Praneet Kumar Sahoo

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Summary

Human Factors and HMI Specialist with a Master's in Kinesiology and expertise in designing intuitive, user-centered interfaces for automotive and industrial applications. Skilled in Figma prototyping, usability testing, eye-tracking, CAD, CAE, ML and AI with 3 peer-reviewed publications and a demonstrated history of optimizing human-machine interfaces for enhanced usability and safety through rigorous user research. Passionate about optimizing human-machine interactions across diverse industries, including collaborations with the Ministry of Transportation Ontario, Windsor Police Department, and industrial firms such as Atlas Copco.

Education

Master of Science in Kinesiology (Grade: 90/100)
Specialized in Human Factors
University of Windsor, Canada
2022–2024

Bachelor of Technology in Biotechnology (CGPA: 8.98)
National Institute of Technology Durgapur, India
2018–2022

Research Interest

Self Driving Vehicles, Automotive Systems, Human Factors, Human-Machine Interface (HMI), User Experience (UX), Virtual Reality, Machine Vision, Artificial Intelligence, Human Centric Design

Technical Skills

- **Design Tools:** Figma, CATIA, Blender, Unreal Engine, Adobe XD, GIMP
- **User Research:** Usability Testing, Eye-Tracking, Cognitive Analysis, Situational Awareness
- **Analysis Tools:** MATLAB, SPSS, Ansys, R Studio (R)
- **Programming & AI:** Python, PyTorch, TensorFlow, Java, C, C++, YOLO, Mediapipe, NVIDIA TinyCUDA, OpenPose
- **Prototyping & VR:** Wireframing, VR Environment Design
- Familiar with training AI models using frameworks such as PyTorch and TensorFlow to enhance system performance and safety.

Work Experience

Research Associate, Human System Labs, University of Windsor (2024–Present)

- Led 5 UX-focused research projects on driver behavior and cognitive workload, designing user studies that improved interface usability by an average 20%.

- Conducted 2 usability testing for industrial partners and authored 4 peer-reviewed publications on Human Machine Interface (HMI).
- Led 3 AI-driven machine vision projects for driver behavior analysis and posture feedback in a medical setting.
- Led VR-based HMI projects using Unreal Engine to understand driver behavior in fully autonomous vehicles and industrial settings.
- Conducted extensive in-lab and on-field data collection with industry partners and Windsor Police Department.
- Mentored 5 undergraduates in human factors research, guiding them in experimental design, VR-based HMI development, and in-lab and on-field data collection.
- Project lead, experiment design, data collection, analysis, literature reviews, report authoring, methodology development, team management, mentoring.

Research Assistant, Human System Labs, University of Windsor (2022–2024)

- Conducted data collection and analysis for optimizing driver interfaces for Tesla Autopilot and other autonomous vehicle systems.
- Evaluated cognitive workload in driver behavior scenarios, comparing standard webcams to high-end eye trackers, improving UX insights by 15%.
- Conducted data collection and analysis of driver behavior using Tesla Autopilot with the Ministry of Transportation, Ontario.
- Compared webcam vs. high-end eye trackers for vision-based workload analysis, improving AI model accuracy.
- Data collection, analysis, experimental support, report drafting, team collaboration.

Graduate Assistant, Dept. of Kinesiology, University of Windsor (2022–2024)

- Facilitated workshops and taught core concepts for 3 kinesiology courses, enhancing course content usability.
- Graded assignments and provided feedback for 200+ students, improving learning outcomes through clear and structured communication.
- Taught concepts of human factors and AI, improving the usability of the course content.
- Assisted faculty in teaching and grading for more than 200 students.
- Faculty support, teaching assistance, administrative tasks.

Projects

AI-Driven Driver Behavior Detection (Human System Labs, 2024–Present)

- Developed AI-powered HMI using YOLO, Mediapipe and PyTorch to monitor driver behavior, enhancing safety feature usability.
- Integrated user feedback to refine real-time distraction alerts and quantify glance allocation.
- Developed software to analyze driver behavior using YOLO, MediaPipe, Pytorch & Tensorflow.
- Integrated gen-AI APIs to assess glance allocation and distractions for road safety analysis.

- Studied driver behavior patterns and distraction levels across different driving modes using machine vision.

HMI and UX Comparison Across Guidance Modalities in Industrial Setting (Human System Labs & Atlas Copco, 2024–Present)

- Designed and tested laser projection vs. software-based HMI, to be tested on a EV battery pack assembly.
- Conducted usability testing leveraging eye tracking to reduce cognitive workload for assembly workers.
- Compared UX of laser projection vs. software guidance for EV battery pack assembly.
- Assessed eye metrics to evaluate impact on engagement, efficiency, and workload.

