RAHUL NAIR

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In my early work in computer vision, I used pre-trained models to create real-world applications. In my Ph.D., I focus on evaluating how ready these models are for the end user. I examine the root cause of algorithmic biases in vision and language models.

Education

Arizona State University — Tempe, Arizona
Doctor of Philosophy, Computer Science (GPA:- 4.00 / 4.00) — *Aug 2022 - Present*

Amrita University — Coimbatore, India
Bachelor of Technology, Computer Science (GPA:- 9.12 / 10.00) — *Jul 2016 - Jun 2020*

Research Experience

Graduate Research Assistant | Advisor: Dr. Hannah Kerner — Jan 2023 - Present
Arizona State University — *Tempe, USA*

Algorithmic Biases in Vision and Language

- Working on a new metric to measure bias amplification in image captions and numerical datasets.
- Investigated why instance segmentation models trained on European driving scenes performed poorly on images from continents outside Europe.
- Proposed a novel metric to measure directional bias amplification for balanced categorical datasets.

Research Fellow | Advisor: Dr. Ravi Kiran S — Aug 2021 - Aug 2022
International Institute of Information Technology — *Hyderabad, India*

Segmentation in Unstructured Roads

- Partnered with Intel to create a novel dataset of unstructured driving scenes captured in Hyderabad, India.
- Led the on-site data collection, cleaning, and annotation of a 1000-hour video repository.
- Created a universal pipeline to semi-automate semantic, instance, and panoptic segment annotations for the dataset, reducing annotation time by 30%.

Work Experience

Research Engineer — Dec 2019 - Mar 2021
International Institute of Information Technology — *Hyderabad, India*

Video Survellaince

- Developed a detection-cum-tracking pipeline for monitoring military tanks using drones 40 ft above sea level. The Indian Defense Ministry adopted the project as a proof-of-concept.
- Engineered an adaptive template matching solution for object tracking, achieving a remarkable 66% reduction in latency compared to widely recognized deep learning trackers.

Sports Analytics

- Developed a player tracking algorithm for 1v1 badminton matches using OpenPose, an algorithm for detecting key points on the human body.
- Used the tracking algorithm to create visualizations (e.g., heat maps, quadrant graphs) that visually illustrated the tactical dominance of a player in a rally.

Publications and Patents

- **Rahul Nair**, Mukesh N Chugani, T Senthil Kumar. "MetaData: A Tool to Supplement Data Science Education for the First Year Undergraduates" Proceedings of the 8th International Conference on Information and Education Technology 2020. [LINK]
- System and Method for Detecting and Tracking Objects at Midrange using Deep Learning Model. **Indian Patent Published**

PREPRINTS

- **Rahul Nair**, Gabriel Tseng, Esther Rolf, Bhanu Tokas, Hannah Kerner. "Classification Drives Geographic Bias in Street Scene Segmentation." arXiv preprint arXiv:2412:11061 [LINK]
- Bhanu Tokas*, **Rahul Nair***, Hannah Kerner. "Making Bias Amplification in Balanced Datasets Directional and Interpretable." arXiv preprint arXiv:2412:11060 [LINK]

SERVICE

- Co-organizing a weekly reading group on algorithmic biases at Arizona State University.
- Instructed a class of 40 students for the FSE100: Introduction to Engineering course during the Fall 2022 semester for incoming freshmen at Arizona State University.