

Taegyeong Lee

Ph.D. Student
[NC Lab.](#)
School of Computing, KAIST

E-mail: tglee@nclab.kaist.ac.kr
Website: <https://tglee.info>

SUMMARY

I am a graduate student at KAIST, under the supervision of Prof. Junehwa Song. My research interests lie in the areas of mobile/IoT systems and social computing. My current projects focus on mobile deep learning platforms and privacy-preserving AI systems. I am also interested in studies on computer systems understanding interpersonal interactions and crowd context. I enjoy implementing working prototypes and discussing new problems, and prefer to work as a team.

RESEARCH INTERESTS

Mobile/IoT Systems

- Mobile deep learning platform
- Continuous monitoring & pervasive sensing
- Wearable system
- Privacy-aware intelligent system
- Self-mobile robotics system

Social & Interactional Computing Systems

- Deep understanding of interpersonal interactions
- Computer vision system for human context tracking
- Providing presence and togetherness for physically separated people
- Crowd context-aware applications

EDUCATION

- 2019 – present** Ph.D. in Computer Science, KAIST, Daejeon, Korea
Advisor: Prof. Junehwa Song
- 2017 – 2019** M.S. in Computer Science, KAIST, Daejeon, Korea
Advisor: Prof. Junehwa Song
- 2013 – 2017** B.S. in Computer Science, KAIST, Daejeon, Korea

WORK EXPERIENCE

- JUL. 2018** Microsoft Research, Beijing, China
– **SEP. 2018** Research Intern, Intelligent Cloud & Edge Group (Mentor: Dr. Yunxin Liu)
- MAR. 2016** KAIST Networking & Mobile Systems Lab, Daejeon, Korea
– **FEB. 2017** Undergraduate Research Intern (Advisor: Prof. Sung-Ju Lee)
- DEC. 2015** SK Hynix, Icheon, Korea
– **FEB. 2016** Undergraduate Intern, Memory System Lab

AWARDS AND HONORS

NAVER Ph.D. Fellowship Award, 2020.

Best Demo Award, ACM MobiSys 2019.

PUBLICATIONS

Conferences

- 2021 [C.03] Wonjung Kim, Seungchul Lee, Youngjae Chang, **Taegyong Lee**, Inseok Hwang, Junehwa Song. **Hivemind: social control-and-use of IoT towards democratization of public spaces**. In *Proceedings of the 19th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '21)*. [[ACM DL](#)] [[Demo Video](#)]
- 2019 [C.02] **Taegyong Lee**, Zhiqi Lin, Saumay Pushp, Caihua Li, Yunxin Liu, Youngki Lee, Fengyuan Xu, Chenren Xu, Lintao Zhang, Junehwa Song. **Occlumency: Privacy-preserving Remote Deep-learning Inference Using SGX**. In *Proceeding of the 25th Annual International Conference on Mobile Computing and Networking (MobiCom '19)*. [[ACM DL](#)]
- 2018 [C.01] Bumsoo Kang, Inseok Hwang, Jinho Lee, Seungchul Lee, **Taegyong Lee**, Youngjae Chang, Min Kyung Lee. **My Being to Your Place, Your Being to My Place: Co-present Robotic Avatars Create Illusion of Living Together**. In *Proceedings of the 16th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '18)*. [[ACM DL](#)] [[Demo Video](#)] [[Concept Video](#)]

Adjuncts (Demos and Posters)

- 2021 [A.04] Wonjung Kim, Seungchul Lee, Youngjae Chang, **Taegyong Lee**, Inseok Hwang, Junehwa Song. **Facilitating in-situ shared use of IoT actuators in public spaces (demo)**. In *Proceedings of the 19th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '21)*. [[ACM DL](#)]
- 2020 [A.03] Seungpyo Choi, Seonghoon Kim, **Taegyong Lee**, Junehwa Song. **Scenario-based energy estimation for continuous mobile sensing applications (poster)**. In *Proceedings of the 18th Conference on Embedded Networked Sensor Systems (SenSys '20)*. [[ACM DL](#)]
- 2019 [A.02] Bumsoo Kang, Inseok Hwang, Jinho Lee, Seungchul Lee, **Taegyong Lee**, Youngjae Chang, Min Kyung Lee. **Towards Peripheral Awareness of Remote Family Member's Context Using Self-mobile Robotic Avatars (demo)**. In *Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '19)*. [[ACM DL](#)] [**Best Demo Award**]
- 2018 [A.01] Bumsoo Kang, Inseok Hwang, Jinho Lee, Seungchul Lee, **Taegyong Lee**, Youngjae Chang, Min Kyung Lee. **HomeMeld: Co-present Robotic Avatar System for Illusion of Living Together (demo)**. In *Proceeding of the 16th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '18)*. [[ACM DL](#)]

PROJECTS

Occlumency: Privacy-preserving remote deep learning system [C.02]

