CS 598 SM

COURSE LOGISTICS

Course Roadmap

Applications: Probabilistic inference & programming

Analysis Tools: Probabilistic analysis and verification

Approximate Systems: Compilers, middleware, and hardware

Roadmap

August	Probabilistic Programming (user-land approximation)
September	Probabilistic Program Analysis (semantics and verification)
October & November	Approximate Computing (languages, systems, hardware)
December	Project Presentations

Schedule

Twice a week – Tuesdays and Thursdays 2-3:15 pm

We first do several lectures
- Probability background and hands-on introduction to probabilistic programming

In the majority of the course, we will discuss recent papers
- Typically, discuss one paper at a time
- One student presents the paper
- Everyone participates in the discussion

Course Format

Research-oriented Course:
- Discussing latest research
- Reading from primary literature (papers)
- Focus on finding new ideas and building new systems, not lecturing and grading

Research project is the main outcome of the course
- Be able to publish your work at a conference
- It is **hard**! Unpredictable + requires a lot of time and effort

Prerequisites

Basic Probability (e.g., CS 361)

Compilers and/or PL course (e.g., CS 421)

Basic computer architecture (e.g., CS 233)

(or a commitment to learn as you go)

Real Prerequisites

Experience doing research

(If you don't know what you're getting into,
talk to me after the class)

Grading

Miniquizes	10%
Reviews & Discussion	15%
Paper Presentation	25%
Project	50%

Miniquizzes

Tests background knowledge (like the one today)
- Concept from the paper, math, intuition
- 5 minutes at the beginning of the class
- We will discuss solution immediately afterwards

Each miniquizz is **worth 0.5%** (up to 10%).
- Self-graded, the main purpose is to bring everyone to the same page before we start the discussion
- In total 25 quizzes; can miss 5 without penalty

Papers

For the majority of the class, we will jointly read and discuss recent research results

Focus on one paper per lecture

In most lectures, you can choose between two candidate papers
- Or send me a suggestion for an alternative paper!

Make sure you can make it to the class on the day you're presenting the paper!

Papers (Selecting)

Submit 5 candidate papers you'd like to present
- List of papers is on the website (use the week and number)
- For many weeks, there are two candidate papers, but we will present on
- If you'd like a paper outside of the list, email me and make a case

Submission deadline is **this Sunday**
- Link: See the website
- Will get back with the assignments by the class on Tuesday

Reviews and Discussions

For each paper, write a review of up to 500 words:
- Summarize the paper:
  state main contributions in 2-3 sentences (use your own words!)
- Discuss pros and cons:
  give a honest critique of the approach (at least 1 pro and 1 con)
- Two questions:
  about the paper, the general topic, or its impact
- (Optional) Extensions or modifications to the approach:
  how to improve the work (theory, system, experiments, usage)

Reviews and Discussions

Send reviews before the lecture
- By midnight the day before
- Submission forms: next to the paper on the course site

Purpose of reviews is to prepare for the in-class discussion
- Light feedback on the reviews, leads where discussion goes

Participate in the discussion during the class
- Purpose: practice how to be loud
  (at the conferences, board meetings, home…)

Presentation

Week before: Meet with the instructor
- **Mandatory!** (typically during the office hour, e.g. 30 mins)
- Discuss outline and questions so far (ok if still rough!)

30 minute slot per presentation:
- Explain motivation for the work
- Clearly present the technical solution and results
- Use your own example (not the one from the paper)
- Outline limitations / improvements
- Focus on concepts, leave out nonessential details
- Discuss the impact on the related/follow-up work

Grading Presentations

Presentation quality:
- How well did you understand the work?
- How well did you present it (clarity and grace)?
- How well did you answer the questions?

We will take into account the **paper difficulty**

Project

Teams of two (if the number of students is even)
- Teamwork is a great experience!

Research projects, some ideas:
- New SW/HW approximations
- Optimize approximate inference algorithms
- New program analysis for probabilistic programs
- **New probabilistic analysis of approximate programs**
- Implement and compare existing approaches
- Survey literature on an emerging topic

Grading Projects

Proposal by **October 8**
- Meet with instructor for a quick discussion

Deliverables:
- Short paper – up to 5 pages ACM 10pt format
- Project overview – 10/15 minutes
- Due **last week of classes (Tuesday)**

Real outcome:
- Prepare (or make a good step toward) a publishable research paper

Grading Summary

Miniquizes	10%
Reviews & Discussion	15%
Paper Presentation	25%
Project	50%

Grading on an absolute scale (no curve!)

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RESOURCES FOR READING, WRITING AND PRESENTING

Reading Papers

"How to Read a Research Paper",
  by Michael Mitzenmacher
    http://www.eecs.harvard.edu/~michaelm/postscripts/ReadPaper.pdf

"How to Read an Engineering Research Paper",
  by William Griswold
    http://cseweb.ucsd.edu/~wgg/CSE210/howtoread.html

Advice compiled by Tao Xie:
    http://taoxie.cs.illinois.edu/advice.htm#review

Writing Reviews

"The Task of the Referee", by Allan Smith
http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.177.3844

"Constructive and Positive Reviewing",
 by Mark Hill and Kathryn McKinley
http://www.cs.utexas.edu/users/mckinley/notes/reviewing.html

Presenting Research

"How to give strong technical presentations"
 by Markus Püschel
http://users.ece.cmu.edu/~pueschel/teaching/guides/guide-presentations.pdf

Patrick Winston's talk @ MIT:
https://www.youtube.com/playlist?list=PL9F536001A3C605FC

Jean Luc Doumont's talk
https://www.youtube.com/watch?v=meBXuTIPJQk