Overview

- Course information
  - Personnel,
  - Policy,
  - Schedule,
  - Grading,
  - Projects Discussion
Instructor Introduction

Klara Nahrstedt

- PhD 1995 from Department of Computer and Information Science, University of Pennsylvania

Research:

- Networking (routing, QoS management, pricing),
- Multi-modal Distributed systems (overlay multicast, peer-to-peer systems, service composition, resource management),
- Mobile computing – smart phones protocols – P2P, video streaming over mobile phones, group management, …
- Operating systems (soft-real-time scheduling, caching),
- Multimedia applications (multi-view 3D tele-immersive systems, multi-camera systems, collaborative environments, mobile multimedia, P2P IPTV, multi-view 360 Video Streaming)
- Multimedia and critical infrastructure security (watermarking, real-time security)
- Cloud computing/Edge Computing
- Internet of Things
Course Logistics

Office Assistant:
- Candice Steidinger (steidin2@illinois.edu)
- If you need to meet with me outside of office hours, please ask Candice for an appointment. She has access to my calendar and will help you very fast.

Teaching Assistant: Ayush Sarkar
- Any questions you have, please, email
  - Instructor klara@illinois.edu with subject line “CS537 or
  - Teaching assistant ayushs2@illinois.edu

Class Time: Tuesday and Thursday 2:00-3:30pm
Class Place: virtual zoom
Zoom link is available on compass2g
Course Logistics

Instructor Office Hours:
- Tuesday and Thursday 4:00pm - 5:00pm CST
- Use the same zoom link as for the class
- Phone: 217-244-6624

Class Website – Reading List on the website and compass2g

Discussion, Announcements, and Postings:
- Compass2g app
- Campuswire app

Grading Center: https://compass2g.illinois.edu
Required Readings for CS 537

- Papers in Reading List (posted on class website)
  - https://courses.grainger.illinois.edu/cs537/fa2021

- Lectures and Discussion in class
  - Papers in class plus optional papers
Other Readings for CS 537

IoT Books and Papers
- “Internet of Things and Big Data Analytics”, Edited by P. Raj et al, CRC Press, 2020
- “Analytics for the Internet of Things (IoT)”, Andrew Minteer, Packt Publishing, 2017
- …. Many conference and journal papers from ACM and IEEE professional orgs
  - ACM IOTDI (Internet of Things Design and Implementation)
  - ACM IPSN (Information Processing of Sensor Networks)
  - IEEE MASS (International Conference on Mobile Ad-Hoc and Smart Systems)
  - ACM/IEEE CPS-IOT Week,
  - ACM SEC (Symposium on Edge Computing)
  - Many conferences on cloud computing (e.g., ACM SoCC – Symposium on Cloud Computing)

Multimedia Books and Papers
- Media Coding and Content Processing, Ralf Steinmetz, Klara Nahrstedt, Prentice Hall, 2002
- Multimedia Systems, Ralf Steinmetz, Klara Nahrstedt, Springer Verlag, 2004 (online book free)
- … many other conference and journal papers from ACM and IEEE professional orgs
  - ACM International Conference on Multimedia,
  - ACM MMSys (Multimedia Systems)
  - ACM ICMR, (International Conference on Multimedia Retrieval)
  - IEEE ICME (International Conference on Multimedia and Expo)
  - IEEE CVPR (International Conference on Computer Vision and Pattern Recognition)
  - IEEE ICASSP (International Conference on Acoustics, Speech, and Signal Processing)
  - ACM and IEEE TMM (Transactions on Multimedia)
Course Prerequisites

- It is helpful if you have taken at least one of these classes in your undergrad studies
  - CS 425 (distributed systems undergrad) and/or
  - CS 438 (networking systems undergrad)
  - CS 437 (Internet of Things systems undergrad)
  - 400-level computer vision class
Goal of the Course

- **Expand breath of knowledge** in the area of multi-modal IoT systems through
  - Learn new Multi-Modal IoT-specific system and networking concepts
  - Learn new mathematical and design tools to model and design complex systems that run multi-modal IoT systems

- **Learn scientific tools for your MS/PhD theses**
  - Learn how to critique scientific papers (review)
  - Learn how to ask questions and prepare answers
    - (More and more conferences ask for rebuttals to reviewers’ questions)
  - Learn how to prepare and present a scientific work as lecture
  - Learn how to present related work
  - Learn how to prepare project proposal
  - Learn how to prepare project presentation and final project report
Class Format

