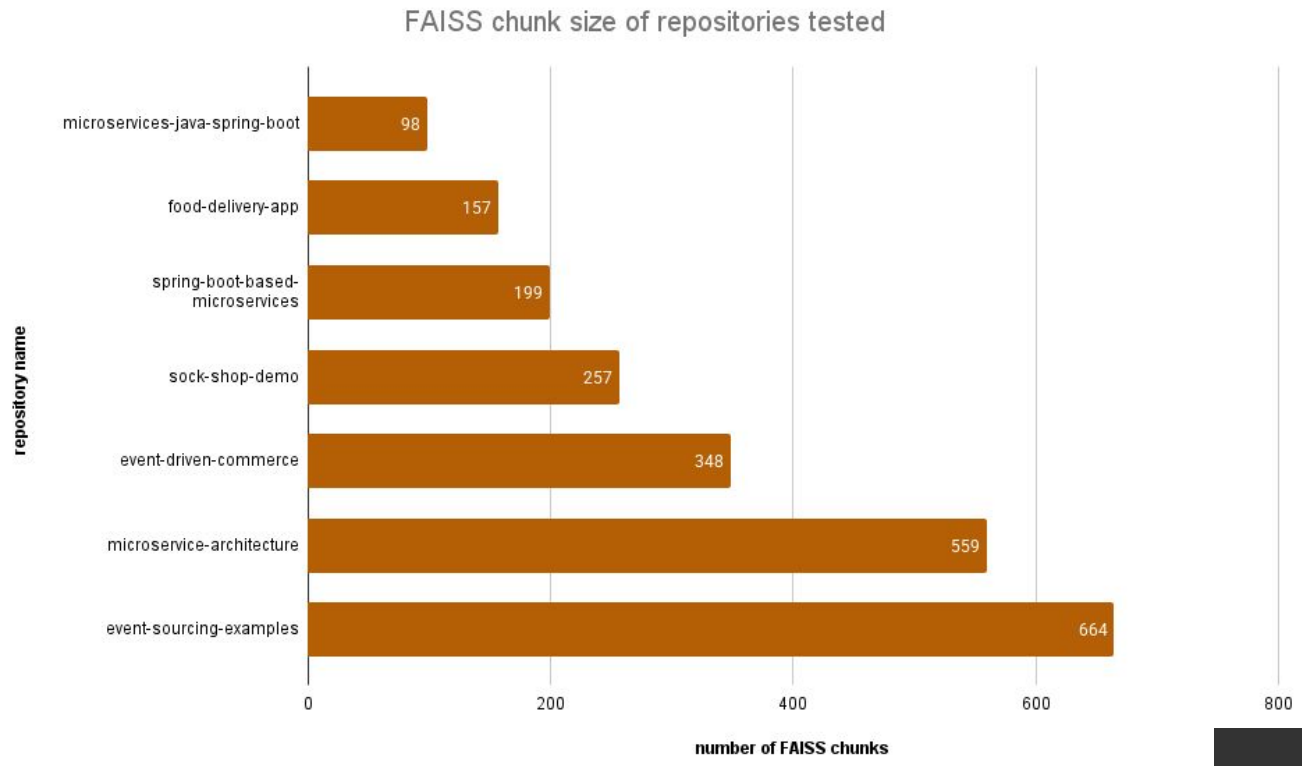
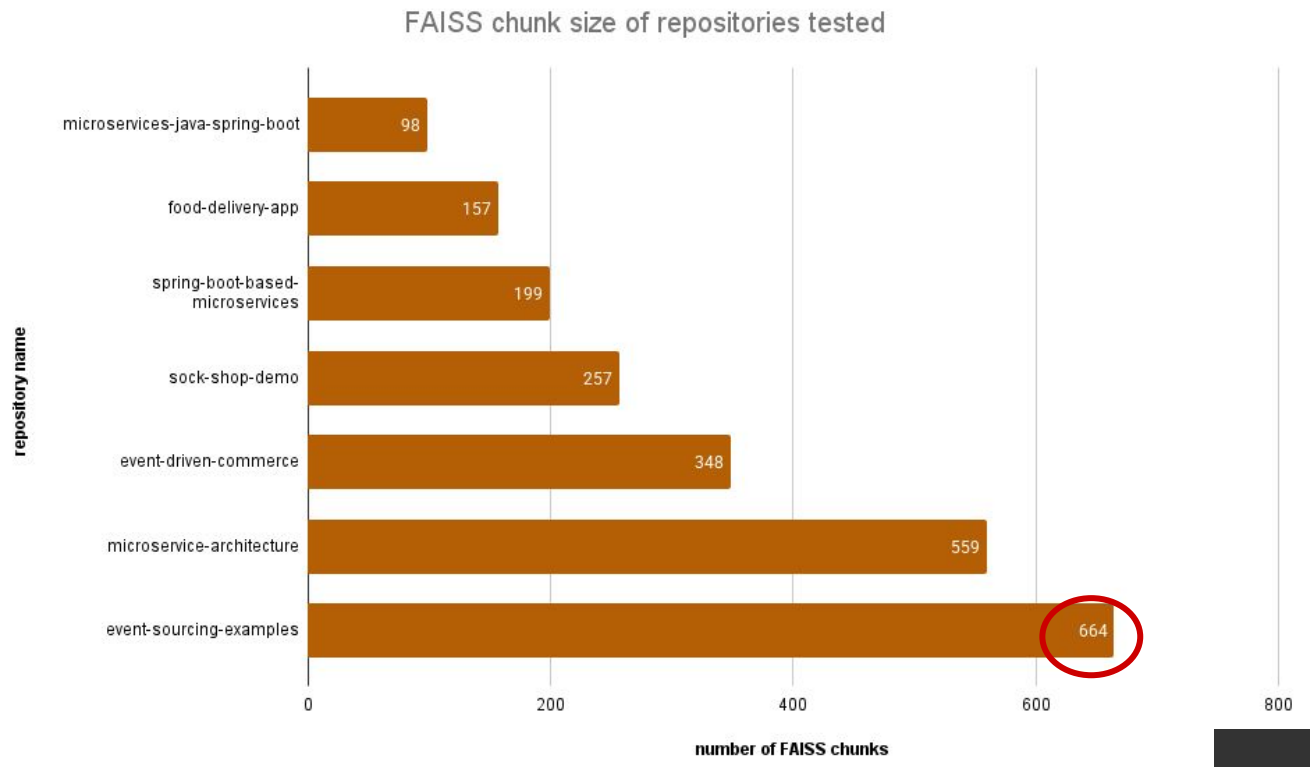

