Akshay Gopalkrishnan

MS Computer Science at University of California, San Diego
akshay.gopalkrishnan@gmail.com | agopalkr@ucsd.edu | +1 (408)-382-1263 | LinkedIn | Github

EDUCATION

University of California, San Diego (Master's)   *2023 – 2025 (Expected)*
- Computer Science Master of Science with a focus in Artificial Intelligence
- Relevant Coursework: Generative AI, Advanced Computer Vision, Advances in Language Models, Data Systems for Machine Learning, Natural Language Processing, Probabilistic Reasoning & Learning

University of California, San Diego (Bachelor's)   *2019 – 2023*
- Majoring in Electrical Engineering with a specialization in Machine Learning & Controls, **GPA: 3.946**
- *Honors & Awards*: Magna Cum Laude, Phi Beta Kappa, Tau Beta Pi, Provost Honors, ECE Henry Booker Award
- Relevant Coursework: Deep Learning, Recommender Systems, Object-Oriented Programming with C++, Advanced Data Structures, Design & Analysis of Algorithms, Machine Learning, Probabilistic Reasoning & Graphical Modeling, Intro to Computer Engineering, Python for Data Analysis

RESEARCH

Laboratory for Intelligent and Safe Automobiles   *Oct. 2021 – Current*
Advisor: Dr. Mohan Trivedi

Efficient Vision Language Models for end-to-end Autonomous Driving
- Enhancing human interactivity and interpretability of autonomous driving (AD) systems by designing an efficient Vision Language Model (VLM) that performs visual question answering tasks for AD tasks such as perception and motion planning.
- Developed a custom lightweight and efficient VLM framework using a quantized T5 Language Model and ViT patch embeddings to perform Visual Question Answering given a text prompt along with various modalities such as multi-view traffic scene images, LiDAR data, or video context.
- Experimenting with multi-modal Retrieval Augmented Generation to enhance context for multi-view images and prompts.

Analyzing Alcohol Impairment of Drivers
- Addressing traffic accidents involving alcohol impairment through designing a computer vision and deep learning framework to non-intrusively monitor a driver's blood alcohol concentration.
- Using a vision Transformer and deep learning multimodal data fusion techniques to create a model that predicts the blood alcohol concentration of a driver with camera and thermal image data.

Context-Based Cascaded CNN Approach to Vehicle Light Detection
- Curated the first specialized vehicle light dataset specifically designed for downstream applications in vehicle detection and intent and trajectory prediction.
- Developed an ensemble of CNN models using the vehicle lights dataset that predict the corners of a vehicle light given an upstream vehicle detection and approximation of the vehicle light's center, providing a more robust and precise vehicle light detection than current research.

Salient Traffic Sign & Light Detection
- Thoroughly annotated traffic light and signs detections in addition to a salience property which determines whether a light or sign is relevant to the next immediate decision a driver is made.
- Trained the first detection network for traffic signs & lights that emphasizes detecting salient traffic lights and signs using a Deformable DETR model with focal loss.

Crowdsourced, History-Based Advisories of Mapped Pedestrians (CHAMP)
- Collaborated with a research group on a map-based pedestrian detection system we named CHAMP, which addresses weaknesses in visual-based pedestrian detection systems such as nighttime conditions and pedestrian occlusion.
- Designed a simulation which takes pedestrian and drive data to visualize when CHAMP would alert a driver when they are near pedestrians.

PUBLICATIONS

All my research publications can be found on my Google Scholar profile

- **Akshay Gopalkrishnan**, Ross Greer, Mohan Trivedi, "[Multi-Frame, Lightweight & Efficient Vision-Language Models for Question Answering in Autonomous Driving](#)", CVPR 2024 Vision and Language for Autonomous Driving and Robotics Workshop, 2024.
- Ross Greer, **Akshay Gopalkrishnan**, Maitrayee Keskar, Mohan Trivedi, "[Patterns of Vehicle Lights: Addressing Complexities in Curation and Annotation of Camera-Based Vehicle Light Datasets and Metrics](#)" Pattern Recognition Letters, 2024.
- **Akshay Gopalkrishnan**, Ross Greer, Maitrayee Keskar, Mohan Trivedi, "[Robust Detection, Association, and Localization of Vehicle Lights: A Context-Based Cascaded CNN Approach and Evaluations](#)" arXiv preprint, 2023.
- Ross Greer, **Akshay Gopalkrishnan**, Nachiket Deo, Akshay Rangesh, Mohan Trivedi, "[Salient Sign Detection in Safe Autonomous Driving: AI Which Reasons Over Full Visual Context](#)" 27th Enhanced Safety of Vehicles Conference, 2023.
- Ross Greer, **Akshay Gopalkrishnan**, Jacob Landgren, Lulua Rakla, Anish Gopalan, Mohan, Trivedi, "[Robust Traffic Light Detection Using Salience-Sensitive Loss: Computational Framework and Evaluations](#)" IEEE Intelligent Vehicles Symposium (IV), 2023.
- Ross Greer, Samveed Desai, Lulua Rakla, **Akshay Gopalkrishnan**, Afnan Alofi, Mohan Trivedi, "[Pedestrian Behavior Maps for Safety Advisories: CHAMP Framework and Real-World Data Analysis](#)" IEEE Intelligent Vehicles Symposium (IV), 2023.

WORK EXPERIENCE

Software Development Engineer Intern at AWS   *Jun. 2022 – Sept. 2022*
- Decreased the latencies by up to 1000% for a comment microservice in an internal employee Amazon website used by over 30,000 Amazon employees.
- Designed the new, more efficient comment microservice that contains APIs allowing users to create, update, and delete comments stored on a database using Python and the AWS tools Lambda, DynamoDB, and API Gateway.

Software Engineer Intern at Cisco   *Jun. 2021 – Sept. 2021*
- Wrote Python files to increase unit test coverage from 65% to 90% for a Django application which serves as a SD-WAN (Software Defined Wide Area Network) Self-Service Portal for Cisco customers.
- Developed a Python script that automatically syncs customer/organizational data from Cisco's Azure Cloud Portal to the Self-Service Portal application database.
- Added additional web APIs in Python allowing customers on the SD-WAN Self-Service Portal application to view all their virtual accounts stored on Cisco's database.

TEACHING EXPERIENCE

ECE 172A, Introduction to Intelligent Systems: Robotics and Machine Intelligence   *Jan. 2024 – Mar. 2024*
- Teaching Assistant (TA) for upper-division class related to AI principles and machine perception. Hosting weekly discussion sections for various robotics topics and personal office hours for Python homework assignments.

ECE 253, Digital Image Processing   *Sept. 2023 – Dec. 2023*
- Tutored for a graduate-level Digital Image Processing class and hosted weekly personal office hours for Python Image Processing homework assignments.

CSE 101, Advanced Data Structures   *Sept. 2022 – Dec. 2022*
- Hosted office hours for an upper division Advanced Data Structures class to help students debug and clarify weekly coding homework assignments focused on implementing a certain Data Structure by scratch in C++.

CSE 12, Basic Data Structures & Object-Oriented Design   *Sept. 2021 – Dec. 2021*
- Tutored students in a college intro Data Structures and Object-Oriented Design class in Java through holding personal office hours and helping debug students' code.
- Reviewed and graded students' programming assignments by providing constructive feedback on how they can improve their coding style and efficiency.

SKILLS

Programming Languages: Python, Java, C++
Engineering Skills/Tools: Git, Linux, Pytorch, AWS, Numpy, Pandas, Matplotlib, Jupyter Notebook, OpenCV, VSCode, HuggingFace, Pandas, scikit-learn