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Research Interests

- **Intelligent Systems:** Smart Sensing, Localization and perception systems, Deep Learning at the Edge, Smart and Autonomous Systems
- **Internet-of-Things:** Cyber Physical Systems, IoT Gateway, Emergency Communication, Sensor Network, Smart City
- **Cloud and Edge Computing:** Edge/Fog Computing Framework, Private Cloud, Software-Defined Ecosystem

Highlights

- **Technical Program Chair**, IEEE Mobile Cloud 2020.
- **Faculty Mentoring Award** for CSU Student Competition 2018.
- **CoE Research Professor Award** 2018 (San Jose State University).
- **Cisco Cooperate Chair Professor**.
- One book published in CRC Press 2017.
- **Best Paper Award**, IEEE Smart World Congress (SWC) 2017.
- **CoE Research Professor Award** 2017 (San Jose State University).

Appointment

San Jose State University (SJSU)	Assistant Professor	2015.8 - Now
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Education

Nanjing University of Science & Technology (NUST)	Electrical Engineering	B.S., 2004-2008
University of Science and Technology of China (USTC)	Electrical Science & Technology	M.S., 2008-2011
University of Florida (UF)	Electrical & Computer Engineering	M.S., 2011-2013
University of Florida (UF)	Electrical & Computer Engineering	Ph.D., 2011-2015

Current Projects

1. **Creating a Community Infrastructure for Interoperable Emergency Connectivity (Funded by NSF \$200,000 [link])**
 - a) This research proposes to develop a community infrastructure for interoperable emergency connectivity that can operate in austere conditions, provide its own power, and create linkages throughout the community and across jurisdictional boundaries.
 - b) Collaborate with the Office of Emergency Services (OES) from the City of San Jose
2. **Intelligent Edge Computing System for Intelligent Traffic Intersection (Funded by Cisco \$40,000/year for five year)**
 - a) To enable energy efficient and scalable edge computing, we propose to design a new edge computing node with pluggable GPU and FPGA modules for deep learning based object detection.
 - b) Our new hardware is designed to integrate multiple raw sensor chips and perform deep sensor fusion with high-speed system-level interconnection
3. **Multi-Tenant Network Acceleration Scheme for OpenStack (Funded by Arista Network \$40,000)**
 - a) In order to boost the performance of computing and networking services for data-intensive applications, as well as reduce the overhead of the software virtualization, we propose a new data center network design based on OpenStack.
 - b) We map the OpenStack networking services to the hardware switch, and perform hardware-accelerated L2 switch and L3 routing to reduce the software overhead, as well as achieve the software-like scalability and flexibility.
4. **Intelligent and Autonomous Systems for Firefighting Missions (Funded by Redline Safety \$50,000)**

- a) The goal of this project is help the fire departments better serve their citizens as well as their own personnel.
- b) Our solution will enable devices to monitor fires and firefighters autonomously, thus bringing new capabilities to first responders where direct human control is not physically or economically possible.
5. **Autonomous Assistance System for People with Special Needs (Funded by CoE \$30,000 and \$40,000)**
 - a) The objective of this project is to develop an intelligent assistance system that assists people with independent transportation challenges towards their independent and dignified lifestyle (for example, shopping in the stores without assistance).
 - b) The proposed research will resolve the major challenges in urban indoor environments and address fundamental problems that involve spatial awareness, automated obstacle avoidance process, navigation, and intelligence, with an emphasis on the mapping and recognizing of the "physical" components in a fine-grained map.
6. **Software-Defined Edge Cloud for Smart City (Funded by CoE \$40,000)**
 - a) To solve current deficiencies in the ability of allowing developers to control and automate the remote edge devices, we extend existing cloud orchestration frameworks to edge devices that are agnostic to the network media.

