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
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
• 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
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 a google form (see website)
• 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 1-2 days 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.
Project

• You will complete a research-style project on a topic of your choosing.

• Work in groups of 2-3.

• Start thinking of topics now!
  • You’ve already had 240A, so you have plenty of idea fodder.

• More information to come.
Questions

• Did they care about touring completeness?
• When did the first OS show up?