FAISS chunk size of repositories tested
repository name
microservices-java-spring-boot
98
food-delivery-app
157
spring-boot-based-microservices
199
sock-shop-demo
257
event-driven-commerce
348
microservice-architecture
559
event-sourcing-examples
664
0
200
400
600
800
number of FAISS chunks

Results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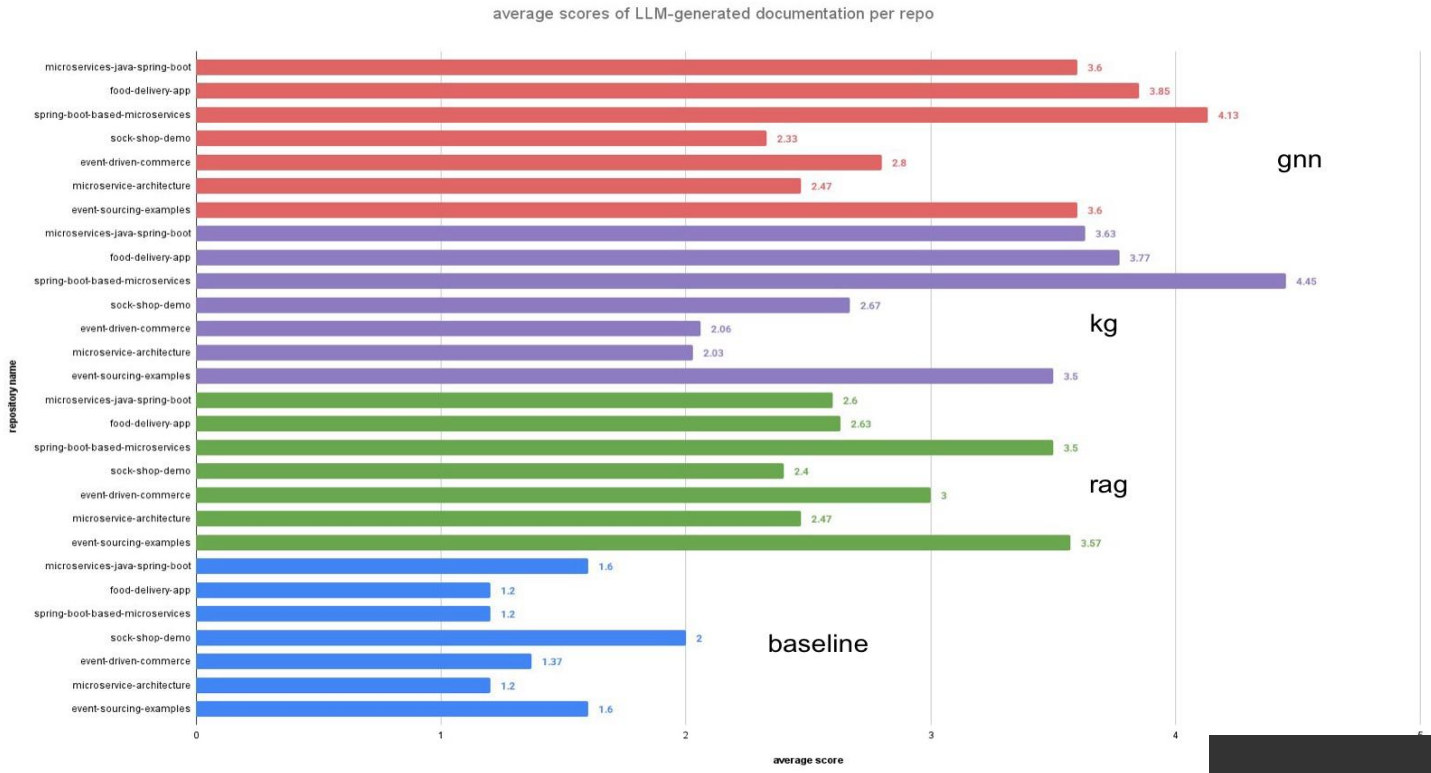
average scores of LLM-generated documentation per repo
