CSE240C: Advanced Microarchitecture

Or: Advanced Not Parallel Architecture
Scope

- Everything in architecture that is not parallel.
- Really, everything not “coarse-grain” parallel.
- We might fudge a little bit on this.
240C Goals

• Get a broad picture of architecture
• There is much more than 240a
• This class has a strong “meta” component
  • Paper reading skills
  • Presentation skills
  • Synthesis skills
• Do an exciting research project
Content

- Historical perspectives
- New approaches to out-of-order execution (i.e., exploiting ILP)
- Specialized architectures.
- Circuit-level issues
- Multi-threading
- Case studies of real machines
- “super brainiac” processors
- Program analysis and behavior.
- Reliability issues.
Mechanics

• Reading papers
• Becoming an expert
• Research projects
• No tests!
Reading papers

• 18 Class meetings, about 36 papers
  • This is a pretty heavy load.

• Discussion format
  • Class is discussion-based. This means you!

• Part I: Answer questions from previous day
  • Part II: New material.
Assignments: Paper reading

• Read and *think about* each paper.

• Submit a summary.

• It is essential that you do this. Your grade depends substantially upon it.

• It is also essential that you learn to do this well.

• Extracting content from papers is one of the most important skills in grad school.
Paper summaries

• Goal 1: Extract the good ideas from the paper.
  • This means discarding the junk.
  • Identifying the good parts.

• Goal 2: Understand how it fits into its context (i.e., the rest of architecture)
  • How is it similar/different/an extension of...?
What’s the paper’s goal?

• Does it solve a problem?
• Demonstrate an opportunity?
• Does it provide information?
What does it contribute?

- An idea?
- A mechanism?
- A description of an artifact?
- A methodology?
How do the authors substantiate their claims?

• Experiments?
• Real systems?
• Simulation?
• Prose arguments?
• Examples from “the real world”
How does the paper relate to others?

- Refute?
- Confirm?
- Extend?
- Synthesize?
- Re-examine?
  - In light of new tech./new app./new idea
What conclusions do they draw?

- Small conclusions
  - Did their idea work?
  - How well?
  - Do you believe them?

- Big conclusions
  - How do they think it should shape the future?
  - Do you believe them?
How well is the paper crafted?

• Does it tell a story?
• Is it interesting?
• Are the figures easy to understand?
• Do they properly highlight the important parts?
• Could you summarize the paper after looking at it for 5 minutes? (not for this class, you can’t ;-)


How would you improve the paper?

- Technically
  - Different approach (maybe you should write a paper?)
  - Methodology
  - Experiments
- Presentation
  - Organization
  - Additional background
  - Be concrete -- “make it more clear” is not useful.
What questions does it raise?

• Issues with their approach?
• Directions for new work?
• Broader questions about architecture?
• What didn’t you understand?
Daily paper assignment

• Submitted via WebCT

• Due 10 minutes before class -- no exceptions.

• You should never miss class for this

• You should bring a printed version of each paper to class!
Becoming an expert

• In place of the mid term and exam...
• You will present 1 day worth of material in class
  • Become an expert on the topic.
  • Prepare 40 minutes of slides.
• Collect and answer questions for the next day.
Class presentation timeline

• 2 weeks ahead: Meet with me about the topic.
• 1 week ahead: Send me a draft of your slides
• Present your slides, collect questions.
• Prepare and present answers
• Send me slides with answers

• You are responsible for tracking these deadlines.
• My schedule fills up fast. Schedule at least 1 week ahead.
Evaluating In-class Presentations

• Background -- 3 points
  • How well did you place the papers in context with respect to related work and other papers we've read.

• Synthesis -- 4 points
  • How well did you extract the key contributions and ideas from the paper? How well did you provide additional insight beyond what is in the paper?

• Presentation -- 3 points
  • How good was your presentation? Were your slides well-prepare and clear?

• Questions -- 3 points
  • How well did you record and respond to the questions, including presenting answers at the next class meeting?
Grading Breakdown

• three equal pieces
• Participation
• In-class presentation
• Paper summaries
Grading

- I grade on a 13 point scale F through A+
- You get a letter grade in everything
- Your final grade is a weighted average.
- There's no curve in this class. Figuring out your own grade is easy.