

## Binary Instrumentation with PIN

Definition: In this homework, you are going to do some experiments with X68 ISA, which is the instruction set in your computers. For this task, you will use PIN Binary Instrumentation Tool:

○ <https://software.intel.com/en-us/articles/pin-a-dynamic-binary-instrumentation-tool>  
PIN allows you to collect runtime information about any application compiled and running on an X86 computer. In this homework, you will instrument simple factorial application both for iterative and recursive versions. You can get the code from here: <https://www.javatpoint.com/factorial-program-in-c>

This homework is to warm up the usage of PIN. In the next homework, you will do more experiments in PIN.

**Task1:** Count the total number of macroinstructions and microinstructions in the application.

**Task2:** In the ISAs, there are three classes of machine instructions:

- Memory Instructions (ie. Loads and Stores)
- Branch Instructions (ie. Jumps, Branches etc.)
- Arithmetic and Logic Instructions (ie. Add, Sub, Mul, Div, Shift, And, Or etc.)

Count the number of instructions in each class and find their ratio.

### Submission:

Write your instrumentation code for each task into the same instrumentation file as a .c or .cpp file. Also write a report to explain your code and also put your results for the iterative/recursive factorial applications to the report. Submit your code and your report on Canvas for this homework.