Abhi Kamboj

PhD Candidate | ***NSF Graduate Research Fellow*** | Sensing and AI
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ACADEMIC PROFILE

University of Illinois at Urbana-Champaign (UIUC) **May 2026**

Doctor of Philosophy in Electrical and Computer Engineering *GPA 3.6/4.0*

Bachelor of Science in Computer Engineering, Dual in Engineering Entrepreneurship (May 2021) *GPA: 3.9/4.0*

Academic Exchange Semester School of Computer and Communication Sciences EPFL, Switzerland (May 2019)

PUBLICATIONS AND PRESENTATIONS

(**CVPR 2025, VisCon: Workshop on Visual Concepts**) Kamboj, A., Nguyen, A. & Do, M. (2024). Towards Achieving Perfect Multimodal Alignment. arXiv preprint: 2503.15352

(**Neurips 2024, UniReps: Workshop on Unifying Representations**) Kamboj, A., Nguyen, A. & Do, M. (2024). C3T: Cross-Modal Transfer Through Time for Human Action Recognition. arXiv preprint: 2407.16803

(**MS Thesis, Publication Pending**) Kamboj, A., & Do, M. (2024). A Survey of IMU Based Cross-Modal Transfer Learning in Human Activity Recognition. arXiv preprint arXiv:2403.15444.

(**Poster, 3rd Place Award**) Kamboj, A., Do, M. (2024, April). Sensor Fusion and Cross-Modal Transfer in Human Action Recognition. In 7th Illinois and Health Summit - Healthy Aging of Brain and Mind with AI.

(**Arxiv)** Kamboj, A. (2023). A Brief Survey on Leveraging Large Scale Vision Models for Enhanced Robot Grasping. arXiv preprint arXiv:2406.11786.

(**Oral, RO-MAN**) Kamboj, A., Ji, T., & Driggs-Campbell, K. (2022, August). Examining Audio Communication Mechanisms for Supervising Fleets of Agricultural Robots. In *2022 31st IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)* (pp. 293-300). IEEE.

(**Arxiv)** Kamboj, A. (2022). The Progression of Transformers from Language to Vision to MOT: A Literature Review on Multi-Object Tracking with Transformers. arXiv preprint arXiv:2406.16784

(**Senior Thesis**) Kamboj, A. (2021, May). The Optimal Audio Interface for Teleoperation on an Autonomous Farm. *Illinois Digital Environment for Access to Learning: Senior Theses - Electrical and Computer Engineering*.

RESEARCH EXPERIENCE

Google PhD SWE Internship, Mountain View, CA **May 2025 – Aug 2025**

- Conducting a research project on the AdsAI team focused on temporal reasoning in complex video scenarios by leveraging agentic AI and investigating a novel continuous, hierarchical contrastive loss formulation

Computational Imaging Group Multi-Sensor Research, UIUC **Aug 2022 – May 2025**

- Investigating advanced techniques (e.g., self-attention, contrastive alignment) for temporal robustness in multi-sensor learning and computer vision to enhance human motion analysis under guidance of Dr. Minh Do

Machine Learning Research Intern at Netradyne, San Deigo, CA **May 2022 - Aug 2022, May 2023 - Aug 2023**

- DriverGPT: Experimented training GPT models on time-series driving data for driver behavior prediction
- Devised and tested a novel transformer based neural network architecture for multi object tracking (MOT)
- Improved existing methods' ID switch metric on MOT17 dataset by encoding multiple frames in a temporal window simultaneously and extracting output detections and tracks for all frames at once using Pytorch

Human Centered Autonomy Lab, UIUC **Aug 2020 – Dec 2022**

- Studied manipulator pose estimation using foundation model pretraining under Dr. Katie Driggs-Campbell
- Created multiagent grid-world simulations and explored effective robot speech interaction via a user study
- Presented publication titled "Audio Communication for Supervising Fleets of Robots" at the *31st IEEE International Conference on Robot and Human Interactive Communication (RO-MAN*) in Naples, Italy

Sensor Fusion in Machine Learning Research, UIUC **Jan 2022 – Dec 2022**

- Studied AI on smart home IoT for human analysis using foundation model pretraining under Dr. Deming Chen
- Investigated methods to fuse radar, lidar, and camera data for autonomous driving perception in fog/rain

Embedded AI Intern at NVIDIA, Santa Clara, CA **May 2021 - Aug 2021**

- Surveyed state of the art scene text recognition (STR) models then implemented them on a Jetson AGX Xavier
- Optimized opensource PyTorch STR models using TensorRT and benchmarked the throughput and latency
- Published on NVIDIA-AI-IOT/scene-text-recognition github and showcased work on Jetson AI Labs (3k views)