repository name
microservices-java-spring-boot
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spring-boot-based-microservices
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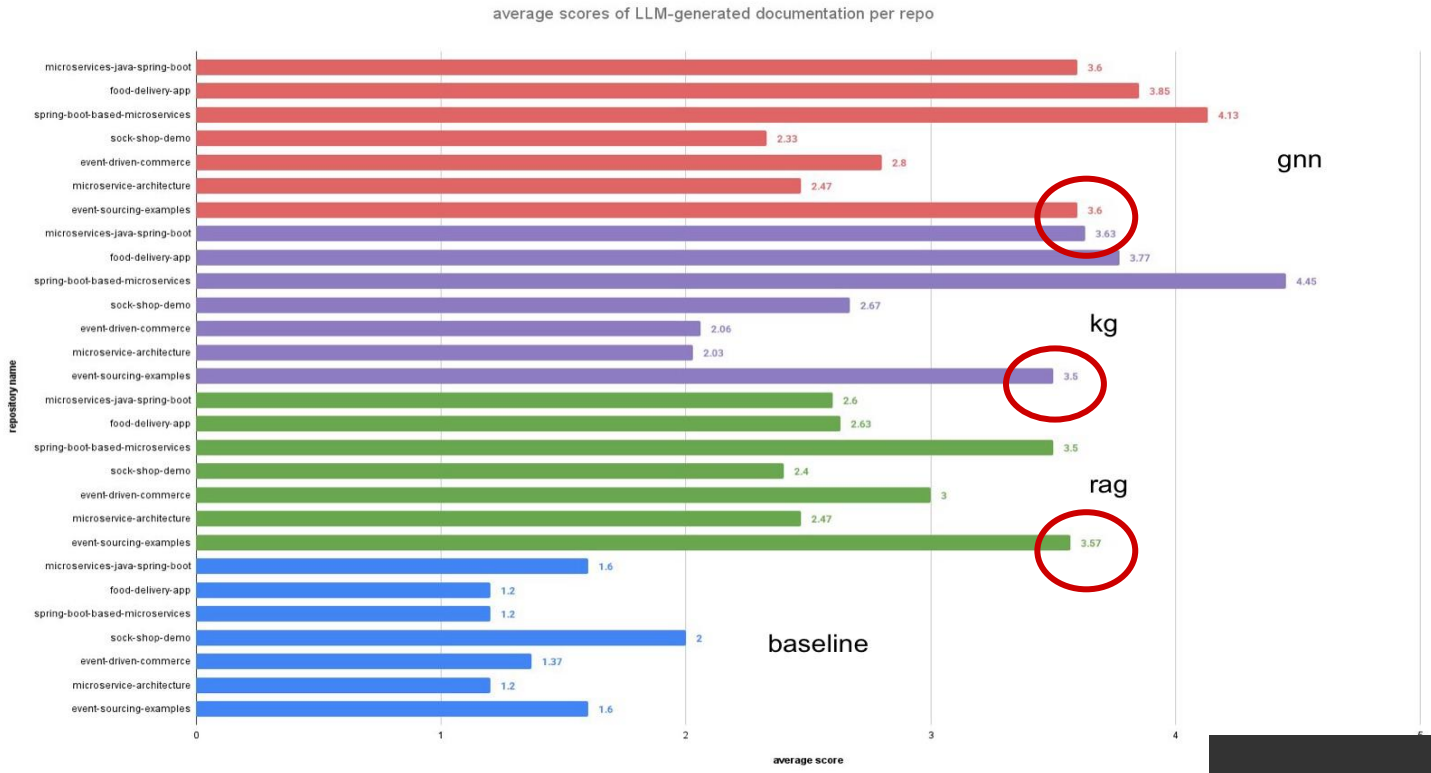
microservice-architecture
event-sourcing-examples
3.6
3.85
4.13
2.33
2.8
2.47
3.6
gnn
3.63
3.77
4.45
2.67
2.06
2.03
3.5
kg
2.6
2.63
3.5
2.4
3
2.47
3.57
rag
1.6
1.2
1.2
2
1.37
1.2
1.6
baseline
0
1
2
3
4
average score

