

Graph Ingestion Engine (Fall 2024)

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Abstract—Graph Ingestion Engine (GIE) began in Fall 2022. It is about converting data in forms of graphs into data points to be accessible by people with disabilities in csv or hssp formats. In this project, we continue the previous efforts.

1 INTRODUCTION

Charts are used to explore and get insights about underlying data. Unfortunately, they are embedded into images formats with no meta data about their content, thus providing no information to screen readers and their users. There has been growing interest in converting them into accessible formats, by converting them into tables Liu et al., 2022,. Another direction is concerned with Chart Question Answering Masry et al., Masry et al., 2022, 2024.

2 RELATED WORK

There are many types of graphs, and each type proposes a different set of challenges in extracting their underlying data, in a process known as deplot. This necessitates determining the type of input chart. DSouza and Walker, 2023 built a classifier to detect the type of input chart. DSouza, Gandhi, and Walker, 2022 explored the usage of image segmentation algorithms to deplot gray scaled scatter plots. DSouza and Walker, 2023 succeeded in making data out of Line Charts and initially good results on Pie Charts. They showed that Deep Learning is superior to other techniques in Pie Charts.

3 SCOPE

During this semester, we aim at:

- making a deployment that can be tested by external partners,
- Assess the quality of models made by other colleagues in the wild, and
- Improve the quality of all models in the system.

4 WEBSITE DEPLOYMENT

In this semester, we want to make the system ready to be used by external partners. This is translated into:

1. Test the user interface (UI),
2. ensure accessibility of front end,
3. test the speed of the system in terms of latency and throughput,

5 EVALUATING CURRENT MODELS

After doing some research, we did not find scores explaining the performance of current models. Our goal is to be able to calculate a number to indicate the performance of the models in Chart Classification and Chart to Data points conversion.

In short, we want to:

1. Search for latest benchmarks in Chart-to-Datapoints,
2. Prepare the benchmarks to be in a single format,
3. Write script to calculate Relative Mapping Similarity (RMS) Liu et al., 2022.

6 IMPROVING PERFORMANCE OF MODELS

As illustrated in section 5, we don't have a score to indicate the performance of models used in the system. As a result, we don't know what are areas of improvement in the system. So, we can't be specific about what to do in this section at present. However, we will read papers about various approaches, e.g. in Classical Computer Vision and Multimodal Large Language Models (MLLMs). Also, the approach to choose depends on the hardware specifications of deployment server.

7 TIMELINE

Table 1 includes information about tasks we are settle on and their respective estimated deadlines. For further details, you may check Tasks tab on our Microsoft Teams Channel.

As highlighted in our team contract 8, each one may request help from the other team member.

Task	Assignee	Deadline
Reading Papers and clarify TODOs in improving models section	All	2024-10-02
Test current UI	both	2024-09-11
Unify the format of chart datasets	Mohamed	2024-09-25
Fix bugs in the deployment front and back end	Varun	2024-09-25
Implement RMS metric	Mohamed	2024-09-25
Identify the cost and performance of Gemini models	Varun	2024-09-25
Evaluate models on deployment	Mohamed	2024-10-02

Table 1—Timeline of main tasks and their main assignments.

8 TEAM CONTRACT

8.1 Main Roles

8.1.1 *Technical*

Varun is specialized in High Performance Computing, so they will be responsible for test stress the deployment. Mohamed is more specialized in Machine Learning, thus he will focus towards improving the AI models. However, their skillsets intersect. Therefore, they can cooperate on getting tasks done and learn from each other. For example, Mohamed could be assigned some tasks in stress testing the deployment under Varun’s supervision. This also applies the other way around.

8.1.2 *Non-technical*

Each one will do their main part of the presentation. For Mohamed’s part, since he is blind, Varun is expected to double check the formatting and that everything is visible.

8.2 Communication

- MS Teams:
 - Graph Ingestion Engine (GIE) for HSS channel: We will use “Posts” tab for logging progress, and “Tasks” for documenting, assigning tasks and tracking progress.
 - Personal Chat: when discussing details and technical details.
 - Online Meetings: team members will meet together every Tuesday at 3:00pm Eastern to discuss current progress and next steps.

- Email: when contacting Mihai Dascal. This is limited contact regarding deployment server.

8.3 Signature

By signing this document, I consent that I read this document and will follow it during the course of the project.

- Varun Ramakrishnan
- Mohamed EMK Fayed

9 REFERENCES

1. DSouza, Ashlyn, Gandhi, Kavish, and Walker, Bruce (2022). "Graph Ingestion Engine Project Report, Fall 2022". In.
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3. Masry, Ahmed, Long, Do Xuan, Tan, Jia Qing, Joty, Shafiq, and Hoque, Enamul (2022). "Chartqa: A benchmark for question answering about charts with visual and logical reasoning". In: *arXiv preprint arXiv:2203.10244*.
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