

CS539: Advanced Topics of Wireless Networks & Mobile Computing

Fall 2021-2022

Professor Maria Papadopouli + guest lecturers

TA: Eva Papadogiannaki

[Chapter 2 of Fundamentals of Wireless Communication](#) by Tse & Viswanath

This graduate-level seminar class covers the fundamentals for mobile computing and wireless network and emerging technologies for ocean IoT and health-care; Topics include systems and technologies for underwater sensing, drones, communication, localization, observations, user tracking, activity monitoring.

Background:

Learning how to read and review a paper

[How to Read a Paper](#), SIGCOMM CCR

PART B. OVERVIEW OF SPECIAL TOPICS

UNDERWATER INTERNET OF THINGS IN SMART SEA

1. T. Qiu, Z. Zhao, T. Zhang, C. Chen and C. L. P. Chen, "Underwater Internet of Things in Smart Ocean: System Architecture and Open Issues," in *IEEE Transactions on Industrial Informatics*, vol. 16, no. 7, pp. 4297-4307, July 2020, doi: 10.1109/TII.2019.2946618.

<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8863935>

Goal: Learn fundamentals of localization and physics of wireless/acoustic channel

Required Reading:

- [A Survey of Architectures and Localization Techniques for Underwater Acoustic Sensor networks](#), IEEE Communications Surveys & Tutorials, 2011

- [Passive Inverted Ultra-Short Baseline \(piUSBL\) Localization: An Experimental Evaluation of Accuracy](#), IROS 2019

Goal: Learn fundamentals of energy harvesting, backscatter, end-to-end system design

Required Reading:

- [Underwater backscatter networking](#), ACM SIGCOMM 2019
 - [Underwater Ultrasonic Wireless Power Transfer: A Battery-less Platform for the Internet of Underwater Things](#), IEEE Transactions on Mobile Computing 2020
2. [csdp1209] [Networking across boundaries: enabling wireless communication through the water-air interface](#), ACM SIGCOMM 2018
 3. [AmphiLight: Direct Air-Water Communication with Laser Light](#), Usenix NSDI 2020
 4. [csd5041] [Saildrone design and capabilities: What Is a Saildrone and How Does It Work?](#), 2021
 5. [csd5041] [Exploration of underwater life with an acoustically controlled soft robotic fish](#), Science Robotics, 2018
 6. [csdp1233] [SMART Cables for Observing the Global Ocean: Science and Implementation](#), Frontiers in Marine Science 2019
 7. [csd5041] [Visual tracking of deepwater animals using machine learning-controlled robotic underwater vehicles](#),

HUMAN TRACKING & LOCALISATION

1. (Csdp1235) **Title:** Learning long-term representations for person re-identification using radio signals; **Proceedings:** IEEE/CVF Conference on Computer Vision and Pattern Recognition; **Publication date:** 2020; **Authors:** Lijie Fan, Tianhong Li, Rongyao Fang, Rumien Hristov, Yuan Yuan, Dina Katabi; **DOI:** [10.1109/CVPR42600.2020.01071](https://doi.org/10.1109/CVPR42600.2020.01071)
2. (csdp1219) **Title:** Making the invisible visible: Action recognition through walls and occlusions; **Proceedings:** IEEE/CVF International Conference on Computer Vision; **Publication date:** 2019; **Authors:** Tianhong Li, Lijie Fan, Mingmin Zhao, Yingcheng Liu, Dina Katabi; **DOI:** [10.1109/ICCV.2019.00096](https://doi.org/10.1109/ICCV.2019.00096)
3. (Csdp1235) **Title:** SpotFi: Decimeter Level Localization Using WiFi; **Proceedings:** 2015 ACM Conference on Special Interest Group on Data Communication (SIGCOMM); **Publication Date:** August 2015; **Authors:** Manikanta Kotaru, Kiran Joshi, Dinesh Bharadia, Sachin Katti; **DOI:** <https://doi.org/10.1145/2785956.2787487>
4. (csdp1250) **Title:** Decimeter-Level Localization with a Single WiFi Access Point; **Proceedings:** Usenix NSDI 2016; **Publication Date:** March 2016; **Authors:** Deepak Vasisht, MIT CSAIL; Swarun Kumar, Carnegie Mellon University; Dina Katabi, MIT CSAIL; **URL:** <https://dl.acm.org/doi/10.5555/2930611.2930623>
5. (csdp1219) **Title:** Through-Wall Human Pose Estimation Using Radio Signals; **Proceedings:** IEEE Conference on Computer Vision and Pattern Recognition 2018 (CVPR); **Publication Date:** 2018; **Authors:** Mingmin Zhao, Tianhong Li, Mohammad

Abu Alsheikh, Yonglong Tian, Hang Zhao, Antonio Torralba, Dina Katabi; **DOI:** [10.1109/CVPR.2018.00768](https://doi.org/10.1109/CVPR.2018.00768)

6. **(csdp1250)** **Title:** mD-Track: Leveraging Multi-Dimensionality for Passive Indoor Wi-Fi Tracking; **Proceedings:** MobiCom 2019; **Publication Date:** October 2019; **Authors:** Y Xie, J Xiong, M Li, K Jamieson; **DOI:** <https://doi.org/10.1145/3300061.3300133>
7. **(csdp1244)** **Title:** IndoTrack: Device-Free Indoor Human Tracking with Commodity Wi-Fi; **Proceedings:** ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 2017; **Publication Date:** September 2017; **Authors:** XIANG LI and DAQING ZHANG, QIN LV, JIE XIONG, SHENGJIE LI, YUE ZHANG, and HONG MEI; **DOI:** <https://doi.org/10.1145/3130940> .