Previous Projects

(Please visit [\[link\]](#) for details)

CLOUD AND SDN

1. **GatorCloud: SDN-enabled Campus Cloud (Funded by over \$2M from NSF)**
2. **NSF GemsCloud: A GENI-Federated Cyber-Physical System with Multi-Modalities**

MOBILE SYSTEMS

1. **Guoguo: Enabling Smartphone-based Fine-grained Indoor Localization**, Project Leader. [\[link\]](#)
2. **NSF I-Corps: Commercialization Feasibility Research and Implementation for Smartphone Localization via Indoor Positioning Satellites and Opportunistic Sensing**, Entrepreneurial Leader.
 - a) Granted project, [\[link\]](#)
 - b) Representative (No.1) team award for the NSF I-Corps Winter cohort
3. **InAR: Smartphone on Steroids with Indoor Augmented Reality**, Project Leader. [\[link\]](#)

HEALTH AND EMERGENCY CARE

1. **VitalCloud: Weaving a Pervasive Life Network for Healthcare** [\[link\]](#)

Publications

1. **Kaikai Liu**, "Smart and Connected Scooter for People with Mobility Challenges" IEEE GLOBECOM 2019.
2. **Kaikai Liu**, Shivam Chauhan, Revathy Devaraj, Sneha Shahi, Unnikrishnan Sreekumar, "Enabling Autonomous Unmanned Aerial Systems via Edge Computing," International Workshop on Cloud/Edge Computing in Robotic Systems 2019 (CCR2019).
3. **Kaikai Liu**, "Software-Defined Edge Cloud Framework for Resilient Multitenant Applications," *Wireless Communications and Mobile Computing*, vol. 2019, Article ID 3947286, 17 pages, 2019. [\[link\]](#)
4. Deepa Rajendra Sangolli, Nagthej Manangi Ravindrarao, Priyanka Chidambar Patil, Thrishna Palissery and **Kaikai Liu**, "Enabling High Availability Edge Computing Platform." *IEEE Mobile Cloud 2019*.
5. **Liu, K.**, and Xiaolin Li. "Enhancing Localization Scalability and Accuracy via Opportunistic Sensing." *IEEE/ACM Transactions on Networking (2018)* [\[link\]](#).
6. **Liu, K.**, Rajathswaroop Mulky, "Enabling Autonomous Navigation for Affordable Scooters", *Sensors 2018*, Vol. 18, Number. 6, ISSN=1424-8220 [\[link\]](#)
7. Linh Phan and **Kaikai Liu**, "OpenStack Network Acceleration Scheme for Datacenter Intelligent Applications" *2018 IEEE 11th International Conference on Cloud Computing (CLOUD) 2018*. [\[link\]](#)
8. Unnikrishnan Kizhakkemadam Sreekumar, Revathy Devaraj, Qi Li and **Kaikai Liu**, "Real-time Traffic Pattern Collection and Analysis Model for Intelligent Traffic Intersection" *2018 IEEE International Conference on Edge Computing (EDGE)*. [\[link\]](#)
9. Arvind Allawadi and **Kaikai Liu**, "Touch-based Magnetic Communication through Your Hand" *2018 IEEE International Congress on Internet of Things (ICIOT) (Acceptance rate = 20%)*. [\[link\]](#)
10. Tyler Jones, Aniket Dali, Manoj Ramesh Rao, Neha Biradar, Jean Madassery and **Kaikai Liu**, "Towards A Layered and Secure Internet-of-Things Testbed via Hybrid Mesh" *2018 IEEE International Congress on Internet of Things (ICIOT)*.

(Acceptance rate = 20%) [\[link\]](#)

