

# Tomoyoshi Kimura

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## Education

- M.S. in Computer Science, University of Illinois at Urbana-Champaign 2023 Aug–2024 Dec  
Supervised by Prof. Tarek Abdelzaher GPA: 4.00  
Thesis: *Towards Micro Foundation Models for Robust Multimodal IoT Sensing*
- B.S. in Computer Science, University of Illinois at Urbana-Champaign 2020 Aug–2023 May  
Supervised by Prof. Tarek Abdelzaher & Prof. Shengzhong Liu Highest Honors

## Research Interests

- Representation Learning: Self-Supervised Representation Learning for multi-modal time-series sensing signals.
- Reasoning & Planning: Intelligent sensing systems with advanced reasoning and planning capabilities in the physical world.
- Efficient On-Device Multimodal Foundation Models: Multimodal inference optimization on resource-constrained edge devices.
- Human-Centric Multimodal Applications: Robust and interpretable sensing systems for real-world human-centric applications.

## Research Positions

- ACE Center for Evolvable Computing, SRC Research Scholar 11.2023–Present
- Internet of Battlefield Things (IoBT) REIGN, Army Research Laboratory 2023–Present
- Coordinated Science Laboratory, Graduate Research Assistant with Prof. Tarek Abdelzaher 2023–Present
- Coordinated Science Laboratory, Undergraduate Research Assistant with Prof. Tarek Abdelzaher 2022–2023
- Distributed System Undergraduate Researcher with Prof. Indranil Gupta Spring 2023
- Carl R. Woese Institute for Genomic Biology, Research Intern with Prof. Nuria Gomez-Casanovas 2021–2022
- National Center for Supercomputing Applications, Research Intern with Prof. Kaiyu Guan 2021–2022

## Peer-reviewed Publications

- [13] **InfoMAE: Pairing-Efficient Informational Masked Autoencoders for Multimodal IoT Sensing Signals**  
Tomoyoshi Kimura, Xinlin Li, Osama Hanna, Yatong Chen, Yizhuo Chen, Denizhan Kara, Tianshi Wang, Jinyang Li, Xiaomin Ouyang, Shengzhong Liu, Mani Srivastava, Suhas Diggavi, Tarek Abdelzaher  
ACM The Web Conference (WWW) 2025
- [12] **MMBind: Unleashing the Potential of Distributed and Incomplete Data for Multimodal Learning in IoT**  
Xiaomin Ouyang\*, Jason Wu\*, Tomoyoshi Kimura, Yihan Lin, Gunjan Verma, Tarek Abdelzaher, Mani Srivastava  
The 23rd ACM Conference on Embedded Networked Sensor Systems (Sensys) 2025
- [11] **SemiCMT: Contrastive Cross-Modal Knowledge Transfer for IoT Sensing with Semi-Paired Multi-Modal Signals**  
Yatong Chen, Chenzhi Hu, Tomoyoshi Kimura, Qinya Li, Shengzhong Liu, Fan Wu, Guihai Chen  
Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT) 2025
- [10] **DynaGen: Conditional Diffusion Models for Enhancing Acoustic and Seismic-Based Vehicle Detection**  
Tianshi Wang, Jinyang Li, Qikai Yang, Ruijie Wang, Yizhuo Chen, Dachun Sun, Bohan Li, Yigong Hu, Tomoyoshi Kimura, Denizhan Kara, Tarek Abdelzaher  
IEEE International Conference on Computer Communications (Infocom) 2025
- [09] **The Case for Micro Foundation Models to Support Robust Edge Intelligence**  
Tomoyoshi Kimura, Ashitabh Misra, Yizhuo Chen, Denizhan Kara, Jinyang Li, Tianshi Wang, Ruijie Wang, Joydeep Bhattacharyya, Jae Kim, Prashant Shenoy, Mani Srivastava, Maggie Wigness, Tarek Abdelzaher  
The 6th IEEE International Conference on Cognitive Machine Intelligence (CogMI) 2024
- [08] **Fine-grained Control of Generative Data Augmentation in IoT Sensing**  
Tianshi Wang, Qikai Yang, Ruijie Wang, Dachun Sun, Jinyang Li, Yizhuo Chen, Yigong Hu, Chaoqi Yang, Tomoyoshi Kimura, Denizhan Kara, Tarek Abdelzaher  
The 38th Annual Conference on Neural Information Processing Systems (NeurIPS) 2024
- [07] **PhyMask: An Adaptive Masking Paradigm for Efficient Self-Supervised Learning in IoT**  
Denizhan Kara, Tomoyoshi Kimura, Yatong Chen, Jinyang Li, Yizhuo Chen, Ruijie Wang, Tianshi Wang, Shengzhong Liu, Tarek Abdelzaher  
The 22nd ACM Conference on Embedded Networked Sensor Systems (SenSys) 2024

