A D I T I T I W A R I

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EDUCATION

University of Illinois, Urbana-Champaign (UIUC) **Urbana, IL**
PhD in Computer Science *Aug 2024*
- CGPA: **4.0/4.0** | **Research Interests:** LLM, Efficient Multimodal Learning, Computer Vision, Optimization of AI Systems
- Advisors: **Dr. Klara Nahrstedt, Dr Heng Ji**
- Collaborators: **Dr. Derek Hoiem, Dr. Shenlong Wang**

University of Illinois, Urbana-Champaign (UIUC) **Urbana, IL**
Master of Science in Computer Science *Aug 2022-May 2024*
- CGPA: **3.85/4.0** | **Courses**: Computer Vision, Computational Photography, Autonomous Vehicle System Engineering, Applied Machine Learning, Applied Parallel Programming
- **Thesis**: Action Detection in In-Classroom Firefighter Training: A 360-Degree Video Analytics Service
- Advisor: **Dr. Klara Nahrstedt**

Guru Gobind Singh Indraprastha University **Delhi, India**
Bachelor of Technology in Computer Science *Aug 2018-Jul 2022*
- CGPA: **9.39/10.0** | **Gold medalist** | **Courses**: Data Structures, Database Systems, Operating Systems, Computer Networks

PUBLICATION AND POSTER PRESENTATION

Under Review:
- ACT360: Action-Centric Training with 360-Degree Video Analytics for First Responders.
- Balancing Speed and Precision: Comparing Latency and Accuracy Benchmarks in Quantized and Full-Precision LMMs.

Peer-Reviewed Journal & Conference Papers:
- ST-360: Spatial–Temporal Filtering-Based Low-Latency 360-Degree Video Analytics Framework *(ACM Transactions on Multimedia Computing, Communications and Applications, 2024).*
- Latency-Aware 360-Degree Video Analytics Framework for First Responders Situational Awareness *(ACM NOSSDAV, 2023).*

Thesis and Posters:
- Action Detection in In-Classroom Firefighter Training: A 360-Degree Video Analytics Service (*Masters Thesis, UIUC*)
- A Comprehensive Exploration of 360-Degree Video Representations *(Multimedia Operating Systems and Networking (MONET) Research Group, 2022 - Poster)*
- Transforming Content: A Transformer-Based Approach to Video Summarization (*GN Institute of Technology Undergraduate Research Presentation, 2022 - Poster*)

RESEARCH EXPERIENCE

UIUC **Urbana, IL**
Research Collaborator *Jan 2025-Present*
- Collaborating with Prof. Derek Hoiem & Prof. Shenlong Wang on feedforward rendering techniques for 3D scene understanding and multimodal vision-language tasks.
- Exploring region-based slot attention for efficient 3D instance segmentation, aiming to improve semantic segmentation and object representation for large-scale scenes.
- Investigating self-supervised learning for scene change detection and 3D instance retrieval, leveraging multi-view geometric consistency and visual-language models to enable scene-aware AI agents.

Rivian Automotive **Palo Alto, CA**
Research Intern (Computer Vision) *May 2024-Aug2024*
- Designed and coded **custom Image Signal Processing (ISP) pipeline** from scratch to convert raw sensor data into RGB/YUV formats for human evaluation. Used low-level language to ensure performance efficiency, scalability, and maintainability.
- Implemented core functions like **histogram equalization, demosaicing, decompanding, gamma correction,** etc. in **C/C++,** achieving end-to-end latency of **2-4** seconds, surpassing company benchmarks, and reducing manual input by **85%**.

Coordinated Science Laboratory, UIUC **Urbana, IL**
Research Assistant (Computer Vision/Machine Learning) *Sep 2022-May 2024*
- Curated one of the **first action detection datasets of 360-degree firefighting videos** and developed a custom annotation script.
- Developed **ACT360**, a **quantized, latency-efficient** action detection model for **360-degree videos**, surpassing baseline YOWO with **4% mAP improvement (0.865)** while achieving **48ms/frame inference**.
- Optimized **ACT360 for deployment**, implementing **NMS, confidence threshold tuning, and quantization-based compression**, reducing inference time to **33ms** while maintaining **0.850 mAP**, enabling real-world firefighter training applications.

- ACT360 made video analysis during firefighter training **95%** faster. Model successfully **deployed at Illinois State Fire Department** to be used during training sessions of firefighters.

