

Xin Liu

PHD CANDIDATE · PAUL G. ALLEN SCHOOL OF COMPUTER SCIENCE & ENGINEERING

University of Washington, Seattle

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Summary

I am currently a rising 5th-year PhD candidate in computer science at the University of Washington-Seattle and a Google PhD Fellow. My research interests lie in the intersection of machine learning/computer vision, sensing, and health. I have published 14 peer-reviewed papers on top venues in machine learning (NeurIPS, CHIL, CVPR), mobile and ubiquitous computing (CHI, Ubicomp), and health & biomedical engineering (TBME, JBHI, EMBC, PLOS). During my PhD, I have been pushing the limit of video-based contactless physiological sensing. My research have gained significant attention from both academia and industry and been featured as an oral presentation at NeurIPS and on various public media including IEEE Spectrum, ACM TechNews, GeekWire, ZDNet, UW news. I am on the job market this fall and am looking for research scientist / applied scientist positions for AI + Health/Vision/Wearables in industrial R&D teams.

Education

University of Washington, Seattle

Seattle, WA, USA

PH.D. IN COMPUTER SCIENCE

Sep 2018 - March 2023 (Expected)

- Advisors: Shwetak Patel & Daniel McDuff
- Google PhD Fellow in Health Research
- Research Areas: Machine Learning, Mobile & Ubiquitous Computing, Health

University of Massachusetts, Amherst

Amherst, MA, USA

B.S. IN COMPUTER SCIENCE

Sep 2014 - June 2018

- Advisor: Sunghoon Ivan Lee
- Graduated with Honors + Outstanding Undergraduate Achievement Award + 21st Century Leaders Award
- Research Area: Mobile & Ubiquitous Computing, Mobile Health, Rehabilitation Technology

Professional Experience

- 2018-Now **UW + Ubiquitous Computing Lab**, Graduate Research Assistant
- 2022 **Google Fitbit & Research + Consumer Health Research Team**, Research Intern (Summer)
- 2022 **Google Fitbit & Research + Consumer Health Research Team**, Student Researcher (Part-time Jan - June)
- 2021 **Google Fitbit & Research + Consumer Health Research Team**, Research Intern (Fall)
- 2021 **Microsoft Research + Human Understanding and Empathy Team**, Research Intern (Summer)
- 2020-2021 **OctoML + Machine Learning System Team**, Research Intern (Part-Time Nov - June)
- 2019 **Allen Institute for Artificial Intelligence (AI2)**, Research Intern (Summer)
- 2016-2018 **UMass Amherst + Advanced Human Health Analytics Lab**, Undergraduate Research Assistant

Awards

- 2022 **Google PhD Fellowship**, Three-year full support, Worldwide, Google AI
- 2018 **Glerum Family Endowed Fellowship**, University of Washington
- 21st Century Leaders Award**, Top 10 most exceptional graduates out of 5500, UMass Amherst
- Outstanding Undergraduate Achievement Award**, UMass Amherst
- Bay State Fellowship (declined)**, UMass Amherst

2017 **Rising Researcher Award**, Highest honor for undergraduate research, UMass Amherst
Outstanding Undergraduate Course Assistant Award, UMass Amherst
NSF Student Travel Award, National Science Foundation
Honors College Research Assistant Fellowship, UMass Amherst

2014-2018 **University Merit Director's Scholarship**, UMass Amherst

Publications

SELECTED PUBLICATIONS

- [6] **Xin Liu**, Ziheng Jiang, Shwetak Patel, Daniel McDuff, "Federated Remote Physiological Measurement with Imperfect Data," *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshop*, 2022
- [5] **Xin Liu**, Yuntao Wang, Sinan Xie, Daniel McDuff, Shwetak Patel, "MobilePhys: Personalized Mobile Camera-Based Contactless Physiological Sensing," *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT/UbiComp 2021)*
- [4] Daniel McDuff, Javier Hernandez, **Xin Liu**, Erroll Wood, Tadas Baltrusaitis, "Using High-Fidelity Avatars to Advance Camera-based Cardiac Pulse Measurement," *IEEE Transactions on Biomedical Engineering* 2022
- [3] **Xin Liu**, Ziheng Jiang, Josh Fromm, Xuhai Xu, Shwetak Patel, Daniel McDuff, "MetaPhys: Few-Shot Adaptation for Non-Contact Physiological Measurement," *ACM Conference on Health, Inference, and Learning (ACM-CHIL 2021)*
Selected Media Coverage: [UW News], [ACM TechNews Headline], [IEEE Spectrum], [GeekWire]
- [2] **Xin Liu**, Josh Fromm, Shwetak Patel, Daniel McDuff, "Multi-Task Temporal Shift Attention Networks for On-Device Contactless Vitals Measurement," *Conference on Neural Information Processing Systems, (NeurIPS 2020)* **[Oral, Top 1%, 105 out of 9454 Submissions]**
Selected Media Coverage: [Microsoft Research Webinar], [Microsoft Blog], [ZDNet]
- [1] **Xin Liu**, Smita Rajan, Nathan Ramasarma, Paolo Bonato, Sunghoon Ivan Lee, "Finger-Worn Sensors for Accurate Functional Assessment of the Upper Limbs in Real-World Settings," *IEEE Journal of Biomedical and Health Informatics (J-BHI)*, vol.23, no.2, 2019) **[Cover Article Nominee]**