Machine Learning Building Classification, EPFL **Oct 2019 – Dec 2019**

- Developed a building classification system in python for a civil engineering lab by identifying the buildings' window to facade ratio with a Torchvision CNN and using images from the Google Streetview API

- Determined the optimal number of images needed to classify buildings on various ResNet CNNs

NSF REU in Robotics Sensor Networks Lab, University of Minnesota-Twin Cities **May 2018 - Aug 2018**

- Researched intelligent robot navigation and obstacle avoidance under Dr. Volkan Isler
- Developed an autonomous indoor navigation system for a Create2 iRobot with a 2D Hokuyo laser using SLAM
- Implemented navigation algorithms, e.g. random trajectory generation, A* Search, Kalman Filter, Q-learning

Research at Graphics and Visualization Lab, University of Minnesota-Twin Cities **Aug 2016 - May 2017**

- Created a virtual environment enabling the visualization and use of hands in virtual reality using an Oculus Rift, a Leap Motion Sensor, and UnrealEngine4 and implemented a user study using a 7-point Likert scale, to determine the effect of haptics on ownership and agency over the user's avatar in the virtual simulation
- Awarded 2017 Scholars of Distinction award by the Minnesota Department of Education for work

SOFTWARE ENGINEERING EXPERIENCE

Big Data Platform Engineering Intern at Western Digital, San Jose, CA **May 2020 - July 2020**

- Enhanced internal applications and tools, revitalizing and standardizing python code and Docker containers
- Created 3 Splunk dashboards to monitor web traffic and user logins, streamlining the team's efficiency

Software Engineering Intern at Collins Aerospace, Cedar Rapids, IA **Jun 2019 - Aug 2019**

- Developed and booted a Linux configuration for the Ultrazed EV Xilinx processor allowing for company-wide testing and development of operating environments and waveform applications for software defined radios
- Revitalized 6 Linux drivers using pc-lint debugging, decreasing potential software malfunctions in the radios

TEACHING, LEADERSHIP, AND EXTRACURRICULARS

ECE 220 Computer Systems & Programming Teaching Assistant, UIUC **Aug 2021 - May 2022**

- Taught advanced use of LC-3 assembly, essential C programming concepts, and basic object-oriented design used in modern systems through individually led office hours and lab sections of 40 students
- Formulated rigorous exam questions on fundamentals like recursion and assembly code for 400+ students

ECE 385 Digital Systems Course Assistant, University of Illinois **Aug 2020 – May 2021**

- Assisted students in developing a logic processor and RAM using TTL chips on a breadboard
- Guided students in learning SystemsVerilog programming and FPGA concepts such as state machines, simulations, testbenches, synchronization, memory layout, timing analysis, etc.

IEEE Eta Kappa Nu, UIUC **Aug 2018 – May 2021**

- Led individual tutoring sessions and open review sessions for the following ECE courses: ECE 120 Intro to Computing, ECE 210 Analog Signal Processing, ECE 313 Engineering Probability, ECE 329 Fields and Waves, ECE 340 Semiconductors, ECE 391 Computer Systems Engineering
- Volunteered at local outreach events in Champaign, Illinois, teaching kids circuit soldering and programming

PULSE Competitions Committee Director, UIUC **July 2019 - May 2021**

- Coordinated a university wide coding competition and hardware hackathon with more than 80 participants
- Developed programming questions and test cases involving dynamic programming, DFS/BFS, topological sort, etc. from subjects such as AI, parallel programming, and computer security for beginner and advanced levels

Institute of Electrical and Electronics Engineers (IEEE), UIUC **Aug 2017 - Aug 2019**

- Corporate Committee: Networked with companies to arrange Tech Talks and Info Sessions for peers

iRobotics, UIUC **Aug 2017- May 2018**

- Tour Robot: Programmed an audio system of an autonomous GPS-navigation based outdoor robot tour guide
- Drawing Robot: Created a command system for communication and programmed mechanical parts in Python

HONORS AND AWARDS

Best Reviewer Award, Unifying Representations Workshop (Unireps) Neurips 2024 **Nov 2024**

National Science Foundation Graduate Research Fellow **2023 – May 2026**

Leadership Certificate **2019 - May 2021**

Chancellor's Scholar Program, University of Illinois **2018 - May 2021**

IEEE Eta Kappa Nu Electrical and Computer Engineering Honors **2018 - May 2021**

Tau Beta Pi Engineering Honors **2018 - May 2021**

Dean's List Academic Standing, College of Engineering James Scholars Honors **2017 - May 2021**