

Graph Ingestion Engine (Spring 2024)

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Abstract—

Graph Ingestion Engine (GIE) is a project that aims at reverse engineering graphs into their underlying data points. This is important for digitizing those graphs into more compressed form and making charts accessible to people with visual disabilities. In this semester, we will continue on previous efforts towards this goal.

1 INTRODUCTION

Charts are convenient methods in conveying messages about underlying data. However, they are stored as images, thus consuming a lot of storage capacity. Moreover, they are inaccessible to screen readers, thus not informative to visually impaired people.

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. However, these efforts needed quantification, which has began by Fayed, Ramakrishnan, and Walker, 2024. Fayed, Ramakrishnan, and Walker, 2024 started working on a survey illustrating strengths and weakness of Large Vision Language Models (LVLMs) in Chart-to-Table task.

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.

In details:—

1. Fix connectivity issues between front-end and back-end,
2. store the input images into disk to be used in training and testing new models,
3. synchronize the deployment to larger storage,
4. Make a new metric for evaluating the consistency of models in extracting the trend in data used to generate graphs.
5. Update the RMS algorithm and handle more input cases,
6. post-process the output of computer vision models to be compared to ground truth using RMS algorithm,
7. Continue the survey of testing LLMs in the task of Chart-to-Table.
8. Continue organizing testsets according to difficulty in order to make it more informative in quantifying improvement and track progress, and
9. Add more types of graphs.

4 TIMELINE

In table 1, we show the most important tasks to work on, and more will be added as we go through the semester and after testing the deployment.

| Task | Assignee | Due Date |
|---------------------------------|----------|-------------------------------------|
| Finish survey of Chart-to-Table | Both | 02/13 (Deadline for ACL conference) |
| Fix Deployment - Backend | Mohamed | 02/27 |
| Fix Deployment - Backend | Kruthik | 02/27 |
| Convert CV outputs into tables | Mohamed | 03/06 |

*Table 1—*Timeline Table

5 TEAM CONTRACT

5.1 Communication Means

We will be incontact via teams on Mondays at 2:00pm EST. We can use email for occasionally.

5.2 Signature

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

Kruthik Ravikanti

Mohamed Fayed

6 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*.
4. DSouza, Ashlin and Walker, Bruce (2023). "Graph Ingestion Engine Project Report, Spring 2023". In.
5. Fayed, Mohamed, Ramakrishnan, Varun, and Walker, Bruce (2024). "Graph Ingestion Engine Report Fall 2024". In.
6. Masry, Ahmed, Thakkar, Megh, Bajaj, Aayush, Kartha, Aaryaman, Hoque, Enamul, and Joty, Shafiq (2024). "ChartGemma: Visual Instruction-tuning for Chart Reasoning in the Wild". In: *arXiv preprint arXiv:2407.04172*.