

Final Project

- Investigate the latest research topics in computer networks
 - Select a few related papers from the top tier conferences
 - SigComm, CoNext, IMC, MobiCom, NSDI, ICNP, etc
 - Explore the problem space
 - What's the issue?
 - What are the challenges?
 - Explore the solution space
 - What are the possible solutions?
 - What are the benefit and cost?
 - Implement the solutions proposed in the papers
 - Evaluate the performance
 - Discussions
 - What's the novelty of the solution?
 - What are the limitations?

Logistics

- 4 people as a team (NO free-rider)
- Week 3~6: Propose the topic
 - Start as early as possible. Feel free to discuss with me.
- Week 15~16:
 - Prepare for a 20-minute oral defense
 - 10-min presentation
 - 5-min demonstrations
 - 5-min Q&A
- Submission
 - Presentation slides
 - 4-page report
 - Complete codes of the system / simulation / emulation
- Score
 - 50%: Completeness of the implementation
 - 30%: Scores from classmates
 - 10%: Presentation and report
 - 10%: Beyond the paper
 - Personal bonus: ask questions during Q&A session

Topics

- Internet Protocols
- Network Security
- Wireless Communication
- Mobile Networks
- Sensor Networks
- Cellular Networks
- Vehicular Networks
- Software-Define Networks
- IoT / Network Applications

Example — AI-Enhanced Internet Performance Optimization

- Papers:
 - AuTO: Scaling Deep Reinforcement Learning to Enable Datacenter-Scale Automatic Traffic Optimization. SigComm 2018.
 - Characterizing the Internet Host Population Using Deep Learning: A Universal and Lightweight Numerical Embedding. IMC 2018.
- Problem space:
 - What are the causes of the network performance problems?
 - Who traditional methods cannot solve the problems?
- Solution space:
 - How does deep learning help?
 - Which ML algorithms work the best? Why?

Example – Augmented Functions Provided in Future Networks

- Papers (Localization)
 - In-body Backscatter Communication and Localization. SigComm 2018.
 - Verification: Accuracy Evaluation of WiFi Fine Time Measurements on an Open Platform. MobiCom 2018.
- Problem space:
 - Why we need localization?
 - It has been studied for decades – why is not widely available yet?
- Solution space:
 - Too many..

Example – Battery-less Communication

- Papers
 - X-Tandem: Towards Multi-hop Backscatter Using Commodity WiFi. MobiCom 2018.
 - FlipTracer: Practical Parallel Decoding for Backscatter Communication. MobiCom 2017.
 - NICScatter: Backscatter as a Covert Channel in Mobile Devices. MobiCom 2017.
- Problem space:
 - Development of IoT, sensor networks are constrained by power sources and communication is blamed.
 - What are challenges?
- Solution space:
 - Which medium to use?
 - How to make it widely available?
 - How to improve bandwidth?

Example – Gold in Network Data

- Papers:
 - [Optimization] Impact of Device Parameters on QoE of Internet-based Mobile Applications. IMC 2018.
 - [Optimization] Mobility Support in Cellular Networks: A Measurement Study on Its Configurations and Implications. IMC 2018.
 - [Security] Following Their Footsteps: Characterizing Account Automation Abuse and Defenses. IMC 2018.
- Problem space:
 - SJTU Network data generates TBs data per day. What we can learn from it?
 - Tracking individual users
 - Inferring users' preference, activities, etc
 - Design better protocols
 - Reduce power of network infrastructure
 - ...