Indian Institute of Technology (IIT) **Delhi, India**
Machine Learning Research Intern *May 2021-Sep 2021*
- Engineered UAV for autonomous object detection and route adaptation, attaining accuracy of **88.21%** (matching SOTA).

INDUSTRY EXPERIENCE

McAfee Inc. **Bangalore, India**
Software Engineer Intern *Aug 2021-Dec 2021*
- Optimized HAR file processing automation in McAfee MVision, reducing file processing time by **58%** using Python and Bash
- Developed a responsive customer query interface with AngularJS and JavaScript, and enhanced a results dashboard to facilitate faster, data-driven insights, cutting development time by **15%.**
- Spearheaded data-driven process improvements by automating SQL-based data extraction, saving **6** person-hours per week.

MEDSupervision (Startup) **Delhi, India**
Full Stack Developer Intern *Nov 2020-May 2021*
- Integrated real-time video calling into the website using Twilio API, enhancing patient-provider interaction and increasing user engagement by **37%**.
- Redesigned the patient portal interface to improve usability, streamlining the experience for medical staff and patients.
- Analyzed and optimized the database by restructuring over **10,000** data entries, achieving a **50%** faster data retrieval rate and reducing system load.
- Built a dynamic, centralized admin portal for easier data management and streamlined workflows, increasing operational efficiency and reducing manual input by **20%.**

QikCircle (Startup) **Delhi, India**
Software Development Engineer Intern *Feb 2020-May 2020*
- Developed front-end of website using HTML, CSS, and JavaScript, resulting in **25%** increase in user engagement.
- Upgraded backend functionalities using Python/Flask, enabling seamless data retrieval and updates from SQL database.
- Designed user registration system, reducing account creation time by **40%** through SQL database optimizations.

TEACHING EXPERIENCE

Thesis Co-advisor, UIUC **Urbana, IL**
Undergraduate Student for her Senior Thesis *Aug 2023-May 2024*
- Co-advised an undergraduate student in her senior thesis with Professor Klara Nahrstedt. Our research is centered on real-time detection of actions in 360-degree videos, employing advanced image segmentation models to enhance the precision and efficiency of the detection process.

Graduate Teaching Assistant, UIUC **Urbana, IL**
CS107 Data Science Discovery *Aug 2023-Dec 2023*
- Lab instructor for a class with over 1000 students where I spearheaded lab sections, delivered lectures on data science concepts, contributed to course content development, including guides for intricate data science topics, and conducted regular office hours to provide additional support and clarification.

PROJECTS

- **Quantization of Multimodal Models for Edge Devices:** Optimizing GLaMM for efficient image captioning on mobile devices by reducing latency and memory footprint while preserving accuracy (in progress).
- **Interactive Image Annotation Tool:** Created a collaborative image annotation tool using React and Flask, enhancing annotation efficiency by 30% through real-time collaboration and version control.
- **Text2Face Generator:** Developed lifelike facial images using generative models and NLP, employing skip-thought vectors for text encoding and DC-GAN/CVAE for image generation.
- **Sentimental Analysis in Twitter Data:** Achieved accuracy of 79% in identifying potential depression indicators in tweets.
- **Automated Testing and Deployment Pipeline:** Implemented an end-to-end automated testing and deployment pipeline using Jenkins and Docker, ensuring smooth application deployment and reducing post-deployment issues by 40%.
- **Hand Tracking and Gesture Recognition for Automated VFX:** Programmed model to generate real-time VFX effects using gesture recognition/tracking and depth estimation.
- **JPMorgan Chase Virtual Software Engineer Intern (Forage):** Built interface with live stock price data feed, leveraging financial data and Python, resulting in streamlined data analysis for traders. Utilized Git for version control and basic programming principles to ensure data accuracy and efficiency.
- **Depth Estimation using Multi-Focused Images:** Developed a depth estimation model utilizing a dataset of 30 self-curated multi-focused images to predict depth information from varying focal perspectives accurately.

SKILLS

- Python, C/C++, Java, Go, PyTorch, Hugging Face, TensorFlow, JupyterLab/Colab Wandb, Scikit Learn, TensorFlow, NumPy, SQL, R, Bash, LATEX, TypeScript, HTML, CSS, JavaScript, ReactJS, AngularJS, MATLAB, Simulink, Selenium, CUDA, AWS (S3), Data Science