

Robert LiKamWa

Assistant Professor, (2016 – Present)

Arizona State University

School of Arts, Media and Engineering

School of Electrical, Computer and Energy Engineering



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Research Interests

Augmented Reality; Virtual Reality; Mixed Reality; Mobile computing; Operating systems; Energy management; Low power sensing on mobile devices; Context-awareness; Computer vision systems

Education

Ph.D., under Dr. Lin Zhong, Electrical & Computer Engineering, Rice University — 2016

Thesis: Continuous Mobile Vision: Rethinking the Vision Sensing Pipeline for Energy Efficiency

M.S., Electrical & Computer Engineering, Rice University — 2012

B.S.E.E. (cum laude), Electrical & Computer Engineering, Cum Laude, Rice University — 2010

Minor, Computational and Applied Math, Rice University — 2010

Honors/Awards

- Top 5% Teaching Award in Fulton Schools of Engineering (5/2021)
- Top 5% Teaching Award in Fulton Schools of Engineering (4/2020)
- NSF CAREER Award (3/2020)
- Google Faculty Research Award (2/2020)
- Top 5% Teaching Award in Fulton Schools of Engineering (4/2019)
- sUAS ASURE Innovation Challenge Award (8/2018)
- Best Poster Award at ACM HotMobile (2/2018)
- Best Poster Award at ACM HotMobile (2/2017)
- Best Presenter Award at Ph.D. Forum @ ACM MobiSys (6/2014)
- Best Paper Award at ACM MobiSys (6/2013)
- Best Paper Award at PhoneSense @ SenSys (11/2011)
- Best Ph.D. Forum Presentation at S3 Workshop @ ACM MobiCom (9/2011)
- Texas Instruments Graduate Fellowship (8/2010-present)

Refereed Conference & Workshop Papers

“LensCap: Split-Process Framework for Fine-Grained Visual Privacy Control for Augmented Reality Apps”

Jinhan Hu, Alexander Shearer, Saranya Rajagopalan, and Robert LiKamWa.

ACM MobiSys '21: Proc. of the 27th Annual Int'l Conf. on Mobile Systems, Applications, and Services [AR: 22%]

“Rhythmic pixel regions: multi-resolution visual sensing system towards high-precision visual computing at low power”

Venkatesh Kodukula, Alexander Shearer, Van Nguyen, Srinivas Lingutla, Yifei Liu, Robert LiKamWa

ACM ASPLOS '21: Proc. of the 26th ACM Int'l Conf. on Architectural Support for Programming Languages and Operating Systems [AR: 20%]

“Visualizing Planetary Spectroscopy through Immersive On-site Rendering”

Lauren Gold, Alireza Bahremand, Connor Richards, Justin Hertzberg, Kyle Sese, Alexander Gonzalez, Kathryn Powell, Robert LiKamWa

IEEE VR '21: IEEE Conference on Virtual Reality and 3D User Interfaces [AR: 23%]

“Adaptive Resolution-Based Tradeoffs for Energy-Efficient Visual Computing Systems”

Robert LiKamWa, Jinhan Hu, Venkatesh Kodukula, Yifei Liu

IEEE Pervasive Computing, vol. 20, no. 2, Special Issue on Pervasive Video and Audio, 2021 [Impact Factor: 4.95]

“Dynamic Temperature Management of Near-Sensor Processing for Energy-Efficient High-Fidelity Imaging

Venkatesh Kodukula, Saad Katrawala, Britton Jones, Carole-Jean Wu, Robert LiKamWa

MDPI Sensors, vol. 21, no. 3, 2021 [Impact Factor: 3.275]

“Coordinate: A Spreadsheet-Programmable Augmented Reality Framework for Immersive Map-based Visualizations”

Aashiq Shaikh, Linda Nguyen, Alireza Bahremand, Hannah Bartolomea, Frank Liu, Van Nguyen, Derrick Anderson, Robert LiKamWa

IEEE AIVR '19: Proc. of the Int'l Conf. on Artificial Intelligence and Virtual Reality [AR: 20%]

“SWISH: Shifting Weight-based Interfaces for Simulated Hydrodynamics in Mixed-Reality Fluid Vessels”

Shahabedin Sagheb, Frank Liu, Alireza Bahremand, Assegid Kidane, Robert LiKamWa

ACM UIST '19: Proc. of the 31st Annual Symp. on User Interface Software and Technology [AR: 24%]

