

# NANDITA BHASKHAR

PhD Candidate, Stanford University | Head TA CS229

Robust Representation Learning, Trustworthy ML, Data-efficient ML, AI Safety, Multi-modal Learning, Self-supervision, Zero-shot/Few-shot Learning, Continual Learning, Active Learning, ML for Health

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## SELECTED RESEARCH EXPERIENCE

Robust, Data-Efficient and Trustworthy AI

Profs. Daniel Rubin, Chris Lee-Messer, Akshay Chaudhari

Jan 2019 – Summer 2023 Stanford University

- Developed domain-specific **self-supervision** strategies for robust and label-efficient representation learning for medical imaging such as Chest X-rays, CT and MRI
- Outperforms fully supervised learning in downstream classification tasks, robustness metrics, unseen concept generalization and minority class performance
- Developed a reliable **trust scoring framework** to quantify trust for deep learning model predictions during continuous model monitoring
- Outperforms strong baselines by over 10 AUROC points across vision, audio and clinical domains and informs model generalization
- Developed methods to detect, quantify and correct for **distribution shifts** for reliable deployment of ML models
- Developed models with alternate sources of supervision such as **observational supervision** using passively-collected event logs that improve model robustness and data-efficiency in clinical outcome prediction models
- Demonstrated benefits to safety critical domains such as healthcare using various data modalities including radiology images (CT/MRI), clinical EHRs, EEG data, etc. apart from generalizing to vision and time-series domains such as natural images and audio

Closed-loop algorithms for Epi-Retinal Prosthesis

Profs. Subhasish Mitra, E.J. Chichilnisky

April 2016–December 2018 Stanford University

- Developed fully automated algorithms that could identify and avoid unwanted axon bundle activation in the retina using graph partitioning and bidirectional propagation identification, matching human performance with 0.93 correlation.
- Modelled electrical stimulation of and recordings from bidirectional electrodes in the retina as a closed-loop Markov Decision Process
- Developed compute and memory efficient sequential decision making algorithms without much loss in accuracy even in stringent power and size budgets for an implantable epi-retinal prosthetic system to restore vision to the blind

## SELECTED PUBLICATIONS

\* denotes equal contributions

- Nandita Bhaskhar, D. Rubin, C. Lee-Messer. TRUST-LAPSE: An Explainable and Actionable Mistrust Scoring Framework for Model Monitoring. *IEEE Transactions on Artificial Intelligence (IEEE-TAI)*, 2023.
- R. van der Sluis\*, Nandita Bhaskhar\*, D. Rubin, et al. Exploring Image Augmentations for Siamese Representation Learning with Chest X-Rays. *Medical Imaging with Deep Learning (MIDL)*, Oral Talk, 2023.
- Nandita Bhaskhar, W. Ip, et al. Clinical Outcome Prediction using Observational Supervision with Electronic Health Records and Audit Logs. *arXiv*, 2023.
- J. Dominic, Nandita Bhaskhar, A. Desai, et al. Data-Limited Tissue Segmentation using Inpainting-Based Self-Supervised Learning. *Bio-engineering, Special Issue on AI in MRI: Frontiers and Applications*, 2023.

## EDUCATION

PhD in Electrical Engineering

Stanford University

Present – 2023 GPA: 3.85/4.0

M.S. in Electrical Engineering

Stanford University

2014 – 2016 GPA: 3.85/4.0

B.Tech. in Electronics Engineering

Indian Institute of Information Technology (IIIT)

2010 – 2014 GPA: 9.83/10.0

## HONORS & AWARDS

- Women in ML (WiML) NeurIPS Travel Award, 2022
- Google CSRMP Fellow, Class of 2022 (Sept - Dec)
- Creativity in Research Innovation Scholar (CIRS), 2022
- UnifyID Spring Fellowship, 2019
- Qualcomm Innovation Fellowship (QInF) finalist, 2018
- IEEE Santa Clara Valley Women in Engineering (WIE) Scholarship, 2017
- Stanford EE Departmental Fellowship, 2015
- Gold Medal National Institute Merit Award for the Highest CGPA at IIIT, 2014
- Institute Best Project Award for Senior Year Thesis at IIIT, 2014
- JENESYS Student Exchange Program in Japan, 2009.
- Selected for the Indian National Mathematics Olympiad (INMO) and the Indian National Informatics Olympiad (INOI) twice.

