

CSC 372, Spring 2025

Comparative Programming Languages

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May 6, 2025

Plan

• Announcements

- SA8, the final exam review in Gradescope, is due tonight
- SA8 answer key will be posted in piazza tomorrow morning
- Today is the last day of class. It has been a great semester!
- **The final exam is Wednesday May 14th from 3:30-5:30pm in this room**

• Last time

- Outro for class
- Parallelizing histogram in Chapel
- Other parallel constructs

• Today

- Finish up the parallelizing histogram demo
- ICA12: quiz to help review for final exam
- Example problems from previous exams and SA8 questions you have

Please fill out survey, at 62% today

- **Please go complete the survey at <https://scsonline.ucatt.arizona.edu/>**
 - 4 extra credit points if $\geq 80\%$ of the class fill it out, over 40-point limit if applicable
 - They are anonymous. Even with that, I don't see them until after grades are in.
 - Please share what you thought about using LLMs and the open collaboration in class. I will be sharing summaries with the other CS faculty.
 - I read ALL the feedback and adjust future iterations of the class.

HANDS ON: PARALLELIZING HISTOGRAM

Goals

 histogram-serial.chpl

- Parallelize a program that computes a histogram using reductions
- Parallelize it using an array of atomic integers
- Compare the performance of both versions versus each other and the serial version

Parallelize 'histogram-serial.chpl' using a 'forall' loop and a 'reduction' intent

1. Copy 'histogram-serial.chpl' into 'histogram-reduce.chpl'
2. Parallelize the serial 'for' loop using concepts from '04-task-intents.chpl'

Parallelize 'histogram-serial.chpl' using an array of atomic integers

1. Copy 'histogram-serial.chpl' into 'histogram-atomic.chpl'
2. Parallelize the serial 'for' loop using concepts from '04-atomic-type.chpl'

Compare the performance of all three

```
./histogram-serial --numNumbers=100000000 --printRandomNumbers=false --useRandomSeed=false  
./histogram-reduce --numNumbers=100000000 --printRandomNumbers=false --useRandomSeed=false  
./histogram-atomic --numNumbers=100000000 --printRandomNumbers=false --useRandomSeed=false
```

What to know for final

- Can't turn the 'for' loop into a 'forall' loop in histogram because could have data races
- Can do a 'forall' with a reduce intent on the array being used to collect the histogram
- Can do a 'forall' on an array of atomic elements, but that can slow code down

ICA12: Quiz to help with final exam review

- **Read the instructions on the quiz**
- **CJ is going to walk around and record if you have a study guide for +4 extra credit points**

Studying for the Final Exam

- **Practice previous example problems**

- Gather questions from the midterms, pre-assessment, quizzes, TopHat, gradescope online reviews (SA3, SA5, and SA8), and slides
- Create questions and answers about the code you worked with in all the small programming assignments and large assignments
- Ask questions in Piazza if there are concepts that are not clear to you

- **Concepts ~30 Questions Will Cover**

- SML, Prolog, and Chapel code understanding
- Comparisons between programming languages
- Chapel parallelism including data races
- Which language features are useful in particular application domains
- Lexing and parsing as was done in LA1
- Type inference as was done in LA2

Let's do some sample problems

- **MT1 and MT2**
 - Show the statistics on the problems
 - Do a TopHat question for one
 - Have students do the InOrder question and step through it
 - Also the lexing and parse tree questions
- **Any questions about SA8 that is due tonight?**
- **Any other questions?**