THE UNIVERSITY OF ARIZONA
DEPARTMENT OF COMPUTER SCIENCE

CSc 553 : Principles of Compilation

Assignment 4 (Term Paper)

Start: Fri Nov 17, 2023
Due: 11:59 PM, Fri Dec 1, 2023

1. General

This assignment involves writing a term paper that discusses two or more papers from the research literature a compiler-related topic of your choice. The goal is to investigate a compiler-related topic beyond the material covered in the classroom. You can choose to explore something that was discussed in class in greater depth, or you can choose to learn about a topic that was not covered in class, e.g., something related to your own interests; the main requirement is that it should be compiler-related. Some sample topics are listed in Section 5 of this document, but that list is not meant to be exhaustive and you are welcome to consider other compiler-related topics.

2. The Paper: Content, Structure, and Format

2.1. Content

The intended audience for your paper is a student in CSC 553 or comparable graduate compiler class. You should assume the background that a student in such a class can be expected to have.

Your paper should satisfy the following requirements:

1. Consider at least two compiler-related papers that are related in some way.
2. They should both be peer-reviewed publications (conference or journal). You can use other sources, e.g., blog posts, to supplement your analysis, but the main focus of your paper should be peer-reviewed.
3. Discuss the main technical idea(s) in each.
4. Give a comparative analysis of the papers. E.g., based on the technical discussion (item 2), compare and contrast them (e.g., the techniques they use, their strengths and weaknesses) and summarize what lessons we can take away.

2.2. Structure

Structure your paper into a series of *sections*, followed by a *bibliography*. The following is a *suggested* (not mandatory) set of sections; the page lengths given are intended as a rough guide, not as absolute limits.

1. Introduction. (¾ – 1 page) Describe the problem being solved, why the problem is important, what contribution the papers make, a few sentences on how they differ. The reader should get some idea of what your paper is about from reading the introduction.
2. Background [optional]. (0 – ¾ page) This section is useful for introducing any terminology, notation, or concepts that are used by the papers and are helpful to know going into a discussion of the papers.
3. Individual discussion of each paper (1 – 2 pages per paper).
4. Discussion (1 – 1½ pages). Compare the papers to each other, discuss their strengths and weaknesses, summarize what the reader should take away.
5. Conclusions (one or two paragraphs). Briefly summarize your take on the papers.
6. Bibliography. Works mentioned in your paper should be adequately cited. Research papers in computer science generally use the ACM style or IEEE style of citation so I suggest that you use this as well, but this is not mandatory.

2.3. Formatting Guidelines

1. **Length:** 5–7 pages excluding references.
2. **Font size:** Sans-serif fonts (e.g., Arial, Helvetica, Calibri): 10 points; Serif fonts (e.g., Times New Roman): 11 points.
3. **Line spacing:** single-spaced.
4. **Margins:** 1 inch on each side.

3. Submitting your work

Submit your work in GradeScope in the submission area created for this assignment as a single PDF file (not txt or docx or any other format).

4. Grading

- 10% *Introduction.* Does the introduction give the reader a good idea of what to expect in the rest of the paper?
- 40% *Technical content.* Is the technical material of the papers being discussed presented fairly and accurately? Are the important points covered?
- 20% *Discussion.* Is the comparison of the papers, and/or discussion of their strengths and weaknesses, accurate and appropriate?
- 25% *Clarity of presentation.* Is the paper structured in a sensible way? Are ideas presented in a coherent and easy-to-understand way? Is terminology and notation defined clearly before being used? Do the conclusions of the paper follow from what is presented?
- 5% *Bibliography.* Are the references cited adequate?

5. Sample topics

The following is not meant to be an exhaustive list. If you have some other compiler-related topic you are interested in, you should feel free to mention it to me.

- Compiling for modern architectures. E.g., optimizations to improve cache performance; more sophisticated approaches to register allocation; compilation for multi-core processors; etc.
- Program analyses beyond what was discussed in class. For example: dealing with pointers; dealing with inheritance; analyses for security-related issues.
- Optimizations beyond what was discussed in class. For example: other optimizations; optimizations for other performance metrics, e.g., code size or energy usage.
- Domain-specific compilation issues. For example: compilation issues in areas such as security, cryptography, real-time systems, embedded systems.
- Applications to other areas. For example: compilation for blockchain-based applications such as smart contracts; quantum computers.
- Applications of other areas to compilation (or vice versa). For example, applications of machine learning to compilation; relationships between compilation and areas of interest to you.

6. Timeline

- **Oct 30, 2023 to Nov 3, 2023**: Meet with instructor to settle on the topic for your paper.
- **Nov 6, 2023 to Nov 13, 2023**: Meet with instructor to identify the papers you will write about.
- **Nov 17, 2023 to Dec 1, 2023**: Write and submit your paper.