11. Harshitha Bura, Nathan Lin, Naveen Kumar, Sangram Malekar, Sushma Nagaraj and **Kaikai Liu**, "An Edge Based Smart Parking Solution Using Camera Networks and Deep Learning" *2018 IEEE International Conference on Cognitive Computing (ICCC)*. (Acceptance rate = 20%) [\[link\]](#).
12. Rajath Mulky, Supradeep Koganti, Sneha Shahi and **Kaikai Liu**, "Autonomous Scooter Navigation for People with Mobility Challenges" *2018 IEEE International Conference on Cognitive Computing (ICCC)*. [\[link\]](#)
13. Milind Naphade, David C Anastasiu, Anuj Sharma, Vamsi Jaglamudi, Hyeran Jeon, **Kaikai Liu**, Ming-Ching Chang, Siwei Lyu, Zeyu Gao, "The NVIDIA AI city challenge" *IEEE Smart-World, Ubiquitous Intelligence & Computing, Advanced & Trusted Computed, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation (Smart-World/SCALCOM/UIC/ATC/CBDCOM/IOP/SCI) 2017*. [\[link\]](#)
14. Unnikrishnan Sreekumar, Revathy Devaraj, Qi Li, **Kaikai Liu**, "TPCAM: Real-time traffic pattern collection and analysis model based on deep learning" *2017 IEEE SmartWorld, Ubiquitous Intelligence & Computing, Advanced & Trusted Computed, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation (SmartWorld/SCALCOM/UIC/ATC/CBDCOM/IOP/SCI) 2017*. [\[link\]](#)
15. **Liu, K.**, et al, (2017) "Edge Computing Framework for Distributed Smart Applications," *The IEEE Smart World Congress 2017 (IEEE SWC 2017)*. [\[link\]](#) (**Best Paper Award**)
16. **Liu, K.**, Navjot Warade and K. Gupta. (2017) "Location-aware smart campus security application," *The IEEE Smart City Innovations 2017 (IEEE SCI 2017)*. [\[link\]](#)
17. **Liu, K.**, Linh Phan. (2017) "Multi-Tenant Network Acceleration Scheme for OpenStack," *The IEEE Smart City Innovations 2017 (IEEE SCI 2017)*. [\[link\]](#)
18. Sriramulu, Roop K.; Park, Younghee; Chang, Sang-Yoon; **Liu, Kaikai**, "Dynamic cost-effective emergency network provision", *I-TENDER '17 Proceedings of the First CoNEXT Workshop on ICT Tools for Emergency Networks and DisastEr Relief*. [\[link\]](#)
19. Labhesh Deshpande, **Liu, K.**, "Edge computing embedded platform with container migration," *2017 IEEE SmartWorld, Ubiquitous Intelligence & Computing, Advanced & Trusted Computed, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation (SmartWorld/SCALCOM/UIC/ATC/CBDCOM/IOP/SCI)*. [\[link\]](#)
20. Gaurao Chaudhari, Asmita Deshpande, and **Liu, K.** (2017) "Smart Robotic Assistant for Visually Impaired," *The IEEE Smart City Innovations 2017 (IEEE SCI 2017)*. [\[link\]](#)
21. Hyeran Jeon, **Kaikai Liu**, Younghee Park, Jerry Gao, Gong Chen, Jim Kao, "Intelligent Learning Systems Design for Self-Defense Education," *2017 IEEE Third International Conference on Big Data Computing Service and Applications (BigDataService)*. [\[link\]](#)
22. Kurup, P., and **Liu, K.**, (2016) "Demo: Telepresence Robot with Autonomous Navigation and Virtual Reality" *The 14th ACM Conference on Embedded Networked Sensor Systems (ACM SenSys 2016)*, Stanford, CA. (**Best Demo – Runner Up**). [\[link\]](#)
23. Miao, L., and **Liu, K.**, (2016) "Poster: Towards a Heterogeneous Internet-of-Things Testbed via Mesh inside a Mesh" *The 14th ACM Conference on Embedded Networked Sensor Systems (ACM SenSys 2016)*, Stanford, CA. [\[link\]](#)
24. **Liu, K.**, and Li, X. (2016) "Enhancing Smartphone Indoor Localization via Opportunistic Sensing" *IEEE International Conference on Sensing, Communication and Networking (SECON 2016)*, London, UK. (**Best Paper Award**, Acceptance: 56/213 = 26%) [\[link\]](#)
25. **Liu, K.**, Gao, J., et al, (2016) "Software-Defined Edge Cloud for Smart City." *NSF Future Wireless Cities Workshop*, Washington DC. (accepted, whitepaper)
26. **Liu, K.**, Li, M. and Li, X. (2015) "Hiding Media Data via Shaders: Enabling Private Sharing in the Clouds" *The 8th IEEE International Conference on Cloud Computing (CLOUD 2015)*. (Accepted, acceptance: 15%). [\[pdf\]](#)
27. **Liu, K.**; Guo, J.; Orlik, P.V.; Parsons, K.; Sawa, K., (2015) "Battery Energy Management in Heterogeneous Wireless Machine-to-Machine Networks", *IEEE Vehicular Technology Conference (VTC)*, September 2015. [\[link\]](#)[\[pdf\]](#)
28. **Liu, K.**, and Li, X. (2015) "Enabling Context-Aware Indoor Augmented Reality via Smartphone Sensing and Vision Tracking." *ACM Transactions on Multimedia Computing, Communications and Applications (TOMM)*. [\[pdf\]](#)
29. **Liu, K.**, Liu, X., and Li, X. (2015) "Guoguo: Enabling Fine-grained Smartphone Localization via Acoustic Anchors." *IEEE Trans on Mobile Computing (TMC)*. [\[pdf\]](#)
30. **Liu, K.**, and Li, X. (2014) "FindingNemo: Finding Your Lost Child in Crowds via Mobile Crowd Sensing." *The 11th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS 2014)*, Philadelphia, Pennsylvania. (Acceptance: 48/181 = 26.5%) [\[pdf\]](#)
31. **Liu, K.**, Huang, Q., et al, (2013) "Improving GPS Service via Social Collaboration." *The 10th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS 2013)*, Hangzhou, China. (Acceptance: 55/186 = 29.6%) [\[pdf\]](#)
32. **Liu, K.**, Liu, X., and Li, X. (2013) "Guoguo: Enabling Fine-grained Indoor Localization via Smartphone." *The 11th*

