

Shravan Murlidaran

Ph.D. in Psychological and Brain Sciences

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SUMMARY

Vision scientist and machine learning researcher (Ph.D., UC Santa Barbara, 2026) with 7+ years of experience spanning psychological and brain sciences and robotics, specializing in human attention and perception through psychophysics and computational modeling. First-author work in *Nature Communications* and under review at *Nature Human Behaviour*, including a reinforcement-learning model in which human-like eye movements emerge from optimizing scene understanding. Committed to bridging the gap between human behavior and artificial intelligence through interdisciplinary research.

EDUCATION

Ph.D. in Psychological and Brain Sciences, University of California, Santa Barbara, 2026

Master of Science (MS) in Robotics, Worcester Polytechnic Institute, Massachusetts, 2019

Bachelor of Technology (B.Tech) in Mechanical Engineering, National Institute of Technology, Trichy, India, 2016

SKILLS

Human Behavior & Applied Research:

Applied Research, Experimental Design, Psychophysics, Eye Tracking (EyeLink 1000+), Human Attention, Behavioral Data Analysis, Gaze-Contingent Displays, Qualtrics, Human-Computer Interaction (HCI), User Studies, Signal Processing (saccade/fixation parsing)

Data Science & Machine Learning:

Exploratory Data Analysis (EDA), Feature Engineering, Data Cleaning & Preprocessing, Statistical Modeling (GLM, Mixed Models, ANOVA, Bayesian Methods), Machine Learning (Supervised & Unsupervised), Model Evaluation, Cross-Validation, Embedding Extraction, Large-Scale Inference (vLLM, HuggingFace), Reinforcement Learning (Policy Gradient, REINFORCE), Deep Learning (CNNs, LSTMs, Transformers, GANs, Vision-Language Models)

AI, Vision & Robotics:

Computer Vision, Image Processing, Object Recognition, Robotics Perception, VR/AR/Mixed Reality, Simulation & Real-Time Systems, Multimodal Data Integration

Programming & Tools:

Python, C, C++, C#, SQL, R, MATLAB, PyTorch, NumPy, SciPy, OpenCV, Seaborn, Matplotlib, Unity, PsychoPy, Pulse2Percept, Git, Linux, Distributed Training, GPU Computing (A6000), Parallelization

Additional Technical Skills:

Data Pipelines, ETL, Experiment Tracking (TensorBoard, Weights & Biases), API Development, Visualization & Dashboarding, Model Deployment (basic), Big Data Handling, Time-Series Analysis, Anomaly Detection

RELEVANT EXPERIENCE

Graduate Student Researcher,

Sep 2019 – June 2026

University of California, Santa Barbara

- Designed and executed **large-scale psychophysics experiments** and **quantitative surveys (Qualtrics, Python)**, applying **statistical modeling, GLMs, experimental design, EDA, and data visualization** to study human attention, perception, and visual reasoning.
- Led a data-driven research team to build the Winograd Images dataset (published in ***Nature Communications***), developing end-to-end **eye-tracking data pipelines** (Python, EyeLink 1000 Plus) for **data cleaning, feature engineering, fixation/saccade parsing, time-series analysis**, and statistical

evaluation of human behavioral signals.

- Built **reinforcement-learning systems** that **train Vision-Language Models** (DeepSeek Janus, OVIS2.5) to generate human-like eye-movement sequences, **implementing PyTorch training pipelines, embedding extraction (vLLM, HuggingFace), policy-gradient optimization, and quantitative evaluation** of model scan paths against human data (**Under review at Nature Hum. Beh.**).
- Developed **quantitative performance metrics** for assessing model understanding of complex social-interaction scenes, integrating **computer vision preprocessing, similarity metrics, behavioral ML evaluation, and error analysis to benchmark state-of-the-art VLMs** (Gemini, GPT-4 series) against human-level performance.
- Built a **gaze-contingent prosthetic-vision simulation** using **Python, Pulse2Percept, and real-time eye-tracking**, conducting **HCI** experiments, visual-acuity (Landolt C) analysis, and eye-movement signal processing to inform assistive-technology design.

Graduate Teaching Assistant (TA)

Sep 2019 – June 2026

University of California, Santa Barbara

- Taught **statistical concepts, data analysis methods, and experimental design**, supporting undergraduates in applying quantitative reasoning to real datasets.
- Mentored students in **designing experiments, collecting/cleaning data, performing analysis (Python/R), and interpreting results**, improving their analytical and scientific communication skills.
- Provided structured feedback on research questions, hypotheses, and data-driven arguments, helping students strengthen clarity, rigor, and evidence-based reasoning.

