

# Gyanig Kumar

<https://gyanigk.github.io>

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Education	<b>University of Colorado, Boulder</b> , CO, United States Masters in Computer Science Relevant Coursework: Algorithmic HRI, Adv. Robotics, Adv. Computer Vision GPA: overall 3.625/4.0	August 2024-Present Graduation: May 2026
	<b>Kalinga Institute of Industrial Technology</b> , India Bachelors in Computer Science and System Engineering Relevant Coursework: Algorithms, Intro to AI, Natural Language Processing, Quantum Computing, Embedded Systems, Cloud Computing GPA: overall 9.05/10.0;	August 2019-May 2023
Summary	Proficient in multimodal, <b>gaze-informed</b> shared autonomy and <b>preference learning</b> for intent and uncertainty inference. I focus on building <b>cognitive-aware shared autonomy</b> that integrates attention, intent, and personalization for human-robot collaboration.	
Publications	M. Mitra, <b>G. Kumar</b> , P.P. Chakrabarti, P. Biswas. <i>Investigating Inverse Reinforcement Learning during Rapid Aiming Movement in Extended Reality and HRI</i> . Transactions on Human-Robot Interaction (THRI), 2025.– Link S. Raj, B. Karmakar, <b>G. Kumar</b> , et al. <i>Comparing computer vision models for low-resource datasets for mixed-reality assembly</i> . Discover Robotics, 2025. – Link M. Mitra, <b>G. Kumar</b> , et al. <i>Enhanced human-robot collaboration with intent prediction using deep inverse reinforcement learning</i> . IEEE International Conference on Robotics and Automation (ICRA'24). – Link M. Mitra, <b>G. Kumar</b> , et al. <i>Multimodal target prediction for rapid HRI</i> . Short-paper, International Conference on Intelligent User Interfaces (IUI '24). L.R.D. Murthy, <b>G. Kumar</b> , et al. <i>Efficient interaction with automotive heads-up displays using appearance-based gaze tracking</i> . Automotive User Interfaces and Interactive Vehicular Applications (AutoUI '22).– Link	
In Submission	Yi-shiuan Tung*, <b>G. Kumar</b> *, A. Roncone, B. Hayes. <i>SAWO: A Framework for Workspace Optimization to Enhance Intent Recognition in Shared Autonomy</i> at HRI Short Papers 2026† Yi-shiuan Tung, <b>G. Kumar</b> , A. Roncone, B. Hayes. <i>CRED: Counterfactual Reasoning and Environment Design for Generalizable Active Preference Learning</i> at ICRA 2026† *Equal contribution. †Under review.	
Presentations	<i>Co-presented a poster on "Efficient interaction with automotive heads-up displays using appearance-based gaze tracking," Work in progress track at AutoUI' 22 Conference</i> <i>Presented research paper discussion on "End-to-end Frame-to-gaze Estimation" with live demonstration of appearance-based gaze estimation, CUB CSCI 7000 Recent Adv. in Computer Vision</i>	

Research  
Experience

**Univ. Of Colorado CAIRO & HIRO Lab**

Advised by Prof. Bradley Hayes & Prof. Alessandro Roncone  
*Robotics Shared Autonomy and Intent HRI*

Colorado, USA  
September 2024–Present

- Leading research on a **vision-language multimodal shared autonomy framework**, integrating gaze estimation, semantic reasoning, and adaptive task planning for real-time human-robot collaboration.
- Rebuilt a multi-RGBD **calibration and scene understanding pipeline** after early system failures, improving geometric consistency and reducing pose drift.
- Integrated Tobii Glasses 3 gaze pipelines with Sawyer, resolving 100–200ms latency issues and **stabilizing real-time gaze fusion** for intent recognition.
- Developed a ROS-based manipulation stack with motion primitives, relaxed-IK, and variable-horizon planning for **collaborative tabletop tasks**.
- Co-designed simulation environments in Webots and CARLA for evaluating **preference learning approaches under uncertainty**.

**Indian Institute Of Sciences, I3D Lab**

Advised by Prof. Pradipta Biswas

Bengaluru, India

*Multimodal Perception, Gaze Tracking, and Reinforcement Learning* April 2022–July 2024

- Integrated gaze priors into an IRL-based intent prediction framework, improving accuracy by **5%** under partial observability.
- Built and cleaned a **200+GB multimodal video+gaze dataset**, facing significant annotation noise and illumination variation challenges.
- Reduced I2D-Net model parameters by **50%**, addressing deployment failures in low-light conditions and improving real-time performance.
- Developed **GAN-based synthetic-to-real pipelines** for object detection, enabling dataset generation for mixed-reality assembly tasks.

Industry  
Experience

**Collins Aerospace & Faurecia**

July 2022–March 2024

*Funded Research Assitant via IISc*

- Built and Deployed **Interactive mixed-reality assistance** on complex manufacturing parts assembly for workers at Collins Aerospace Factory.
- Co-designed and Validated **distraction-detection and Heads Up Display interface** combining gaze and gesture cues inside a car Dashboard.

Teaching  
Experience

CS3155 Principles of Programming Languages, *Teaching Assistant*

Summer 2025

CS3302 Introduction to Robotics, *Course Manager*

Spring 2025

CS2824 Discrete Structures *Course Grader*

Fall 2024

Python Programming & Mathematics, *Part-time Teaching Instructor*

2023

Grad Course  
Projects

**Algorithmic HRI**, Instructor: Dr. Bradley Hayes

Fall 2025

- Built a multimodal interactive pipeline integrating **Tobii gaze tracking, finger pointing, Speech translation, joystick teleop, and local VLM parsing** for robot-assisted Lego assembly tasks.

**Advanced Robotics**, Instructor: Dr. Leopold Beuken

Spring 2025

- Built an autonomous racing bot using **image-based lane detection; implemented EKF and SLAM-based localization** for real-world navigation robustness.

**Recent Adv. in Computer Vision**, Instructor: Dr. Danna Gurari

Fall 2024

- Curated a **5000-image simulated manufacturing** dataset, unified attribute normalization, and trained diffusion models for cross-domain variance.

Awards  
2025 Tata Millennium Scholarship – \$800  
2025 HackCU11 AI Track – Ranked 2/15  
2025 AWS Amazon Hackathon – Ranked 2/25

Community  
Involvement  
*Reviewer* : **ECIS 2023, IUI 2024, HRI 2026, ICRA 2026**  
ACC Conference, Denver, *Student Volunteer* July 2025  
CUB CS-Graduate Student Association, *Vice Chair* May 2025  
CUB CS-Graduate Professional Development Club, *Coordinator* August 2024-May 2025  
CUB CS Tea Time, *Coordinator* January 2025

References  
**Dr. Bradley Hayes**  
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**Dr. Alessandro Roncone**  
Assistant Professor of Dept. of Computer Science, University of Colorado Boulder,  
**Email:** Alessandro.Roncone@Colorado.EDU,  
**Dr. Pradipta Biswas**  
Associate Professor of Dept. of Design and Manufacturing at Indian Institute of Science,  
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