- We propose Occlumency, a cloud-driven solution to protect user privacy without compromising the benefit of using powerful cloud resources. Our key idea is to leverage trusted execution environments to perform DNN inference in the hardware-protected enclave. We devised a new DNN parameter management and DNN inference engine to effectively reduce the memory footprint of DNN inference and maximize the inference performance running in enclaves.
- **Role:** lead investigator
- **Talks:**
 - Paper presentation: ACM MobiCom 2019
 - Seminar: University of Southern California, Networked Systems Lab., Oct. 2019
 - Seminar: Seoul National University, HCS Lab., Oct. 2019
 - Seminar: UNIST, MSN Lab., Sep. 2019
 - Invited talk: KAIST, CS442 (Mobile Computing and Applications) Course, Oct. 2019
- This work was done in part of an internship at Microsoft Research, Beijing.

HomeMeld: Providing living togetherness with co-present robotic avatars for work-separated families [C.01] [A.01] [A.02]

- We propose HomeMeld, a zero-hassle self-mobile robotic system providing living togetherness for families who are involuntarily living apart. It uses continuous computer vision to detect a person's spatial context (location/orientation) and superposes the context into the other family member's home with a telepresence robot.
- I designed and implemented a navigation system for a telepresence robot that mimics spatial contexts of a person. I devised a modified A* path planner and destination predictor to reduce start/stop latency of telepresence robot for seamless living togetherness.
- I implemented a server bridging all components of HomeMeld.
- For human detection, we collected top-view images of participants and augmented dataset with floor images. We modified and trained the CNN model (YOLO) with Darknet framework to recognize and detect users' location and orientation with a top-view camera.

CommBetter: Parent-driven speech therapy for children with communication developmental delay

- We envision to deeply understand interpersonal communications and to facilitate human interaction using a computer system. In line with this vision, we present CommBetter, an in-situ communication regulation system for parents with children suffering from communication developmental delays. CommBetter monitors meta-linguistic information and gesture from parent-child communication. It intervenes to provide proper guidelines to parents by correcting their communication habits in caring for their children with communication developmental delays.
- I have been implementing a real-time gesture tracing system with multiple cameras deployed at home. I adopted face detection vision APIs (OpenFace, dlib, OpenPose) to estimate location/orientation of user's head in 3D space and extract visual cues.

Oing: Facilitating lecturer's interaction in a large class by observing students' contexts

- We propose Oing, an audience monitoring system for a lecturer in a large class to facilitate the interactions between the lecturer and the audience. Oing monitors audience's head poses with a single camera and estimates the attention level of the audience. It provides guidelines to the lecturer based on attention heatmap, and thereby makes the classroom more interactive.
- **Role:** lead investigator
- I collected and labeled 80,000 images of students from actual lectures, and built a random-forest based model to estimate students' attention.

- We as a team built an early prototype system which highlights low-attentive students and notify the lecturer of these students.

Card-stunt as a Service: Empowering a Massively Packed Crowd for Instant Collective Expressiveness

- We propose Card-stunt as a Service (CaaS), an infrastructure-free service that enables the densely packed crowd to instantly visualize collective symbols using their smartphones. It utilizes visible-light angle-of-arrival sensing and scalable constrained optimization to achieve decimeter-level localization of the crowd. After localization, CaaS server sends pixel information to each smartphone to make a collective visual image.
- I fortified CaaS system in terms of network robustness. CaaS, with its early design, suffered from connection failure due to a massive amount of wireless connections. I implemented Bluetooth ad-hoc connection into CaaS system so that devices with a broken connection could adaptively communicate with nearby devices via Bluetooth.
- I also participated in the demo in ACM MobiSys 2017. We deployed 16 smartphones on the table and successfully showed that it achieved localization and collective image visualization.

SERVICES

OCT. 2020	IEEE INFOCOM 2021 External Reviewer
JUN. 2019	ACM MobiSys 2019, Seoul, Korea Student Volunteer
MAY. 2017	IEEE MDM 2017, Daejeon, Korea Student Volunteer

TECHNICAL SKILLS

Programming Languages	Python, C/C++, Java/Kotlin
Mobile Platforms	Android, iOS, Arduino
Deep Learning	Caffe, Tensorflow, MACE
Robotics Platforms	Double Robotics
Security	Intel SGX

TEACHING EXPERIENCE

2021 SPRING	Data Structure, TA
2020 FALL	Operating Systems and Lab (Pintos project), TA
2019 FALL	Compiler Design, TA
2019 SPRING	Introduction to Programming, TA
2018 FALL	Operating Systems and Lab (Pintos project), TA
2018 SPRING	Introduction to Programming (Hubo Snake project), TA
2017 FALL	Operating Systems and Lab (Pintos project), TA
2017 SPRING	Introduction to Computer Networks (KENS project), TA