## TEACHING EXPERIENCE

I hold a vast teaching record and am a veteran, seasoned TA at Stanford (with many Head TA offers), having taught diverse grad and undergrad courses

- ENGR 76 (Information Science and Engineering), TA, Spring 2023, with Prof. Ayfer Ozgur
- ENGR 108 (Introduction to Matrix Methods), TA, Winter 2023, with Prof. Brad Osgood
- CS 229 (Machine Learning), Head TA, Fall 2022, with Profs. Andrew Ng, Moses Chariker, Carlos Guestrin
- CS 229 (Machine Learning), TA, Spr 2022, Fall 2021, Sum 2019, with Profs. Tengyu Ma, Chris Re, Anand Avati
- CS 217 (Hardware accelerators for Machine Learning), TA, Fall 2018, with Kunle Olukotun
- PSYCH 287 (Brain Machine Interfaces), TA Spring 2017, with Profs. E.J. Chichilnisky, Justin Gardner
- EE 271 (VLSI systems), TA, Winter 2016, with Profs. Binh Le, Subhasish Mitra
- ENGR 40M (Intro to Making: What is EE?), Fall 2015, with Prof. Mark Horowitz

## SELECTED PUBLICATIONS (CONTD.)

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- **Nandita Bhaskhar**. When can you trust your model's predictions? A Mistrust Scoring Framework for inference. **Oral Talk**, *BayLearn*, 2022.
- **Nandita Bhaskhar**, D. Rubin, C. Lee-Messer. Trust Me Not: Trust Scoring for Continuous Model Monitoring. *NeurIPS 2022 WiML Workshop*.
- JMZ. Chaves, **Nandita Bhaskhar**, M. Attias, et al. RaLes: a Benchmark for Radiology Language Evaluations. *Preprint. Under Submission*.
- K. Steinberg\*, I. Dryden\*, **Nandita Bhaskhar**, et al. A Digital Morphometric Comparison of Nucleolar Features in BAP1-Mutant Versus BAP1-Wildtype Uveal Melanomas. *USCAP 2022 and ARVO 2022*.
- P. Tandon, **Nandita Bhaskhar**, N. Shah, et al. Automatic Identification of Axon Bundle Activation for Epiretinal Prosthesis. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 2021.
- **Nandita Bhaskhar**, D. Rubin, C. Lee-Messer. Knowing when you don't know: Detecting Overconfidence in deep learning based algorithms for EEG interpretation. *American Epilepsy Society (AES) Annual Meeting*, 2020.
- **Nandita Bhaskhar**, S. Fleming, S. Bakr, I. Banerjee, D. Rubin. Establishing digital phenotypes for mental health using artificial intelligence. *Frontier of AI-assisted Care Symposium*, 2019.
- L. Grosberg, K. Ganesan, G. Goetz, S. Madugula, **Nandita Bhaskhar**, V. Fan, et al. Selective activation of ganglion cells without axon bundles using epiretinal electrical stimulation. *Journal of Neurophysiology*, 2017. Awarded **APS Distinction in Scholarship**.
- **Nandita Bhaskhar\*** & K. Ganesan\*, Identification and avoidance of axon bundle activation in epiretinal prosthesis. *BioX Annual IIP Seed Grant Symposium*, 2016. Awarded **Best poster**.

## GRANTS

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- **Stanford HAI Seed Grant** (\$75,000), "Improving Medical Decision Making through Observationally Supervised Learning", 2020-21
- **Amazon AWS AI Research Grant**, "Large-Scale Self-Supervised Learning for Medical Imaging", 2023-24
- **Stanford HAI Google Cloud Compute** grant (\$15,000 GCP credits), "Domain Specific Augmentations for Medical CTs", 2022

## MENTORING EXPERIENCE

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- **Stanford REU** (Research Experience for Undergraduates program) mentor to Stanford undergrads: Maria Angelica-Nikita (EE), Jesus Cervantes (ME), & Rachel Stutz (Physics), Summer 2020.
- **Research mentor** to Sathvik Nallamalli (Stanford undergrad, CS), 2022.
- **SIMR** (Stanford Institute of Medicine Summer Research Program) mentor to high-school intern, Isha Rajput, Summer 2019.