“Banner: An Image Sensor Reconfiguration Framework for Seamless Resolution-based Tradeoffs”

Jinhan Hu, Saranya Rajagopalan, Alexander Shearer, Robert LiKamWa

ACM MobiSys '19: Proc. of the 25th Annual Int'l Conf. on Mobile Systems, Applications, and Services [AR: 22%]

“GLEAM: An illumination estimation framework for real-time photorealistic augmented reality on mobile devices”

Siddhant Prakash, Alireza Bahremand, Linda D. Nguyen, Robert LiKamWa

ACM MobiSys '19: Proc. of the 25th Annual Int'l Conf. on Mobile Systems, Applications, and Services [AR: 22%]

“Protecting Visual Information in Augmented Reality from Malicious Application Developers”

Jordan Kyle Jensen, Jinhan Hu, Amir Rahmati, Robert LiKamWa

ACM WearSys workshop @ MobiSys 2019

“Composing Ecosystemically in Responsive Environments with Gestural Media, Objects and Textures”

Brandon Michael Mechtley, Todd Ingalls, Lauren Hayes, Byron Lahey, Jessica Rajko, Seth Dominicus Thorn, Robert LiKamWa, Julian Stein, Garrett Johnson, Oswaldo Emiddio Vasquez, Connor Rawls, Peter Weisman, Assegid Kidane, Xin Wei Sha

TEI'19: Proc. of the 13th Int'l. Conf. on Tangible Embedded and Embodied Interactions – Studio

“A case for temperature-driven task migration to balance energy efficiency and image quality of vision processing workloads”

Venkatesh Kodukula, Sai Bharadwaj Medapuram, Britton Jones, Robert LiKamWa

HotMobile '18: Proc. of the 18th workshop on mobile systems and applications [AR: 29%]

“Characterizing the Reconfiguration Latency of Image Sensor Operation on the Android OS”

Jinhan Hu, Jianan Yang, Vraj Delhivala, Robert LiKamWa

HotMobile '18: Proc. of the 18th workshop on mobile systems and applications [AR: 29%]

“Characterizing Bottlenecks towards a Hybrid Integration of Holographic, Mobile, and Screen-based Data Visualization”

Alexander Shearer, Lei Guo, Megumi Ashley Satkowski, Robert LiKamWa
Immersive Analytics '17 workshop @ IEEE VIS '17

“RedEye: Analog ConvNet Image Sensor Architecture for Continuous Mobile Vision”

Robert LiKamWa, Yunhui Hou, Julian Gao, Mia Polansky, Lin Zhong
ISCA '16: Proc. of the 43rd int'l symposium on computer architecture [AR: 19%]

“Starfish: Efficient concurrency support for computer vision applications”

Robert LiKamWa, Lin Zhong
MobiSys '15: Proc. of the 13th annual int'l conf. on mobile systems, applications, and services [AR: 13%]

“Draining our Glass: An energy and heat characterization of Google Glass”

Robert LiKamWa, Zhen Wang, Aaron Carroll, Felix Xiaozhu Lin, Lin Zhong
APSys '14: Proc. of 5th Asia-Pacific workshop on systems

“Styrofoam: A tightly packed coding scheme for camera-based visible light communication”

David Ramirez, Robert LiKamWa, Jason Holloway
VLCS @ MobiCom '14: Proc. of the 1st ACM workshop. on Visible Light Communication Systems

“Energy proportional image sensors for continuous mobile vision” (*Best Paper Award*)

Robert LiKamWa, Bodhi Priyantha, Matthai Philipose, Lin Zhong, Paramvir Bahl
MobiSys '13: Proc. of the 11th annual int'l conf. on mobile systems, applications, and services [AR: 16%]

“MoodScope: Building a mood sensor from smartphone usage patterns”

Robert LiKamWa, Yunxin Liu, Nicholas D. Lane, Lin Zhong
MobiSys '13: Proc. of the 11th annual int'l conf. on mobile systems, applications, and services [AR: 16%]

“Reflex: using low-power processors in smartphones without knowing them”

Felix Xiaozhu Lin, Zhen Wang, Robert LiKamWa, Lin Zhong
ASPLOS '12: Proc. of the 17th int'l conf. on arch. support for programming languages and op. systems [AR:21%]

