Karan P. Singh

karanps@stanford.edu karanps.com

Education

Stanford University Sep. 2023 - Present
PhD in Electrical Engineering

Cal Poly San Luis Obispo Sep. 2019 - Mar. 2022
Bachelor of Science in Electrical Engineering

Research Experience

Stanford University

Graduate Research Assistant — Machine Learning Sep. 2023 - Present
Advisor: Dr. **Ehsan Adeli**

- **Brain Foundation Models**: Developing foundation models for resting-state functional MRI to improve understanding of brain functional networks and uncover new insights into neurological disease progression and prediction. Focusing on data-driven approaches using vision transformers and time-series prediction, with biologically-inspired approaches to model training and evaluation.

Post-Baccalaureate Researcher — Machine Learning, Bioengineering Jun. 2022 - Aug. 2023
Advisors: Dr. **Kim Butts Pauly**, Dr. **Gerald Popelka**

- **TUSNet**: Developed the first machine learning-based approach to phase aberration correction for focused ultrasound neuromodulation, achieving a 1200x efficiency increase over traditional physics-based simulation methods. Additionally applied unsupervised image generation to mitigate data scarcity for this problem, specifically in CT scans of human skulls.
- Analyzed calcium imaging data taken from mice under transcranial ultrasound stimulation to correlate sonication parameters to neural responses.

Radiological Sciences Laboratory REU — Bioengineering Jun. 2021 - Sep. 2021
Advisors: Dr. Kim Butts Pauly, Dr. Gerald Popelka

- Developed a web-based tool to aid in the standardized reporting of focused ultrasound neuromodulation parameters
- Improved and applied a novel metric for assessing signal audibility during transcranial ultrasound stimulation

Cal Poly SLO

Research Assistant — Biomedical Engineering Nov. 2020 - Jun. 2021
Advisor: Dr. Benjamin G. Hawkins

- Developed electrowetting (digital microfluidics) simulations in COMSOL Multiphysics to investigate new theoretical models and recapitulate observed droplet motion
- Assembled and troubleshooted a physical digital microfluidics platform (OpenDrop) for experimental comparison to simulated results and use in bioassays

Publications

Karanpartap Singh, Neil Band, Ehsan Adeli, "Curriculum-Guided Layer Scaling for Language Model Pretraining," *International Conference on Machine Learning (ICML) 2026*, arXiv:2506.11389.

Emmy Liu, (…), **Karanpartap Singh**, Sachin Kumar, Steven Y Feng, "A Unified Definition of Hallucination, Or: It's the World Model, Stupid," *ICML 2026 Position Paper*, arXiv:2512.21577.

Kasra Naftchi-Ardebelli†, **Karanpartap Singh**†, Reza Pourabolghasem, Pejman Ghanouni, Gerald R. Popelka, Kim Butts Pauly, "Synthetic Skull CT Generation with Generative Adversarial Networks," 2026, *Medical Physics*, arXiv:2308.00206.

Karanpartap Singh, James Zou, "New Evaluation Metrics Capture Quality Degradation due to LLM Watermarking," 2024, *Transactions on Machine Learning Research (TMLR)*, OpenReview.

Kasra Naftchi-Ardebelli†, **Karanpartap Singh**†, Reza Pourabolghasem, Gerald Popelka, Kim Butts Pauly, "A deep-learning model for one-shot transcranial ultrasound simulation and phase aberration correction," 2025, *Medical Physics*, DOI: 10.1002/mp.70259.

- - -

Karanpartap Singh, Yue Zhao, Mohammad H. Abbasi, Ehsan Adeli, "A Hierarchical Tokenization Framework for Voxel-Level fMRI Representation Learning," Submitted to NeurIPS 2026.

Emmy Liu, (…), **Karanpartap Singh**, Sachin Kumar, Steven Y Feng, "HalluWorld: A Controlled Benchmark for Hallucination via Reference World Models," Submitted to NeurIPS 2026 Evaluations and Datasets Track, arXiv:2605.19341.

Karanpartap Singh, Michael Yu, Varun Gangal, Zhuofu Tao, Sachin Kumar, Emmy Liu, Steven Y Feng, "To Memorize or to Retrieve: Scaling Laws for RAG-Considerate Pretraining," Submitted to Conference on Language Modeling (COLM) 2026, arXiv:2604.00715.