Real-Time Posture Detection System (Human System Labs, 2025)

- Developed a portable machine vision system using OpenPose and Arduino Uno R4 WiFi, enabling real-time posture analysis with wireless alerts to enhance ergonomic safety across diverse settings.
- Integrated lightweight, cost-effective hardware and AI-driven vision algorithms to optimize user mobility and system adaptability for on-field ergonomic monitoring.
- Built an OpenPose-based system for real-time posture monitoring in healthcare settings.
- Designed an Arduino Uno R4 WiFi device to alert on posture risks, improving worker safety.

Blink Detection AI for Driver Safety (Human System Labs, 2024)

- Designed CNN-based program for real-time blink detection using NVIDIA TinyCUDA, improving driver safety.
- Analyzed eye-tracking data to optimize HMI responsiveness.
- Developed a CNN-based blink detection model using NVIDIA TinyCUDA.
- Processed real-time video to enhance driver safety awareness.

HMI Evaluation for Tesla Autopilot (Human System Labs & Ministry of Transportation, Ontario, 2023)

- Assessed user attention in Tesla Model 3's Autopilot vs. manual driving, enhancing HMI safety.
- Analyzed eye-tracking, heart rate, and response-time data to optimize driver experience.
- Compared driver attention and cognitive load on ON-401 for manual and automated vehicle safety.
- Analyzed physiological data such as heart rate, DRT, and eye tracking data.

VR-Based HMI Driver Studies (Human System Labs, 2022–2024)

- Developed VR driving scenarios using Unreal Engine to evaluate HMI situational awareness, reducing distraction by 20%.
- Used eye-tracking and NIRS to inform user-centered HMI design.
- Designed a VR based autonomous driving scenario to study situational awareness(SA).
- Assessed cognitive workload and SA using eye tracking, NIRS, and DRT.

Driver Distraction Analysis in Safety Zones (Human System Labs & Windsor Police Department, 2024)

- Conducted user research in BIAs and school zones, informing data-driven UX improvements for traffic safety systems.
- Analyzed driver distraction patterns in BIAs and school zones to enhance traffic safety.
- Partnered with police to develop data-driven measures reducing transportation risks.

Workload Analysis Across Industrial Workstations (Human System Labs, TRQSS & Atlas Copco, 2025)

- Collected worker data to assess workload variations across workstations and shifts.
- Analyzed findings to optimize performance efficiency in industrial settings.

Comparing Cognitive Workload Across Different Modalities of Instruction (Human System Labs, 2024)

- Created a VR environment to study workload in assembly manufacturing processes.
- Compared cognitive workload and performance across laser, pictorial, and video guidance.

Vehicle HMI and Ergonomics for SAE BAJA (NIT Durgapur & SAE BAJA, 2019–2021)

- Designed vehicle interfaces using CATIA, optimizing driver ergonomics with RULA/REBA assessments.
- Enhanced HMI safety through roll cage and suspension design analysis.
- Led team strategy & oversaw complete vehicle design as the Vice-Captain.
- Designed & manufactured a BAJA vehicle and assessed ergonomics using RULA and REBA.
- Fabricated and tested suspension systems to optimize driver comfort and vehicle stability.
- Evaluated roll cage design and crash dynamics to enhance driver protection and fabricated it.

Publications

- Li, Y., Sahoo, P., et al. (2025). "Stabilization Time after Mode Switch in Conditionally Automated Driving," Transportation Research Record.
- Biondi, F., Sahoo, P.K., et al. (2025). "The Distraction Potential of Driving a Partially Automated Vehicle," Scientific Reports.
- Sahoo, P.K., et al. (2024). "Investigating the interplay between cognitive workload and situation awareness during full driving automation" Theoretical Issues in Ergonomics Science.

Achievements

- Mitacs Award (2024–2025): Awarded for research collaboration and innovation.
- Ontario Graduate Scholarship (2023, 2024): Awarded for academic excellence in human factors.
- Dean's Honor Roll (2023): Recognized for exceptional graduate coursework.
- Ignite Scholarship (2023): Received for leadership and academic community contributions.
- University of Windsor Entrance Scholarship: Awarded for academic excellence upon admission.

Volunteering

- FIRST Robotics: Provided technical assistance to teams, ensuring smooth competition operations.
- Windsor Symphony Orchestra: Supported performances and community outreach initiatives.
- Food Distribution for the Homeless: Volunteered to distribute food to homeless individuals, helping to meet basic needs and promote community welfare.

Hobbies & Activities

Reading, Listening to Podcasts, Martial Arts, Combination Boxing, Calisthenics, and Cube Solving