## OTHER ACADEMIC PROJECTS

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- **Microfabricated Thermionic Energy Converters** (uTECs), Research at Stanford, mentored by Prof. **Roger Howe**, 2014-16.
- **Novel Low Power Vedic MAC (Multiplication-Accumulation) Unit**, Research at IIIT, Senior Year Thesis, mentored by Prof. **Binsu J Kailath**.
- **ML & AI**: Encoding the retina: CS229, Optimizing 3D printing: CS221
- **DNN**: Can we Salsa to Bach? Music Style Transfer: CS230
- **Circuit design**: Transimpedance Amplifier (TIA): EE214B, Voltage Controlled Oscillator (VCO): EE314A, **Hardware VLSI design**: Micropolygon Rasterization Unit: EE271

## RELEVANT COURSEWORK

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- Machine Learning, Deep Learning, Artificial Intelligence, Convex Optimization, Digital Signal Processing, Digital Image Processing, Fourier Transforms, Biochips and Medical Imaging, Computational Genomics, Meta-learning (audited), Foundation Models (audited)

## INDUSTRY EXPERIENCE

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### Qualcomm Corporate R&D intern

**Mentors: Aidin Bassam, Nick Carbone**

📅 June 2018–Sept 2018   📍 San Diego, CA

- Developed deep learning models for Digital Pre-distortion (DPD) for transmitter linearity, outperforming classical techniques with little overhead in complexity (~ 3dB improvement in EVM on average, > 6dB best case), over multiple operating conditions

### Proteus Digital Health, Advanced Technology Intern

**Mentors: Alireza Shirvani, Mark Zdeblick**

📅 June 2015–Sept 2015   📍 Redwood City, CA

- Worked on the Coil Project in modeling, simulation and optimization of the end-to-end Ingestible Event Marker (IEM or a sensor pill that talks to a patch worn on the torso) wireless link. Redesigned the Pill-Patch system at Proteus. Version 2 would enable the receiver to be a wearable that need not be stuck to the body.

### NMEC – NEC Mobile Networks Excellence Center

📅 May 2013–July 2013   📍 Chennai, India

- Implemented **IP Multimedia Subsystem (IMS)** with UCT IMS Client using OpenIMS Core to provide cellular access to different services including text messaging and voice (audio) calling; and **GNU Radio with OpenBTS** (Software Defined Radios) to implement the transceiver on software, replacing the traditional GSM network.

### Bosch Limited – Security Systems Limited

📅 May 2012–July 2012   📍 Bengaluru, India

- **Public Address and Conference Systems (PACo)**: Designed Class A, B, AB & D Amplifiers, Microphones and Loudspeakers according to client requirements (Commercial Audio Design). **Closed Circuit Television (CCTV) technology**: Worked on Image and Signal processing algorithms for detection of fire, smoke & intruders

## LEADERSHIP & COMMUNITY

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- **Stanford MedAI**. Founder and co-organizer. Weekly inter-institutional seminar series featuring invited speakers from all over the world with wide viewership (over 2000 subscribers), 2021-now.
- **Stanford CRFM**. Community & Publicity Team. 2022-23.
- **Stanford GradsTeachGrads**, Co-Founder and Co-President. Awarded **SPICE** grant by Stanford VPGE. 2020-now. Serves as a peer resource and fosters peer connections and peer mentorship.
- **Stanford Graduate Society of Women Engineers (GradSWE)**. Co-President, 2019. Vice President, 2018.
- **Stanford IEEE Chapter**, Industry Chair. 2018-19.
- **Stanford Women in Electrical Engineering (WEE)**. Faculty Liaison. 2016-18.
- **Community Associate** for Graduate Residents at Stanford, 2017-20.

## REVIEWER SERVICE

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- Reviewer for *NeurIPS*, *ICML*, *ICLR*, *IEEE Transactions on Medical Imaging (TMI)*, *Medical Imaging Analysis (Media)*, *IEEE Transactions on Neural Networks and Learning Systems (TNNLS)*.