Karanpartap Singh, Adam Turnbull, Mohammad Abbasi, Feng Vankee Lin, Ehsan Adeli, "Interpretable Cross-Network Attention Model for Resting-State fMRI Representation Learning," 2026, arXiv:2603.00786.

Karanpartap Singh, Benjamin Hawkins, "Improved Modeling of Droplet Motion in Open-Format Digital Microfluidic Devices," 2022, bioRxiv:2022.11.30.518563.

(† denotes equal contribution)

Posters and Talks

"Application of deep learning to phase aberration correction in transcranial focused ultrasound." *International Symposium on Transcranial Ultrasound (ISTU)*, Apr. 2023. **Oral: Best Talk Award Winner.**

"TUSNet: Deep learning based instant simulations for transcranial focused ultrasound." *Caltech International Symposium on Biomedical Ultrasound & Sonogenetics*, Dec. 2022. **Poster presentation**.

"Transcranial Ultrasound Stimulates Neurons at the Focus."
Stanford Bio-X Seed Grants Symposium, Aug, 2022. **Poster presentation**.
Focused Ultrasound Neuromodulation (FUN) Symposium, Sep. 2022. **Poster presentation**.

"Development of a computational tool to guide transcranial ultrasound parameter selection and reporting."
Focused Ultrasound Neuromodulation Symposium, Sep. 2021. **Poster presentation**.

Honors and Awards

- Stanford Interdisciplinary Graduate Fellowship (SIGF) 2026
- NSF Graduate Research Fellowship 2023
- Ford Foundation Fellowship — Honorable Mention 2023
- Youngest Engineering Graduate in Cal Poly SLO History 2022
- Cal Poly Engineering Graduate of the Year 2022
- Cal Poly SLO President's List 2020 - 2022

Work Experience

Noetik.AI Jun. 2025 - Sep. 2025
Machine Learning Intern

- Designing new masking strategies for Noetik's cancer biology **Tissue World Models**. These models are simulators of disease biology at the patient level, and may help select effective therapies for cancer.

Akura Medical Jun. 2024 - Sep. 2024
Machine Learning Intern

- Developed a model for the synthetic generation of CT scans with pulmonary embolisms, for use in a new navigation system for Akura's pulmonary thrombectomy platform. Currently applying this synthetic data to train effective segmentation algorithms for the pulmonary artery.

Livingnlight Inc. May 2015 - May 2019
Freelance Mobile App Developer (iOS / Swift and Android / Java & Kotlin)

Teaching / Mentoring

CS 25: Transformers United 2023, 2025, 2026
Stanford University

- Co-instructing one of Stanford's most popular seminar courses, featuring talks and discussions from researchers and industry leaders in machine learning. [https://cs25.stanford.edu]

REU Mentor Jun. 2022 - Aug. 2022
Stanford RSL REU

- Co-mentored an undergraduate through a quarter-long radiology research program involving image processing and analysis for GCaMP imaging in mice.

Teaching Assistant
Stanford University & Cal Poly SLO

- CS231n: Deep Learning for Computer Vision (Stanford University) Apr. 2026 - Jun. 2026
- EE 409: Electronic Design (Cal Poly SLO)f Jan. 2022 - Mar. 2022

Academic Server & Study Session Host Apr. 2020 - Mar. 2021

- To aid students during the pandemic, created and managed various online academic servers for Cal Poly classes and standardized testing with a collective 1000+ members
- Planned and hosted regular study sessions for various core electrical engineering classes

Extracurriculars / Outreach

Co-Founder and Co-President Mar. 2023 - Present
Stanford Piano Society (SPS) [https://piano.stanford.edu/]

President Jan. 2023 - Present
Graduate Students in Electrical Engineering (GSEE)

Volunteer Teacher and Lesson Planner Sep. 2022 - Jan. 2023
Stanford RSL SEED (Science Education Enrichment for Diversity) Program

Skills

Languages: Punjabi (Native), Hindi (Native), Korean (Conversational), Mandarin (Conversational)

Programming: Python (PyTorch, TensorFlow, Huggingface Transformers, FAISS, Nilearn, etc.), MATLAB, C, Java, Verilog, SLURM

Circuit Design / Simulation: SPICE, COMSOL Multiphysics

Last Updated: 06/15/2026