UNDER REVIEW/REVISION

- [8] **Xin Liu**, Xiaoyu Zhang, Yuntao Wang, Shwetak Patel, Daniel McDuff, "Deep Physiological Sensing Toolbox," *Scientific Reports*
- [7] Xuhai Xu, **Xin Liu**, Han Zhang, Weichen Wang, Subigya Kumar Nepal, Kevin S. Kuehn, Jeremy F Huckins, Margaret E Morris, Paula S. Nurius, Eve Ann Riskin, Shwetak Patel, Tim Althoff Andrew Campbell, Anind K. Dey, Jennifer Mankoff, "Cross-Dataset Generalization of Longitudinal Human Behavior Modeling," *IMWUT 2022*
- [6] Xuhai Xu, Han Zhang, Yasaman Sefidgar, Yiyi Ren, **Xin Liu**, Woosuk Seo, Jennifer Brown, Kevin Kuehn, Mike Merrill, Paula Nurius, Shwetak Patel, Tim Althoff Margaret E. Morris, Eve Riskin, Jennifer Mankoff, Anind K. Dey, "GLOBEM: Multi-Year Datasets for Longitudinal Human Behavior Modeling Generalization," *NeurIPS 2022*
- [5] Daniel McDuff, Miah Wander, **Xin Liu**, Brian Hill, Javier Hernandez, Jonathan Lester, Tadas Baltrusaitis "SCAMPS: Synthetics for Camera Measurement of Physiological Signals," *NeurIPS 2022*
- [4] **Xin Liu**, Brian Hill, Ziheng Jiang, Shwetak Patel, Daniel McDuff, "EfficientPhys: Enabling Simple, Fast, and Accurate Camera-Based Vitals Measurement," *WACV 2023*
- [3] Brian Hill, **Xin Liu**, Daniel McDuff, "Learning Higher-Order Dynamics in Video-Based Cardiac Measurement," *WACV 2023*
- [2] **Xin Liu**, Shwetak Patel, Daniel McDuff, "Camera-Based Physiological Sensing: Challenges and Future Directions," *Cell Pattern*

- [1] Yang Li, Yuntao Wang, **Xin Liu**, Yuanchun Shi, Shao-Fu Shih, "Enabling Real-time On-chip Audio Super-Resolution for Bone Conduction Microphones," *SenSys 2022*