- Class will consist of partially
  - lecturing by instructor, TA, guest lecturer and
  - lecturing by students based on reading list
  - paper discussions

- Students' responsibility
  - Attend lectures
  - Read papers!!
  - Work on presentations, questions, reviews, evaluation, midterm exam, project, lectures
  - Look for new material and post on campuswire when you find interesting papers, tools, other material to share
Workload (1a)

Lecturing and Q&A

- Student presents 1 paper presentation (Paper #1)
- Student presents 2nd paper (Paper #2)
- TA will setup a sign-up sheet with papers and students can select papers for presentations
Workload (1b)

- Instructions regarding sign-up sheet and selection will be placed on campuswire.
- Paper assignment will be on a first-come-first-serve policy
  - Student presents the papers synchronously in zoom-class
  - Instructor evaluates the lectures, and discussions
Workload (2)

Paper Reviews and Evaluation of Reviews

- Each student selects three papers for review which are
  - different from Paper #1
  - different from Paper #2
  - different weeks (3 reviews should be from papers over 3 weeks – one paper per week to review).

- Send your selected three papers to the TA.

- Review information will be then posted on campuswire.
  - Reviews will be evaluated by the TA
Workload (3)

- Take-Home Midterm Exam
  - Questions will be asked from Lectured material and papers presented prior to exam
  - Problems will include material covered in papers and lectures to answer the midterm questions
Workload (4)

- **Final project** will include three parts:
  - 1. project proposal
  - 2. project presentation in class
  - 3. project paper
Lecturing

- Each student needs to present **Paper #1** and **Paper #2**
  - Each student selects choice of papers in sign-up sheet
    - Details about sign-up sheet will be posted on campuswire
    - Selection of papers will be based on First Come First Serve
    - Assignments will be posted on the class website in the **Reading List**

- The **sign-up sheet** will open on **September 13** and close on **September 17, 2021**
Lecture Format for Papers’ Presentation

- Paper presentation should be **20 minutes maximum** to leave at least 10 minutes for discussion.

- You should plan 1-2 minutes per slide, so having around 15-20 slides.
  - Use simple strong contrast colors.
  - Do not make the slide too busy.

- **Post your slides on campuswire before lecture or send it to TA/instructor.**
Lecture Format (2)

- Your presentation should include
  - **Motivation of the problem** (why are we looking at this issue? What is the environment where the problem resides?)
  - **Problem Description** (What is the problem and what are the challenges of the problem?)
  - **Background** (How did other people solve this problem and why isn’t this enough?)
  - **Novel approach** (solution described in the paper)
  - **Validation of approach**
  - **Conclusion with Pros and Cons of Paper**
Paper Reviews

- Each student sends list of 3 papers (different from the 2 papers to present and each review is done in different week)
  - Email to TA your three papers to be reviewed
  - Use the review format as specified in this lecture
  - Post the review on campuswire under “paper_reviews” chatroom
- Deadline for each Review is day before the paper is presented (11:59pm)
- TA evaluates reviews
Peer Reviews Format

Review should include:

- **Title, authors, venue** of the published paper
- **Short overview of the paper** (what is the main idea of the paper) – few sentences
- **3-5 pros items** – positive sides of the paper – why was the paper accepted
- **3-5 cons items** – negative sides of the paper – what are still missing pieces of the work;
- **Comments** on how would you improve the paper?

Note: review should be ½-1 page long; write full sentences and be clear (don’t just put keywords)

- Think like a reviewer and member of a technical conference committee
Evaluation of Reviews

- Summary of the paper (concise description of the idea)
- The pros and cons items if they are valid
- Improvement suggestions to the paper
- What the reviewer has done well and what could be improved
Take-Home Midterm Exam

- Midterm exam will be
  - Posted on October 18 (Monday 11:59pm)
  - Due on October 25 (Monday 11:59pm)

- Use lectures, web material and papers to find answers

- Submit midterm-exam solutions in pdf format to klara@illinois.edu, subject line: “CS537 – Midterm”
Final Project (1)

- Each student must work on a **class project** in multi-modal/IoT system/network area
  - Consider continuation of your research projects if it has IoT context
  - Consider exploring new topic towards your research
  - Come and see instructor during office hours if you need suggestions for class project (or setup a meeting via Candice with the instructor)
  - You can work **alone**, or in **group of 2-3 students**
    - Depending on the size of the project group, corresponding complexity of the project and clear division ‘who does what’ is required and expected.

