Tomoyoshi Kimura

✉ ⓞ in </> G

Education

University of Illinois at Urbana Champaign   2023 Aug - Present
M.S./Ph.D. in Computer Science   GPA: 4.0
Supervised by Prof. Tarek Abdelzaher

University of Illinois at Urbana Champaign   2020 Aug - 2023 May
Bachelor of Science in Computer Science   GPA: 3.98
Highest Honor

Research Interests

My research focuses on advancing Self-Supervised Learning frameworks for Multimodal Time Series data, with a keen interest in developing robust and efficient Foundation Models for the IoT domain, particularly in Edge AI. This work aims to merge theoretical insights with practical applications, optimizing AI models for the unique demands of Edge computing in real-world IoT environments.

Publications

[2] **FreqMAE: Frequency-Aware Masked Autoencoder for Multi-Modal IoT Sensing** (**The Web Conference 2024**)
Denizhan Kara, **Tomoyoshi Kimura**, Shengzhong Liu, Jinyang Li, Dongxin Liu, Tianshi Wang, Ruijie Wang, Yizhuo Chen, Yigong Hu, Tarek Abdelzaher

[1] **FOCAL: Contrastive Learning for Multimodal Time-Series Sensing Signals in Factorized Orthogonal Latent Space** (**NeurIPS 2023**)
Shengzhong Liu, **Tomoyoshi Kimura**, Dongxin Liu, Ruijie Wang, Jinyang Li, Suhas Diggavi, Mani Srivastava, and Tarek Abdelzaher

Research Experience

CyPhy Group at Coordinated Science Laboratory (CSL)   Research Assistant
                                                               November 2022 - Present

- Conducted specialized research on Foundation Models in the IoT space. Proposed new contrastive learning method for multimodal time-series.
- Optimized Self-Supervised Learning models for multimodal time-series sensor data.
- Implemented SOTA generative and contrastive learning frameworks and leveraged SWIN Transformer as encoder to enhance sensing signal processing.
- Researching alignment techniques for multimodal encoders and latent space fusion.
- Performed literature reviews for major computer science conferences.

Distributed Protocols Research Group (DPRG)   Research Assistant
                                                               Jan 2023 - June 2023

- Engaged in a multidisciplinary project centered on Distributed Robotic Operating System (ROS), driving advancements in autonomous technology.
- Conducted in-depth analysis into failure mechanisms of edge devices, uncovering critical insights into hardware-induced reliability issues.
- Implemented a robust experimental framework to isolate and identify root causes of device failures, culminating in a specialized testbed for distributed system evaluations.
- Spearheaded research initiatives on distributed algorithms, optimizing computational model offloading and enhancing system efficiency.

National Center for Supercomputing Applications (NCSA)   Research Intern
                                                               Aug 2021 - Aug 2022

- Merged computational methods with agricultural studies to classify tillage field images in Illinois using Pytorch, OpenCV, and AWS.
- Optimized vision model with residual modules and improved accuracy by 15%.

- Applied various evaluation techniques accuracy thresholding and cross-validation to reduce effect of dirty data and improved performance by 10%.

Teaching Experience	**System Programming (CS 241/341)** *Undergraduate Teaching Assistant*	Jan 2022 - May 2023
	Prob. & Stats for Computer Science (CS 361) *Undergraduate Teaching Assistant*	Aug 2022 - May 2023

Engineering Projects

Distributed Deep Learning Cluster:
Built a Parallel ML cluster with GoLang and Python that supports distributed training and inference of various DNN models. Implemented a ring-structured SWIM style Distribtued File System that guarantees failure detection, bounded recovery upon failures, and efficiency.

Group By:
Targeted on addressing group formation challenges for varoius projects, conference, events, and classes. Developed a public course platform for students to introduce their teams, invite individuals to join the team, request to join a team. Developed Server APIs with Node.js and MongoDB database and designed the frontend with React Frameworks.

Multimodal Comic Generation:
Developed comic based Generative AI through multimodal learning techniques. Implemented Sequential Multimodal Network to learn temporal information from comic sequential data for enhanced generation.

High Frequency Trading Strategies:
Developed trading strategies in C++ and on time-series market data. Implemented Kalman Filter and Reinforcement Learning to predict future market data. Designed metrics measurements and visualizations for evaluations with Python.

Skills

Programming Languages:
Python, Bash, C, C++, GoLang

Framework & Systems:
Pytorch, MongoDB, SQL, AWS, OpenAI, React, Node.js, CUDA, Kernel Development

Languages:
English, Mandarin, Japanese