“Can your smartphone infer your mood?” (*Best Paper Award*)

Robert LiKamWa, Yunxin Liu, Nicholas D. Lane, Lin Zhong
PhoneSense '11: Proc. of the second int'l workshop on sensing applications on mobile phones

Other Works

“Virtually composing and dynamically mixing complex odors”

Alireza Bahremand, Richard C. Gerkin, Christy Spackman, Brian H. Smith, Robert LiKamWa
Smell, Taste, and Temperature Workshop @ CHI '21

“JMARS Augmented and Virtual Reality Experiences for Planetary Research, Education, and Collaboration”

Lauren Gold, Hannah Bartolomea, Shaun Xiong, Alexander Gonzalez, Kathryn Powell, Scott Dickenshied, Robert LiKamWa
American Geophysical Union Fall Meeting 2020

Work-in-Progress—Titration Experiment: Virtual Reality Chemistry Lab with Haptic Burette

Charles Amador, Frank W. Liu, Mina C. Johnson-Glenberg, Robert LiKamWa

iLRN 2020: 6th Int'l Conf of the Immersive Learning Research Network

“Virtual and Augmented Reality Tools for Planetary Scientific Analysis and Public Engagement”

Alireza Bahremand, Lauren Gold, Connor Richards, Kyle Sese, Kathryn Powell, Scott Dickenshied, Saadat Anwar, Johnathon Hill, Chris Edwards, Robert LiKamWa

Lunar and Planetary Science Conference 2020

Demo: "Hololucination: a framework for live augmented reality presentations across mobile devices."

Bahremand, Alireza, Linda Nguyen, Tanya Harrison, and Robert LiKamWa.

IEEE AIVR'19: International Conference on Artificial Intelligence and Virtual Reality

“SWISH: Shifting Weight-based Interfaces for Simulated Hydrodynamics in Mixed-Reality Fluid Vessels”

Shahabedin Sagheb, Alireza Bahremand, Robert LiKamWa, Byron Lahey

ACM TEI'19: Proc. of the 13th Int'l. Conf. on Tangible Embedded and Embodied Interactions – Works in Progress

“An Integrated Environment for Visualizing In-Situ and Orbital Planetary Data”

Kathryn Powell, Ali Bahremand, Alec Gonzalez, Robert LiKamWa, Chris Edwards

Lunar and Planetary Science Conference 2019

Invited keynote: “System Challenges to Mixed Reality on Mobile Devices: Performance, Efficiency, Realism”

Robert LiKamWa

S3 Workshop @ MobiCom '18

Poster: “Real-time Illumination Estimation Using Collaborative Photorealistic Rendering for Mobile Augmented Reality” (*Best Poster Award*)

Siddhant Prakash, Robert LiKamWa

ACM HotMobile '18: workshop on mobile computing systems and applications

Poster: “Temperature-driven task migration to balance energy efficiency and thermal noise of sensor processing workloads” (*Best Poster Award*)

Venkatesh Kodukula, Robert LiKamWa

ACM HotMobile '17: workshop on mobile computing systems and applications

Invited Paper: “Efficient image processing for continuous mobile vision”

Robert LiKamWa, Yunhui Hou, Peter Washington, Lin Zhong

SID Display Week '16, imaging technologies and applications

“Efficient image processing for continuous mobile vision” (*Best Presentation Award*)

Robert LiKamWa

MobiSys PhD Forum '14: Proc. of the MobiSys 2014 PhD forum workshop

Poster: “Retrofitting computer vision libraries for concurrent support on mobile devices”

Robert LiKamWa, Lin Zhong

MobiCom '14: Proc. of the 20th annual int'l conf. on mobile computing and networking

Demo: “SUAVE: Sensor-based User-Aware Viewing Enhancement for mobile device displays”

Robert LiKamWa, Lin Zhong

UIST '11: Adjunct Proc. of the 24th annual ACM symposium on user interface software and technology