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Final Project (2)

• The project should have research flavor (so no survey for final project)

• You are encouraged to
  □ develop new algorithm/protocol and/or application and/or
  □ improve existing algorithm/protocol/application and
  □ validate via comparative simulation or real implementation
  □ run QoE experiments on Video 360 and other IoT data
  □ develop analysis tool for public IoT data
  □ evaluate/measure existing multi-modal IoT system/tool
  □ Evaluate existing analytics tools on existing IoT data
  □ …..
Project Proposal Format (1)

Format:

- ACM format, single column, font 11 Arial (or Times New Roman), pdf
- Specify name, title, class number
- Length: 2-3 pages;

Proposal: Introduction

- Motivation and description of problem
  - explain why it is a problem
  - How did others solve the problem?
  - How do you plan to solve the problem?
  - What is broader impact of your solution?
Project Proposal Format (2)

Proposal: Possible Approaches you consider to take
- Picture of framework/architecture you want to explore
- Algorithm you want to explore and compare/improve
- Experiment(s) you want to conduct

Proposal: Action Plan
- By when you want to do what?

Proposal: References
- Papers you want to read and use in your research (at least 3 references must be included – read related work before you propose a project)
Project Presentation and Report Formats

- **Presentation format** should be similar to the lecture format
  - Talk about your problem, challenges, solution, and validation.
  - Conclude with lessons learned

- **Report format** should be written like a scientific conference/workshop paper in ACM format (available on web)
  - Read and review papers carefully
Project Deadlines

- **Project Proposal**: October 4 (Monday), 11:59pm
  - Submit to klara@Illinois.edu
  - Subject: cs537: Project proposal

- Meet with Instructor for **Project Proposal feedback**:
  - October 12 and 14, 4-5pm (Office Hours)
  - October 13: 1-3:30pm, 4:30-6pm
  - October 14: 8-1:30pm
  - Sign-up sheet will be provided
Project Deadlines

- **Project Presentation:** November 30, December 1 and December 7
  - Sign-up sheet will be available
  - Depending on number of project, time slots will be allocated

- Depending on number of students in the class, number of project in the class, we will inform each group about the allotted presentation time.
Project Deadlines

- **Final Project Report** Deadline: December 15, 11:59pm (Wednesday)

- Depending on the size of the project group
  - 1 person project: min 6 pages – double column ACM Format paper (with references, pictures, tables)
  - 2 person project: min 8 pages – double column ACM Format paper (with references, pictures, tables)
  - 3 person project: min 10 pages – double column ACM Format (with references, pictures, tables)
Facilities and Equipment

- Engineering workstations-linux machines
- Use laptop cameras or mobile phones cameras or just images/videos on Internet
- Software: gstreamer, ffmpeg, GPAC, kvazaar (HEVC encoder), MATLAB, Jupyter Notebook, Phyton, Graphana, MQTT (and other pub/sub systems), other IoT and vision software packages
- If you have any further questions regarding the software, please, contact the TA
  - More software can be installed based on project demands – email for help to engrit-help@illinois.edu (and TA)
  - Any problems with engineering workstations/multi-modal software – email for help to engrit-help@illinois.edu (and TA)
Grading

- Take-Home Midterm Exam: 21%
- Paper #1 Presentation: 10%
- Paper #2 Presentation: 10%
- Paper – Three Reviews: 9% (each review 3%)
- Final Project: 50%
  - Project Proposal (5%)
  - Project Presentation (18%)
  - Project Final Report (27%)
Grading policy

- Gradebook system: TBD
- Late policy
  - 3 Bonus Days for Review posting!!!
  - It is your responsibility!
    - Check announcements in lectures, campuswire, or class website
    - Please, email to TA and/or instructors
Re-grading policy

- Students have 1 week (after the grade is released into the compass 2g gradebook) to request for re-grading
- Re-grading requests need to be in writing to the instructor/TA
- After the re-grading period, no re-grading request will be granted.
Summary

- Any questions you may have, please, email to
- Instructor: klara@illinois.edu
- TA: ayushs2@illinois.edu

- Have a great semester Fall 2021!