

Nandita Bhaskhar

Room x331, Medical Science Office Building (MSOB), 1265 Welch Road, Stanford, CA 94305

✉ nanbhas@stanford.edu • 🌐 web.stanford.edu/ nanbhas/

Education

- **Stanford University** **GPA 3.85/4.0**
○ *PhD Electrical Engineering* *present–2023*
- **Stanford University** **CGPA 3.85/4.0**
○ *MS Electrical Engineering* *2014–2016*
- **Indian Institute of Information Technology (IIIT)** **CGPA 9.83/10.0**
○ *B.Tech Electronics Engineering* *2010–2014*

Areas of Interest

ML/AI, Robust Representation Learning, Trustworthy ML, Data-efficient ML, Self-supervision, Multi-modal learning, Few-shot/Zero-shot learning, Continual Learning, Active Learning, AI Safety, ML for Health, Weak supervision, Multi-modal analysis, Distribution Shifts, Signal processing, Metric learning.

Selected Research Experience

- **Robust, Data-Efficient, and Trustworthy AI for Healthcare** **Stanford University**
○ *Advised by Profs **Daniel Rubin, Christopher Lee-Messer, Akshay Chaudhari*** *January 2019–Summer 2023*
 - Developed a reliable **trust scoring framework** to quantify trust for deep learning model predictions during continuous model monitoring. It outperforms strong baselines by over 10 AUROC points across vision, audio and clinical domains and is less reliant on dataset statistics
 - Developed methods to detect, quantify and correct for **distribution shifts** for reliable deployment of machine learning 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
 - Developed domain-specific **self-supervision** strategies for robust and label-efficient representation learning for medical imaging such as Chest X-rays, CT and MRI. They outperform fully supervised learning in downstream classification tasks, robustness metrics, unseen concept generalization and minority class performance
 - 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
- **Sequential decision making & closed-loop algorithms for Epi-Retinal Prosthesis** **Stanford University**
○ *Advised by Profs **Subhasish Mitra, E.J. Chichilnisky*** *April 2016–December 2018*
 - 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

Academic Honours and Awards

- Oral Talk, Medical Imaging in Deep Learning (**MIDL**) Conference, 2023. (Judged to be in the Top 8)
- Women in ML (**WiML**), NeurIPS Travel Award, 2022. (Top 20%)
- Oral Talk, **BayLearn** 2022. (5% acceptance rate)
- Google **CSRMP** Fellow, Class of 2022 (Sept - Dec)
- d.school Creativity in Research Innovation (**CIRS**) Fellow, 2019-20, 2021-2022.
- Recipient of the **UnifyID** Spring Fellowship, 2019.
- Qualcomm Innovation Fellowship (**QInF**) finalist, 2017-2018.
- IEEE Santa Clara Valley Women in Engineering (**WIE**) Scholarship, 2017.
- Recipient of the Stanford Electrical Engineering (**EE**) Departmental Fellowship, 2014-15.

- o Recipient of the **Gold Medal** National Institute Merit Award for the Highest CGPA at IIIT, 2014.
- o Recipient of the **Institute Best Project** Award for my Senior Year Thesis at IIIT, 2014.
- o Represented India in the **JENESYS** Student Exchange Program to Japan, 2009.
- o Represented the southern region in the Indian National Mathematics Olympiad (**INMO**) and the Indian National Informatics Olympiad (**INOI**) twice, 2008-2010.