Results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2
3
4
average score

Results

Conclusion

Observations

Did we improve the code? Yes!
But we found that it works better on smaller microservices repositories.

Results

More code chunks → lower, less accurate scores to documentation; high scores for RAG documentation

Limitations

Cost per OpenAI LLM call + one Neo4j instance = unable to test our framework on massive industrial scale repositories, LLM-as-a-judge bias

Future Work

Validate proposed method on more massive larger scale repositories + improve how ground-truth microservice architecture topology is extracted from a target repository [5].

Works Cited

1. N. Dragoni et al., “Microservices: yesterday, today, and tomorrow,” 2017.
2. J. Bogner, et al., “Assuring the evolvability of microservices: Insights into industry practices and challenges,” Sept. 2019.
3. J. Bogner et al., “Microservices in industry: Insights into technologies, characteristics, and software quality,” in 2019 IEEE International Conference on Software Architecture Companion (ICSA-C), pp. 187–195, 2019.
4. P. Lewis et al., “Retrieval-augmented generation for knowledge-intensive nlp tasks,” 2021.
5. L. Qiao, “Structure-Aware Enhanced LLMs via Knowledge Graphs for Microservice Architecture Documentation”, 2026. Master’s Thesis, School of Computing, Institute of Science Tokyo.

Questions?

Thanks!

dawnmai@cs.washington.edu
https://github.com/dawnmaii

www.linkedin.com/in/dawnmai

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