Introduction to Parallel Processing

Class Introduction

Professor Amanda Bienz

Course Information

- **Introduction to Parallel Processing (CS442/542)**

- Office Hours : **TBD (fill out poll on Canvas)**

Contact Information

- Email : bienz@unm.edu

- Course Discord : More information in a moment

- Feel free to contact me through email or course discord with any questions or concerns

- I will check emails and discord at least once every day (Monday-Friday 8am-5pm)

  - Expect a response within 24 hours during the weekdays

Online Resources

- Canvas : General information and grades will be posted here

  - Weekly micro-assessments and tutorials

  - Homeworks and deadlines posted here

- Discord : discussion, questions

Course Format

- Fully face-to-face class

  - Will post recordings of class to Canvas

- Project Class!

  - Introducing parallel computing / MPI in first half of class

  - Will cover more advanced methods in second half of class

  - Much of second half of semester : working on your projects

- One midterm covering MPI material, no final exam

Materials and Pre-Reqs

- No required textbook, but a great resource :

  - Parallel and High Performance Computing by Rob Robey and Yuliana Zamora

- Prerequisites : Experience in at least one of the following

  - Computer organization and architecture (CS341)

  - Scientific computing (CS471)

  - Big data computing (CS567)

All About Grades

- Standard 10-point scale (no curve, includes -/+)

- If enrolled in CS442 :

  - **In-Class Questions : 10%**

  - **Exam : 15%**

  - **Homework Assignments : 40%**

  - **Course Project : 35%**

All About Grades

- Standard 10-point scale (no curve, includes -/+)

- If enrolled in CS542 :

  - **In-Class Questions : 10%**

  - **Exam : 15%**

  - **Programming Challenges : 20%**

  - **Homework Assignments : 20%**

  - **Course Project : 35%**

In-Class Questions

- At the end of many classes, you will have "in-class questions" to complete.

  - On paper

  - To be turned in before you leave class

- Graded for correctness.

- Point of questions is to make sure you all understand the material

Programming Challenges

- **Only required for graduate credit (CS 542)**

- Bi-weekly programming on GitHub Classroom

- Simple programming examples covered in class throughout the week

- **Available in C/C++, Fortran, or Python***

  - *whenever possible

Homework Assignments

- Homework assignments are a combination of parallel programming, plotting (using program of your choice, I will typically use Python), and written analysis.

- All homework assignments are due on Fridays @ 5pm.

  - Will not be counted late until grading begins, Monday @ 9am

  - I will not be available to help after the Friday deadline

Midterm Exam

- Will cover general parallel processing questions and all things MPI

- Written exam (no coding)

- In-class questions are great way to study

- **In-person exam**

Course Projects

- You will choose a project in September

  - Proposal

  - Progress Report

  - Final Poster Presentation

  - Final Report

- Project topic examples : **(will discuss more throughout the semester)**

  - Improving/adding/analyzing parallelism in your thesis research (or a project you care about)

  - Communication on Xena : profiling, benchmarking, or improving

  - Performance of collective algorithms (e.g. comparing Alltoall to Alltoallv)

Cheating Policy

- Homeworks and midterm are not partner work

  - No discussion of midterm with classmates until you have both completed it

  - Can discuss homework, but each should be done independently

    - Can help each other debug

    - Cannot write code or answers together

Cheating Policy

- If caught cheating

  - Automatic academic integrity violation

  - Automatic F in class

- **If unsure if something is allowed, just ask me!**

Cheating Policy

- Online resources :

  - Chegg and similar are **not allowed** in any circumstance.

  - ChatGPT can be used as a tool (e.g. to help you debug) but you are expected to understand all code you turn in

Homework Quizzes

- After homework is turned in, you will be asked in class questions (with your code present).

- Your homework grade is dependent on successfully passing these quizzes.

- **In Person**

Discord

- Semester discord group : link on Canvas

  - Link will expire

- If you want me to answer a question, tag me

- Do not post any homework solutions on discord. If you have a question and need to post your code, email me instead of posting publicly

Course Topics

- Concept of parallelism in programming

- Parallel performance models

- Distributed memory parallelism

  - All things MPI

- MPI+X

  - Shared memory (OpenMP)

  - GPUs (CUDA)

- Recent research in parallel computing

- *If you have a topic you want covered, let me know!*