Selected Publications, Conference Posters & Talks

* denotes equal contributions

1. **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.
2. R. van der Sluis*, **Nandita Bhaskhar***, D. Rubin, C. Langlotz, A. Chaudhari. Exploring Image Augmentations for Siamese Representation Learning with Chest X-Rays. 2023, *Medical Imaging with Deep Learning (MIDL)*, **Oral Talk**, 2023.
3. **Nandita Bhaskhar**, W. Ip, J. Chen, D. Rubin. Clinical Outcome Prediction using Observational Supervision with Electronic Health Records and Audit Logs. *Preprint. arXiv*, 2023.
4. J. Dominic, **Nandita Bhaskhar**, A. Desai, et al. Data-Limited Tissue Segmentation using Inpainting-Based Self-Supervised Learning. *Bioengineering, Special Issue on AI in MRI: Frontiers and Applications*, 2023.
5. **Nandita Bhaskhar**. When can you trust your model's predictions? A Mistrust Scoring Framework for inference. **Oral Talk**, *BayLearn*, 2022.
6. **Nandita Bhaskhar**, D. Rubin, C. Lee-Messer. Trust Me Not: Trust Scoring for Continuous Model Monitoring. *NeurIPS 2022 WiML Workshop*.
7. J.M.Z. Chaves, **Nandita Bhaskhar**, M. Attias, et al. RaLes: a Benchmark for Radiology Language Evaluations. *Preprint Under Submission*.
8. 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*.
9. 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.
10. **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.
11. **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.
12. **Nandita Bhaskhar**, I. Banerjee, D. Rubin. Advancing suicide risk detection using AI, *Big Data for Precision Health*, 2019.
13. 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**.
14. **Nandita Bhaskhar*** & K. Ganesan*, Identification and avoidance of axon bundle activation in epiretinal prosthesis. *BioX Annual IIP Seed Grant Symposium*, 2016. Awarded **Best poster**.

Teaching Experience

I hold a vast teaching record and am a veteran, seasoned TA at Stanford (with many Head TA offers, including CS229), having taught diverse grad and undergrad courses. My lectures, sections and office hours are highly sought after with consistently high teaching evaluations.

- o **ENGR 76**: Information Science and Engineering, Spring 2023. Taught by Prof. **Ayfer Ozgur**
 - Held office hours, and answered questions
 - Helped scale the course to a student enrollment of 200 from 40
- o **ENGR 108**: Introduction to Matrix Methods, Winter 2023. Taught by Prof. **Brad Osgood**
 - Prepared and taught weekly sections
 - Held office hours, and answered questions
 - Created final quiz questions, prepared weekly homeworks and quizzes.
- o **CS 229**: Machine Learning, **Head TA**, Fall 2022. Taught by Profs. **Andrew Ng, Moses Chariker, Carlos Guestrin**
 - Managed all logistics of the course with 300 student enrollment and teaching team of 11 TAs

- Prepared and taught weekly TA lectures and problem solving sessions
- Held office hours, graded, and answered questions
- o **CS 229:** Machine Learning, Spring 2022, Fall 2021, Summer 2019.
 - Taught by Profs. **Andrew Ng, Moses Chariker, Carlos Guestrin, Tengyu Ma, Chris Re, Anand Avati**
 - Prepared and taught weekly TA lectures (received high ratings)
 - My weekly TA recordings are being used in **Stanford CS229 Online**
 - Held office hours, graded and answered questions
 - Created exam questions, and prepared weekly homeworks.
- o **CS 217:** Hardware accelerators for Machine Learning, Fall 2018. Taught by Prof. **Kunle Olukotun**
 - Co-created programming assignments in Spatial and Scala
 - Held office hours, and answered questions
 - Course offered for the first time in 2018
- o **PSYCH 287:** Brain Machine Interfaces, Spring 2017. Taught by Profs. **E.J. Chichilnisky, Justin Gardner**
 - Held office hours, and answered questions
- o **EE 271:** VLSI systems, Winter 2016. Taught by Profs. **Binh Le, Subhasish Mitra**
 - Taught weekly TA lectures
 - Prepared and taught a guest lecture
 - Held office hours, and answered questions
- o **ENGR 40M:** Intro to Making – What is EE?, Fall 2015. Taught by Prof. **Mark Horowitz**
 - Prepared and taught weekly lab sections
 - Held office hours, graded labs, and answered questions
- o **Stanford Splash workshops** - The P in Poker (Spring 2015), Magic, Mystery and Math (Fall 2015, Spring 2017)
 - Co-created course content and co-taught the courses at Splash

Industrial Experience

Qualcomm Corporate Research & Development

June 2018–September 2018

Mentors: Aidin Bassam, Nick Carbone

- o **Machine Learning for Digital Pre-distortion (DPD) for Transmitter linearity:** Power amplifiers are pivotal components in any Tx chain having high distortion at high efficiencies, hence requiring a digital pre-distortion (DPD) block to linearize the output. Classical polynomial series based techniques can no longer meet the DPD requirements in the 5G scenario. I developed NN based models that beat classical methods in performance with little overhead in complexity ($\sim 3\text{dB}$ improvement in EVM on average, $> 6\text{dB}$ best case), over multiple operating conditions.