HEALTH & IoT

1. **(csdp1233)** **Title:** Health management and pattern analysis of daily living activities of people with dementia using in-home sensors and machine learning techniques; **Proceedings:** Plos one journal; **Publication Date:** 2018; **Authors:** Shirin Enshaeifar, Ahmed Zoha, Andreas Markides, Severin Skillman, Sahr Thomas Acton, Tarek Elsaleh, Masoud Hassanpour, Alireza Ahrabian, Mark Kenny, Stuart Klein, Helen Rostill, Ramin Nilforooshan, Payam Barnaghi; **DOI:** <https://doi.org/10.1371/journal.pone.0195605>
2. **(csdp5039)** **Title:** Internet of Things and Machine Learning for Healthy Ageing: Identifying the Early Signs of Dementia; **Proceedings:** MDPI Sensors 2020, 20(21), 6031; **Publication Date:** October 2020; **Authors:** F Ahamed, S Shahrestani, H Cheung; **DOI:** <https://doi.org/10.3390/s20216031>

ACTIVITY DETECTION

1. **(csdp1250)** **Title:** Finding Dory in the Crowd: Detecting Social Interactions using Multi-Modal Mobile Sensing; **Proceedings:** ACM SenSys Workshop on Machine Learning on Edge in Sensor Systems (Sensys-ML) 2019; **Publication Date:** 2019; **Authors:** K Katevas, K Hänsel, R Clegg, I Leontiadis, H Haddadi, L Tokarchuk; **DOI/url:** <https://arxiv.org/pdf/1809.00947.pdf>
2. **(csdp1219)** **Title:** Towards automating smart homes: contextual and temporal dynamics of activity prediction; **Proceedings:** Adjunct Proceedings of the 2019 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2019 ACM International Symposium on Wearable Computers; **Publication Date:** September 2019; **Authors:** Yuting Zhan, Hamed Haddadi; **DOI:** <https://doi.org/10.1145/3452296.3472908>

NETWORK OF DRONES

1. **(csdp1217)** Y. Zeng, Q. Wu and R. Zhang, "Accessing From the Sky: A Tutorial on UAV Two beams are better than one: towards reliable and high throughput mmWave Communications for 5G and Beyond," in Proceedings of the IEEE, vol. 107, no. 12, pp. 2327-2375, Dec. 2019, doi: 10.1109/JPROC.2019.2952892.
<https://arxiv.org/pdf/1903.05289.pdf>
2. **(Csdp1235)** X. Lin *et al.*, "Mobile Network-Connected Drones: Field Trials, Simulations, and Design Insights," in *IEEE Vehicular Technology Magazine*, vol. 14, no. 3, pp. 115-125, Sept. 2019, doi: 10.1109/MVT.2019.2917363.
<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8758988>

ACM SIGCOMM 2021 PAPERS

1. **(csdp1217)** links <https://dl.acm.org/doi/10.1145/3452296.3472924>
2. **(csd5039)** A nationwide study on cellular reliability: measurement, analysis, and enhancements

Mobicom 2021 PAPERS

1. **[csdp1233]** Vi-Liquid: Unknown Liquid Identification With Your Smartphone Vibration
Authors: Yongzhi Huang, Kaixin Chen, Yandao Huang, Lu Wang, and Kaishun Wu (Shenzhen University)
2. **(csdp1244)** SMART: Screen-based Gesture Recognition on Commodity Mobile Devices
Authors: Zimo Liao (Shanghai Jiao Tong University); Zhicheng Luo and Qianyi Huang (Southern University of Science and Technology); Linfeng Zhang (Tsinghua University); Fan Wu (Shanghai Jiao Tong University); Qian ZHANG (Hong Kong University of Science and Technology); Yi Wang (Southern University of Science and Technology)
3. **(csd 5039)** RFID and Camera Fusion for Recognition of Human-object Interactions
Authors: Xiulong Liu, Dongdong Liu, and Jiuwu Zhang (Tianjin University); Tao Gu (Macquarie University); Keqiu Li (Tianjin University)
4. **[csdp1209]** EarGate: Gait-based User Identification with In-ear Microphones
Authors: Andrea Ferlini, Dong Ma, Robert Harle, and Cecilia Mascolo (University of Cambridge)
5. **(csdp1244)** Face-Mic: Inferring Live Speech and Speaker Identity via Subtle Facial Dynamics Captured by AR/VR Motion Sensors

Authors: Cong Shi (WINLAB, Rutgers); Xiangyu Xu (Shanghai Jiao Tong University); Tianfang Zhang (WINLAB, Rutgers); Payton Walker (Texas A&M University); Yi Wu and Jian Liu (University of Tennessee, Knoxville); Nitesh Saxena (Texas A&M University); Yingying Chen (WINLAB, Rutgers); Jiadi Yu (Shanghai Jiao Tong University)

6. [\[csdp1209\]](#) RFlens: Metasurface-Enabled Beamforming for IoT Communication and Sensing Authors: ChaoFeng (Northwest University); Xinyi Li (Northwest University); Yangfan Zhang, Xiaojing Wang, Liqiong Chang, and Fuwei Wang (Northwest University); Xinyu Zhang (University of California San Diego); Xiaojiang Chen (Northwest University)