- [06] **VibroFM: Towards Micro Foundation Models for Robust Multimodal IoT Sensing**  
Tomoyoshi Kimura, Jinyang Li, Tianshi Wang, Yizhuo Chen, Ruijie Wang, Denizhan Kara, Maggie Wigness, Joydeep Bhattacharyya, Mudhakar Srivatsa, Shengzhong Liu, Mani Srivastava, Suhas Diggavi, Tarek Abdelzaher  
The 21st IEEE International Conference on Mobile Ad-Hoc and Smart Systems (MASS) 2024
- [05] **Data Augmentation for Human Activity Recognition via Condition Space Interpolation within a Generative Model**  
Tianshi Wang, Yizhuo Chen, Qikai Yang, Dachun Sun, Ruijie Wang, Jinyang Li, Tomoyoshi Kimura, Tarek Abdelzaher  
The 33rd International Conference on Computer Communications and Networks (ICCCN) 2024
- [04] **Acies-OS: A Content-Centric Platform for Edge AI Twinning and Orchestration**  
Jinyang Li, Yizhuo Chen, Tomoyoshi Kimura, Tianshi Wang, Ruijie Wang, Denizhan Kara, Yigong Hu, Li Wu, Walid A. Hanafy, Abel Souza, Prashant Shenoy, Maggie Wigness, Joydeep Bhattacharyya, Jae Kim, Guijun Wang, Greg Kimberly, Josh Eckhardt, Denis Osipych, Tarek Abdelzaher  
The 33rd International Conference on Computer Communications and Networks (ICCCN) 2024
- [03] **On the Efficiency and Robustness of Vibration-based Foundation Models for IoT Sensing: A Case Study**  
Tomoyoshi Kimura, Jinyang Li, Tianshi Wang, Denizhan Kara, Yizhuo Chen, Yigong Hu, Ruijie Wang, Maggie Wigness, Shengzhong Liu, Mani Srivastava, Suhas Diggavi, Tarek Abdelzaher  
International Workshop on Foundation Models for Cyber-Physical Systems & Internet of Things (FMSys at CPS-IoT Week) 2024
- [02] **FreqMAE: Frequency-Aware Masked Autoencoder for Multi-Modal IoT Sensing**  
Denizhan Kara, Tomoyoshi Kimura, Shengzhong Liu, Jinyang Li, Dongxin Liu, Tianshi Wang, Ruijie Wang, Yizhuo Chen, Yigong Hu, Tarek Abdelzaher  
ACM The Web Conference (WWW) 2024
- [01] **FOCAL: Contrastive Learning for Multimodal Time-Series Sensing Signals in Factorized Orthogonal Latent Space**  
Shengzhong Liu, Tomoyoshi Kimura, Dongxin Liu, Ruijie Wang, Jinyang Li, Suhas Diggavi, Mani Srivastava, Tarek Abdelzaher  
The 37th Annual Conference on Neural Information Processing Systems (NeurIPS) 2023

## Teaching

- Teaching Assistant: CS 361 Probability & Statistics for CS with Prof. Hongye Liu 1.2022–5.2023
- Teaching Assistant: CS 241/CS341 System Programming with Prof. Lawrence Angrave 7.2022–5.2023

## Professional Service

- Reviewer: (ACM The Web, AAAI UC, ICLR, NeurIPS) 2024-Present
- Secon Tutorial: Machine Learning and Foundation Models for Sensing Applications Fall 2024
- Mentor: Undergraduate Research in Scientific Advancement (URSA) Spring 2025

## Mentorship

- Liam Nance (UIUC BS CS - 28) URSA 2025
- Lya Mun (UIUC BS IS+DS - 27) URSA 2025

## Skills

- Languages: English, Mandarin, Japanese
- Programming Languages: Python, C++, C, GoLang, HTML/CSS/JS/TS
- Software & Tools: Pytorch, Numpy, Pandas, Tensorboard, LangChain, MongoDB, MySQL, Weight & Biases, Matplot, Latex

## Relevant Coursework

- Intelligence: Machine Learning for Signal Processing, Advanced Natural Language Processing, Deep Learning for Computer Vision, Machine Perception, Applied Machine Learning.
- Systems: Advanced Distributed Systems, Operating Systems, Computer Networks, System Programming, Internet of Things, Computer Security, Computer Architecture, Programming Languages & Compilers.
- Others: Algorithms, Data Structures, Web Programming, High Frequency Trading, Algorithmic Market Microstructure.