Graduate Research Assistant,

Aug 2016 - Aug 2019

Worcester Polytechnic Institute, Massachusetts

- Developed a **Mixed Reality analytics platform** (HoloLens) to visualize large-scale neurological datasets (connectomes, MRI, anatomical structures), using **SQL and data-engineering pipelines** to improve data accessibility and clinical interpretability for AbbVie Inc.
- Designed and implemented custom **TCP-based client-server communication APIs** to enable **real-time data streaming and synchronization** between a **Mixed Reality application** and external computing systems.
- Built **computer vision and machine learning algorithms** for NASA's R5 (Valkyrie) robot using **Python, C++, OpenCV**, and simulation tools, contributing to terrain-navigation modules in the **NASA Space Robotics Challenge**.
- Conducted an **HCI user study** with college participants performing a simulated minimally-invasive surgery (MIS) navigation task, evaluating how **Mixed Reality** could improve hand-eye coordination and user performance through **experiment design, behavioral data collection, and quantitative analysis**.

Member of Robotics Club (RMI),

Jun 2013 - May 2016

National Institute of Technology, Tiruchirappalli, India

- Designed **image-processing and computer-vision** algorithms to detect chess pieces in **real time** using **Python, OpenCV**, enabling accurate board-state tracking for a robotic arm.
- Developed a **CNN-based** real-time word-recognition system, implementing **model training, preprocessing pipelines, and live inference from a camera feed**.
- Built and validated a **mathematical model** of a reciprocating mechanical system, **applying simulation, quantitative modeling, and experimental validation** to align theoretical predictions with real-world behavior.

PUBLICATIONS AND PATENTS

Patents

- Automated Eye Movement Response Systems and Methods. U.S. Provisional Patent Application No. 64/068,590. Filed May 2026. (*Patent Pending*)

Journal papers (appeared/under review/in preparation)

- Murlidaran, S., Eckstein, M.P. Eye movements during free viewing to maximize scene understanding. *Nat Commun* **17**, 940 (2026).
- Murlidaran, S., Wen, Z., Shehabi, S., & Eckstein, M. P. (2026). Why We Look Where We Look: Emergent Human-like Fixations of a Foveated Visual Language Model Maximizing Scene Understanding. *arXiv preprint arXiv:2605.17823 (Under review at Nature Hum Beh.)*.
- Murlidaran, S., & Eckstein, M. P. (2026). Evolution of Accuracy and Visual-Cognitive Errors in a Decade of Vision-Language AI Models. *arXiv preprint arXiv:2607.09654*.
- Murlidaran, S., Wen, Z., Skaza, J., Wang, W., & Eckstein, M. P. (2025, August 1). Semantic Saliency from Multi-Modal Large Language Model Scene Understanding Maps. *arXiv preprint*.
- Wen, Z., Skaza, J., Murlidaran, S., Wang, W. Y., & Eckstein, M. P. (2025). Predicting Reaction Time to Comprehend Scenes with Foveated Scene Understanding Maps. *arXiv preprint arXiv:2505.12660*.
- Skaza, J., Murlidaran, S., Varshney, A., Wen, Z., Wang, W., Eckstein, M. P., & Beyeler, M. (2025). A Deep Learning Framework for Predicting Functional Visual Performance in Bionic Eye Users. *bioRxiv*, 2025-06.

Conference/Workshop Papers

- Murlidaran, S., Wang, W. Y., & Eckstein, M. P. (2021). Comparing visual reasoning in humans and ai. ICLR Brain2AI workshop

Thesis

- Murlidaran, S. (2019). A mixed reality framework for surgical navigation: approach and preliminary results (Masters dissertation, Worcester Polytechnic Institute).

PRESENTATIONS AND TALKS

- **2026 — Invited talk, NVIDIA Research.** Why We Look Where We Look: Emergent Human-like Fixations of a Foveated Visual Language Model Maximizing Scene Understanding.
- **2025 — Scene Understanding Maps: Predicting Most Frequently Fixated Object during Free Viewing with Multi-Modal Large Language Models.** Shravan Murlidaran; Miguel P. Eckstein. *Journal of Vision*, **25 (VSS 2025)**.
- **2024 — Eye Movements during Free Viewing to Maximize Scene Understanding.** Shravan Murlidaran; Miguel P. Eckstein. *Journal of Vision*, **24 (VSS 2024)**.
- **2023 — Eye Movements during Free Viewing and Scene Description are Similarly Directed to Objects**

Critical to Scene Understanding. *Shravan Murlidaran; Miguel P. Eckstein*, **Gordon Research Conference on Eye Movements (GRC)**, Mount Holyoke College, South Hadley, MA, **July 2023**.

- **2023 — Eye Movements during Free Viewing and Scene Description are Similarly Directed to Objects Critical to Scene Understanding.** *Shravan Murlidaran; Miguel P. Eckstein*. *Journal of Vision*, **23 (VSS 2023)**, abstract 5905.