Funded Grants

- **Proctor and Gamble Gift**, Real-time, In-Context Consumer Understanding via VR and Olfactory Science, \$50,000, 2021, Robert LiKamWa, Christy Spackman (ASU SFIS), Brian H. Smith (ASU SOLS), Richard Gerkin (ASU SOLS).
- **NSF CAREER**: Rhythmic Pixel Region Interface Systems for Efficient, Performant, and Precise Augmented Reality, \$450,000, 2020-2025, Solo PI.
- **NSF REU Site**: Computational Imaging and Mixed-Reality for Visual Media Creation and Visualization, \$324,000, 2020-2023, Suren Jayasuriya (ASU AME), Robert LiKamWa (Co-PI).
- **Google Faculty Research Award**, Multi-resolution visual sensing for augmented reality on mobile systems, 2020, \$51,947, Solo PI.
- **NSF Cyber Physical Systems: CPS: Small**: Real-time spatial audio on the Internet of Things, \$499,944, 2019-2022, Robert LiKamWa (PI), Visar Berisha (ASU ECEE/SHS).
- **NSF Cyberlearning for the Future of Work**: Augmented Fluidity: Haptic vessels for online education of chemistry and fluid concepts in VR and augmented reality, \$750,000, 2019-2022, Robert LiKamWa (PI), Mina Johnson (ASU Psychology), Byron Lahey (ASU AME).
- **NSF Software Hardware Foundations: Small**: Collaborative Research: Software-Defined Imaging for Motion-aware Visual Computing, \$332,999, 2019-2022, Suren Jayasuriya (ASU AME/ECEE), Robert LiKamWa (Co-PI), Adrian Sampson (Cornell).
- **National Science Foundation**, CNS-1657602 CRII: CSR: System Support for Reactive Sensor Operation for Efficiency and Performance, \$182,950, 2017-2019, Solo PI.
- **Samsung Mobile Processor Innovation Lab Gift**, Reducing Motion-to-Photon Latency for Visual-Inertial Fusion for Wearable Operating Systems, \$60,000, 2017, Solo PI.
- **ASU Global Sports Institute**, \$20,000, 2018, Solo PI.
- **Herberger Seed Grant**, \$12,000, 2018, Robert LiKamWa, Lauren Hayes (ASU AME).

Patents

- Fidelity-driven runtime thermal management for near-sensor architectures - Venkatesh Kodukula, Saad Katrawala, Britton Jones, Robert LiKamWa, 2020, US; 16/684,735 [application]
- Method and Apparatus for Simulated Hydrodynamics in Mixed-Reality Fluid Vessels - Robert LiKamWa, Shahabedin Sagheb, Alireza Bahremand, Byron Lahey, Frank W. Liu, Assegid Kidane, 2020, US; 16/657,972 [application]
- Illumination estimation for captured video data in mixed-reality applications - Siddhant Prakash, Paul Nathan, Linda Nguyen, Robert LiKamWa, Alireza Bahremand, 2020, US; 16/585,479 [application]
- Systems, methods, and apparatuses for implementing an image sensor reconfiguration framework for seamless resolution-based tradeoffs - Jinhan Hu, Robert LiKamWa, Alexander Shearer, Saranya Rajagopalan, 2020, US; 16/898,791 [application]
- Energy-proportional image sensor (Microsoft) - Robert LiKamWa, Nissanka A. Bodhi Priyantha, Matthai Philipose, Lin Zhong, Paramvir Bahl, 2013/2/19; US; 13/770,031 [grant]
- Wireless electronic pegboard setup for quantification of dexterity (Shriner's Hospital; Rice University) - Steven E. Irby, Dillon P. Eng, Rachel Jackson, Allison C. Scully, Jessica Scully, Robert LiKamWa, Marcia K. O'Malley, Z. Maria Oden, Gloria R. Gogola, Avery L. Cate, 2012/4/13; US; 13/446,610 [application]
- Hand muscle measurement device - Shuai Xu, Gloria R. Gogola, Graham Sattler, Sridhar Madala, Robert LiKamWa, 2010/10/8; US; 13/500,607 [application]

Mentorship

Ph.D. students

- Jinhan Hu [Ph.D. Computer Engineering]
- Venkatesh Kodukula [Ph.D. Computer Engineering]
- Frank Liu [Ph.D. Computer Engineering]
- Alireza Bahremand [Ph.D. Computer Engineering]
- Lauren Gold [Ph.D. Media, Arts and Sciences]
- Aashiq Shaikh [Ph.D. Media, Arts and Sciences]
- Yifei Liu [Ph.D. Computer Engineering]
- Jiqing Wen [Ph.D. Media, Arts and Sciences]