- ACM International Conference on Mobile Systems, Applications, and Services (MobiSys 2013)*, Taipei, Taiwan. (Acceptance: 33/210 = 15.7%) [[pdf](#)]
33. **Liu, K.**, and Li, X. (2013) “Guoguo: Smartphone-based High-precision Indoor Location Ecosystem and Services.” *MobiSys 2013 Ph.D Forum*, Taipei, Taiwan.
 34. Liu, X., **Liu, K.**, Guo, L., Li, X., and Fang, Y, A Game-Theoretic Approach for Achieving k-Anonymity in Location Based Services, The 32nd IEEE International Conference on Computer Communications (INFOCOM 2013). (Acceptance: 280/1613 = 17.4%) [[pdf](#)]
 35. **Liu, K.**, Li, X., et al, (2013) “Towards Accurate Acoustic Localization on a Smartphone.” *The 32st IEEE International Conference on Computer Communications (INFOCOM 2013)*, Turin, Italy. (Acceptance: 21%) [[pdf](#)]
 36. **Liu, K.**, Liu, X., and Li, X. (2012) “Acoustic Ranging and Communication via Microphone Channel.” *IEEE GLOBECOM 2012*, Anaheim California, USA. (Acceptance: 966/2560 = 37.7%) [[pdf](#)]
 37. **Liu, K.**, Yin, H., and Chen, W. (2011) “Low Complexity Tri-level Sampling Receiver Design for UWB Time-of-Arrival Estimation.” in *Proc. Int. Conf. Communication (ICC2011)*, Kyoto, Japan. (Acceptance: 1093/2838 = 38.5%) [[pdf](#)]
 38. **Liu, K.**, Xu, H., et al, (2010) “Odd-Symmetry Template Based Three-Step Detector for IR-UWB Detection.” in *Proc. Int. Conf. Ultra-Wideband (ICUWB2010)*, Nanjing, China, Sep. 2010, vol. 2, pp. 615-618. (Acceptance: 38.6%) [[pdf](#)]
 39. **Liu, K.**, Xu, H., Chen, W., “Finite-Resolution Receiver Performance for IR-UWB Target Detection.” in *Proc. Int. Conf. Signal Processing and Communication Systems (ICSPCS2010)*, Gold Coast, Australia, Dec. 2010. [[pdf](#)]
 40. **Liu, K.**, Ren, J, et al, (2010) “A Practical UWB TOA Estimator in the Presence of Interference and NLOS.” in *Proc. Int. Conf. Signal Processing (ICSP2010)*, Beijing, China, Oct. 2010. [[pdf](#)]
 41. Xu, H., **Liu, K.**, Ma Yunfei, Wang Dongjin, Chen Weidong, “An Improved IPCP Detector of UWB Radar Signals Based on Adaptive Searching Window,” in *Proc. Int. Conf. Ultra-Wideband (ICUWB2010)*, Nanjing, China, Sep. 2010. [[pdf](#)]
 42. Xu, H., **Liu, K.**, Wang Dongjing, Chen Weidong, “The Effect of Timing Jitter to the Radar Detection Performance,” in *Journal of Science and Technology of China (ISSN 0253-2778)*, 2011. (In Chinese)
 43. Hao, J., **Liu, K.**, Jingjing Ren, Guanghua Lu, Weidong Chen, “IR-UWB radar signal sampling and reconstruction based on step-delay pulses,” *Electrical and Control Engineering (ICECE)*, Sept. 2011. [[pdf](#)]