PUBLISHED

- [14] **Xin Liu**, Yuntao Wang, Sinan Xie, Daniel McDuff, Shwetak Patel, "MobilePhys: Personalized Mobile Camera-Based Contactless Physiological Sensing," *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT/UbiComp 2021)*
- [13] Daniel McDuff, Javier Hernandez, **Xin Liu**, Erroll Wood, Tadas Baltrusaitis, "Using High-Fidelity Avatars to Advance Camera-based Cardiac Pulse Measurement," *IEEE Transactions on Biomedical Engineering 2022*
- [12] Brian Hill, **Xin Liu**, Daniel McDuff, "Beat-to-beat cardiac pulse rate measurement from video," *IEEE/CVF International Conference on Computer Vision Conference Workshop*
- [11] Daniel McDuff, **Xin Liu**, Javier Hernandez, Erroll Wood, Tadas Baltrusaitis, "Synthetic Data for Multi-Parameter Camera-Based Physiological Sensing," *IEEE Engineering in Medicine and Biology Conference (EMBC 2021)*
- [10] Chunjong Park, Morelle Arian, **Xin Liu**, Alex Mariakakis, Leon Sasson, Shwetak Patel, Tim Althoff, "Job Performance in Athletes and Salespeople: An Observational Study of Performance, Sleep, and Mobile App Usage," *The Web Conference (WWW 2021)*,
- [9] **Xin Liu**, Ziheng Jiang, Josh Fromm, Xuhai Xu, Shwetak Patel, Daniel McDuff, "MetaPhys: Few-Shot Adaptation for Non-Contact Physiological Measurement," *ACM Conference on Health, Inference, and Learning (ACM-CHIL 2021)*
Selected Media Coverage: [UW News], [ACM TechNews Headline], [IEEE Spectrum], [GeekWire]
- [8] **Xin Liu**, Yang Li, Josh Fromm, Ziheng Jiang, Yuntao Wang, Alex Mariakakis, Shwetak Patel, "SplitSR: An End-to-End Approach to Super-Resolution on Mobile Devices," *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT/UbiComp 2021)*
- [7] Xuhai Xu, Jiahao Li, Tianyi Yuan, Liang He, **Xin Liu**, Yukang Yan, Yuntao Wang, Yuanchuan Shi, Jennifer Mankoff, Anind Dey, "HulaMove: Using Commodity IMU for Waist Interaction," *ACM CHI Conference on Human Factors in Computing Systems (CHI 2021)*
- [6] Kathrin Zürcher, Carl Morrow, Julien Riou, Marie Ballif, Anastasia Sideris Koch, Simon Bertschinger, **Xin Liu**, Manuja Sharma, Keren Middelkoop, Digby Warner, Robin Wood, Matthias Egger, Lukas Fenner "Novel approach to estimate tuberculosis transmission in primary care clinics in sub-Saharan Africa: protocol of a prospective study," *BMJ Open 2020*)
- [5] **Xin Liu**, Josh Fromm, Shwetak Patel, Daniel McDuff, "Multi-Task Temporal Shift Attention Networks for On-Device Contactless Vitals Measurement," *Conference on Neural Information Processing Systems, (NeurIPS 2020)* **[Oral, Top 1%, 105 out of 9454 Submissions]**
Selected Media Coverage: [Microsoft Research Webinar], [Microsoft Blog], [ZDNet]
- [4] Young Lee, **Xin Liu**, Jeremy Gummeson, Sunghoon Ivan Lee, "Towards the Ambulatory Assessment of Movement Quality in Stroke Survivors using a Wrist-worn Inertial Sensor," *IEEE International Conference on Biomedical and Health Informatics (IEEE BHI 2019)*
- [3] Sunghoon Ivan Lee, **Xin Liu**, Smita Rajan, Nathan Ramasarma, Paolo Bonato, "A Novel Upper-Limb Function Measure Derived from Finger-Worn Sensor Data Collected in a Free-Living Setting," *PLOS ONE, vol. 14, no. 3, 2019*
- [2] **Xin Liu**, Smita Rajan, Nathan Ramasarma, Paolo Bonato, Sunghoon Ivan Lee, "Finger-Worn Sensors for Accurate Functional Assessment of the Upper Limbs in Real-World Settings," *IEEE Engineering in Medicine and Biology Conference (IEEE EMBC 2018)*
- [1] **Xin Liu**, Smita Rajan, Nathan Ramasarma, Paolo Bonato, Sunghoon Ivan Lee, "Finger-Worn Sensors for Accurate Functional Assessment of the Upper Limbs in Real-World Settings," *IEEE Journal of Biomedical and Health Informatics (J-BHI), vol.23, no.2, 2019)* **[Cover Article Nominee]**

Teaching Experience

Winter 2021/2022 **TECHN 513 Managing Data and Signal Processing**, Teaching Assistant

Fall 2017 **CS328: Mobile Health & Sensing**, Teaching Assistant (*Outstanding Course Assistant Award*)

University of
Washington
UMass
Amherst

Mentoring

2020-Now	Mentor at GIX Access Computing Program , University of Washington & Tsinghua University	<i>Seattle, WA</i>
2021-Now	Xiaoyu Zhang , Tsinghua University, CS, (incoming PhD Student at Tsinghua CS)	<i>Seattle, WA</i>
2020-2022	Sinan Xie , Tsinghua University, CS (Incoming PhD Student at UCSD ECE)	<i>Seattle, WA</i>
2020-2021	Tess Despres , University of Washington, ECE, (Now PhD Student at UC Berkeley EECS)	<i>Seattle, WA</i>
2020-2021	Haojia Nie , University of Waterloo, CS, (Intern at ByteDance + Meta)	<i>Seattle, WA</i>
2019-2020	Yuang Li , BUPT, China (Now MS student at University of Cambridge)	<i>Seattle, WA</i>
2019-2020	Yongjoon Oh , University of Washington, CSE (Now at Microsoft)	<i>Seattle, WA</i>

Academic Service & Outreach

OUTREACH

2019-2020	UW Allen School PhD Visit Day , Co-Organizer
2019-2020	UW College of Engineering K-12 Discovery Day , Volunteer
2018	UMass Women in Engineering and Computing Career Day for High School Girls , Volunteer

ACADEMIC SERVICE

2020	IEEE Journal of Biomedical and Health Informatics , Reviewer
2020	ACM CHI , Reviewer
2020-2021	ACM IWMUT/UbiComp , Reviewer
2021	IEEE CVPR , Reviewer
2021	NeurIPS , Reviewer
2021	ICLR , Reviewer
2021	UIST , Reviewer
2021	ACII , Reviewer
2021	IEEE Transaction of Mobile Computing , Reviewer