

CS 8803 : Project

Total points : 100

Due dates : Phase II : Friday July 31st (65 points)

Important Policies:

1. **Phase I of the project is individual, phase II is in teams of 2 persons. Please direct questions regarding clarifications to the TA**
2. **Although some project problems may have solutions available in books, internet sources etc. you are supposed to solve them on your own without looking up such solutions. This rule will be STRICTLY enforced and any act of such lookup will be considered an act of plagiarism and will result in the strict penalty as per Georgia Tech honor code.**
3. **Document your solution making suitable reasonable assumptions and clearly stating them.**

Goal of the project: In this project, our goal will be to study internals of LLVM ARM compiler and make some changes to its optimization phases to improve code quality. The project will be carried out in phase I and phase II. Phase I will be to install the compiler, study its optimization phases and IR (intermediate representation) and learn how to use the infrastructure. Phase II will be to write a pass that will allow us to perform an optimization.

- **Phase II : In this phase our goal will be to perform path sensitive optimization. First you will develop a pass to generate path profile which shows most frequent intra-procedural paths through the CFG. Your phase should be able to detect paths of lengths 5, 10 and 15. Using these detected paths, you will carry out CFG restructuring by separating different frequent paths by code duplication and by suitably restructuring the intermediate code (IR). Restructuring of IR is the biggest goal of this project and you have to figure that out on your own working in a team of two students. After restructuring the IR, you will run the data-flow optimization phases on it. Finally you will report:**
- **Code growth incurred**
- **Speed-up improvement for different settings of path lengths and different optimizations turned ON**
- **Also report different optimizations achieved before and after : for example, report the number of constants propagated before and after IR restructuring was undertaken.**