CS 590 Research Reflection

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Introduction

This is a short reflection on my CS 590 research project. This was my first time performing independent research and I learned a lot from the process.

Reflection

I picked "automatic linear algebra program optimization" as the topic for my project. This was a natural choice given my interest in machine learning systems: I was vaguely familiar with existing research in the space and wanted to learn more.

However, my initial project proposal was unrealistic: I set out to create a new linear algebra IR and auto-tuning system without a clear project scope or clear goals. I spent some effort on this system (initial IR and code generation design) before quickly running into technical limitations. I then pivoted my project to focus on TVM, an existing system. As the semester progressed, I refined the scope of the project multiple times to finally arrive at a set of realistic, concrete goals.

What I would have done differently

If I go could back, I would have done many things differently:

- Start with specific goals. My initial project was infeasible because the idea was too broad and goals were vague. Starting with concrete, realistic goals would have helped me scope the project and focus on a clear direction.
- Plan more effectively. There are many unknowns in research and it takes time to explore and refine ideas. Rather than creating a timeline where each step is dangerously uncertain, it would be more productive for me to set concrete checkpoints like "set up end-to-end system" and "set up benchmarks" that quickly build up progress.
- Discuss ideas and ask for help. When encountering difficulties, I should have asked for help and discussed ideas with course instructors. I should have also reached out to TVM researchers and the open-source community to get insight on fruitful research directions.

Lessons learned

From this experience, I've learned the following:

- Start research with clear goals and concrete planning.
- Brainstorm and discuss ideas early to establish a good research direction.
- Set up benchmarks as soon as possible to measure progress and iterate.

I will be sure to remember these points when doing future research.