M.S. Thesis students

- Van Nguyen [M. Computer Science, defended Fall 2020]
- Sathish Kumar Katukuri [M.S. Electrical Engineering (AME), defended Fall 2019]
- Jordan Kyle Jensen [M.S. Computer Engineering, defended Spring 2019]
- Sridhar Gunnam [M.S. Electrical Engineering, defended Summer 2018]
- Siddhant Prakash [M. Computer Science], [Primary advisor: Robert LiKamWa, Secondary advisor: Yezhou Yang, defended Fall 2018]

Graduate researchers

- Linda Nguyen [M. User Experience Design]
- Saranya Rajagopalan [M.S. Computer Engineering]
- Saad Katrawala [M. Computer Engineering, graduated Spring 2020]
- Vraj Delhivala [M. Computer Science, graduated Spring 2018]
- Jianan Yang [M.S. Electrical Engineering, graduated Fall 2016]
- Saurabh Jagdhane [M. Computer Science, graduated Spring 2017]
- Alankrit Shah [M. Software Engineering, graduated Spring 2018]

Undergraduate researchers

- Ashley “Megumi” Satkowski [CS, FURI: Fulton Undergraduate Research Initiative]
- Alireza Bahremand [Software Engineering, FURI]
- Geoffrey Wong [CS, FURI]
- Aashiq Shaikh [CS, FURI]
- Alexander Shearer [CS, FURI]
- Paul Nathan [CS, FURI]
- Tasha Romero [AME]
- Stephan Tapernoux [AME]
- Junshu Liu [AME]
- Britton Jones [EE]

Barrett Honors Thesis

- Kirsten Bauman [AME]
- Meera Benson [AME]
- Jordan Neel [AME]
- Jacob McMichael [AME]

- Schuyler Schanberger [AME]
- Britton Jones [ECEE]

Faculty mentorship of student organizations

- ASU Esports
- ASU Drone Racing FPV
- ASU MobileDevs

Teaching

- Spring 2021, AME 394: Designing and Implementing Mixed Reality Experiences
- Fall 2020, EEE 598: Mobile Systems Architecture
- Spring 2020, AME 394: Designing and Implementing Mixed Reality Experiences
- Fall 2019, EEE 120 / CSE 120: Digital Design Fundamentals
- Spring 2019, AME 394: Designing and Implementing Mixed Reality Experiences
- Fall 2018, EEE 598: Mobile Systems Architecture
- Spring 2018, AME 394: Designing and Implementing Mixed Reality Experiences
- Fall 2017, EEE 598: Mobile Systems Architecture
- Spring 2017, AME 112: Computational Thinking
- Fall 2016, EEE 598: Mobile Systems Architecture

Professional Service

- 2021: ACM HotMobile '21 General Chair
- 2021: ACM MobiSys '21 Technical Program Committee
- 2021: ACM MobiCom '21 Technical Program Committee
- 2020: ACM MobiSys '20 Technical Program Committee
- 2020: ACM HotMobile '20 Technical Program Committee
- 2020: ACM MobiCom '20 Technical Program Committee
- 2019: ACM MobiSys '19 Technical Program Committee
- 2019: ACM MobiCom '19 Technical Program Committee, Publicity Chair
- 2019: ACM HotMobile '19 Technical Program Committee
- 2018: ACM MobiCom '18 Technical Program Committee, Mobile App Competition Chair
- 2018: ACM MobiCom '18 Mobile Application Competition Chair
- 2018: ACM MobiSys '18 External Technical Program Committee, Technical Program Committee Local Host
- 2018: ACM/IEEE ISLPED '18 Technical Program Committee
- 2018: IEEE SECON '18 Technical Program Committee
- 2018: ACM HotMobile '18 Technical Program Committee, Local Chair
- 2017: ACM MobiCom '17 Technical Program Committee
- 2017: ACM MobiSys '17 External Technical Program Committee
- 2017: ACM HotMobile '17 Technical Program Committee
- 2017: ACM/IEEE ISLPED '17 Technical Program Committee
- 2016: Visible Light Communication Systems (VLCS) '16 Workshop Panel Chair

- 2016: ACM MobiCom '16 Social Chair
- 2015: ACM MobiSys '16 Poster/Demo/Video Regional Chair (North America)
- 2015: EAI MobiCASE '15 Technical Program Committee
- 2015: ACM MobiSys '15 Publicity Chair