Patent

1. Li, X., **Liu, K.**, “Apparatus, method, and software systems for smartphone-based fine-grained indoor localization,” (WO 2014089040 A1) (US20150156637) (**Licensed by four companies**). [[Google Patent](#)] [[WIPO](#)] [[News](#)]
2. Li, X., **Liu, K.**, “Dynamic User-Defined Check-In Points,” (WO2016036853A1) (US 20170201858 A1). [[Google Patent](#)]
3. Guo, J., **Liu, K.**, et al, “Energy Efficient Management of Heterogeneous Multi-Hop Wireless Network,” (US 9736771 B2) (US 20160212698 A1) (WO 2016116989 A1). [[Google Patent](#)]
4. **Liu, K.**, et al, “Receiving apparatus for ultra wideband impulse signal and ultra wideband impulse radar system,” (CN 102360070 B). [[Google Patent](#)] [[Chinese](#)]

Book

1. **Liu, K.**, & Li, X. (2017). *Mobile SmartLife Via Sensing, Localization, and Cloud Ecosystems*. CRC Press. [[CRC Press](#)] [[Amazon](#)]

Awards and Grants

1. Faculty Mentoring Award for CSU Student Competition 2018.
2. Cisco Endowed Chair Professor in Internet-of-Things.
3. Best Paper Award, IEEE SWC 2017.
4. CoE Research Professor Award 2018 (San Jose State University).
5. CoE Research Professor Award 2017 (San Jose State University).
6. Best Demo Runner Up, ACM SenSys 2016.
7. Best Paper Award, IEEE SECON 2016.
8. Kordestani Endowed Chair (Research) Professor 2016 (San Jose State University).
9. Gator Engineering Attribute Award – “Creativity” Attribute from the College of Engineering at UF (only one from the whole college).

10. The representative (**No.1**) team award for the 2015 NSF I-Corps cohort (Bay Area, Winter).
11. 2014 Innovator Award from the Office of Technology Licensing (OTL) at the University of Florida.
12. Apple WWDC Student Scholarship, 2013 and 2014.
13. Travel Grant from the ACM MobiSys 2013, Taipei, Taiwan.
14. Travel Grant from the IEEE MASS 2013 and 2014.
15. Certificate of Outstanding Achievement, University of Florida International Center, 2015, 2014, 2013, 2012.
16. The 14, 15, 16th GENI Engineering Conference Travel Grant
17. National Scholarship of China.
18. "Guorui" Scholarship in EEIS of USTC.
19. Excellent Graduate Student of NUST.
20. Outstanding Student Scholarship (NUST) -- three times.
21. "Spansion" Scholarship.

Synergistic Activities

1. Technical Program Chair, IEEE Mobile Cloud 2020.
2. Publicity Chair for IEEE Mobile Cloud 2019.
3. Session Chair of IEEE ICIOT 2018, IEEE CLOUD 2018.
4. Local Chair of 2017 AI Frontiers Workshop in Silicon Valley (organized by NSF Center for Big Learning).
5. TPC Member for the 24th and 25th ICCCN, SEKE 2017, IEEE SCI 2017, IEEE SWC 2017, BDASC 2017, MILCOM 2017, EUC 2016.
6. Demo and Poster chair of IEEE SCI 2017.
7. System Benchmark Chair and Evaluation Committee Member, NVIDIA AI City Challenge 2017.
8. Guest Editor of International Journal of Distributed Sensor Networks, Applied Computational Intelligence and Soft Computing Journal
9. Reviewer for IEEE TSC 2018, IEEE TDSC 2018, ACM Computing Surveys 2017, IEEE TMC 2017, 2016, 2015, 2014, ToN, TPDS 2015, 2013, TWireless, JSAC 2014, IoT 2017, 2014, ACM TOMM 2015, ToN 2016.
10. Reviewer for GLOBECOM 2018, MILCOM 2017, SCI 2017, SWC 2017, SEKE 2017, 2016, INFOCOM 2016, 2015, 2014, 2013, UbiComp 2013, GLOBECOME 2013, PECON 2012, MASS 2012