Proteus Digital Health

June 2015–September 2015

Mentors: Alireza Shirvani, Mark Zdeblick

- o **Modeling, Simulation and Optimization of the end-to-end IEM Wireless Link:** Proteus makes an Ingestible Event Marker (IEM) or a sensor pill that talks to a patch worn on the torso. Worked on the Coil Project with the LW2 team in redesigning the Pill-Patch system, my roles involving circuit design, electro-magnetics & optimization. The Version 2 in the pipeline will have the receiver to be a wearable that need not be stuck to the body.

NMEC – NEC Mobile Networks Excellence Center

May 2013–July 2013

- o **Implementation of IP Multimedia Subsystem (IMS) with UCT IMSClient:** Worked on OpenIMS Core (open source test bed for IMS applications) to provide cellular access to different services provided by the internet. Text messaging and voice (audio) calling were established among remote clients and were proved to be faster.
- o **Implementation of GNU Radio with OpenBTS:** Worked on Software Defined Radios to implement the transceiver on software, so that customization would be simple for any kind of signal without any hardware changes. Using OpenBTS, calls and SMSs were established between two cell phones replacing the traditional GSM network.

Bosch Limited – Security Systems Limited

May 2012–July 2012

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

Grants

- Was awarded the **Stanford HAI Seed Grant** (\$75,000) for my interdisciplinary research proposal, titled “Improving Medical Decision Making through Observationally Supervised Learning”, 2020-21
- Was awarded the **Amazon AWS AI Research Grant** for our research proposal, titled “Large-Scale Self-Supervised Learning for Medical Imaging”, 2023 with PI Akshay Chaudhari
- Was awarded the **Stanford HAI Google Cloud Compute** grant (\$15,000 in GCP credits) for our research proposal, titled “Domain Specific Augmentations for Medical CTs”, 2021-22

Mentoring Experience

- **Stanford REU** (Research Experience for Undergraduates program) mentor for 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 for high-school intern, Isha Rajput, Summer 2019.

Relevant Coursework

- 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)

Academic and Technical Projects

- **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
- **Hobby Projects**:
 - Automated Lawn Sprinkler System: Included pH, temperature, tank water level and custom soil moisture sensors.
 - Home automation System: Included power management, waste management and security system modules.
 - Contraptions: 8-ft×8-ft×8-ft complicated Rube Goldberg machine themed “Around the world in 8 × 8 feet.”
 - Autonomous Hovercraft sponsored by Boeing.
 - BEAM Robotics (Snake Bot): Using bio-mimicry and shape memory alloys.

Reviewer Service

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

Stanford Campus Activities & Leadership

- Founder and co-organizer of **Stanford MedAI**, an inter-institutional weekly series featuring invited speakers discussing core AI/ML research in the context of medicine and healthcare. The series has grown to over three participating institutions, speakers from all over the world with wide viewership (over 2000 subscribers), 2021-present.
- Founder and President of the **Stanford GradsTeachGrads** initiative, recognized by the Stanford Vice Provost for Graduate Education (VPGE). Awarded the Student Projects for Intellectual Community Enhancement (**SPICE**) grant for two years in a row, 2020-21, 2021-22.
- **Stanford Center for Research on Foundation Models (CRFM)**, Community and Publicity Team, 2022-23
- Stanford **Graduate Society of Women Engineers (GradSWE)**, Co-President, 2018-19, Vice President, 2017-18.

- Industry Chair, **IEEE**, Stanford Chapter, 2018-19.
- Faculty Liaison, **Women in Electrical Engineering (WEE)** at Stanford, 2016-2018.
- **Community Associate** for Graduate Residents at Stanford, 2017-2020.
- Member of the **Social, Engagement & Recognition Committee (SERC)** in the Department of Biomedical Data Sciences (**DBDS**), 2019-20.

Previous Campus Activities & Leadership

- Co-editor of the completely student-run, humour and current-affairs magazine, **The Other One**, at IIIT, 2012-2014.
- **Hostel Technical Affairs Secretary & Art Club Core** at IIIT, 2013-14.
- **SSG (Social Service Group)** Coordinator for Teaching & Environmental Activities, IIIT, 2012-13.
- Elected as **The Fourth Estate (TFE)** Editor in high school, P.S. Senior Secondary School, Chennai, India, 2009-10
- Was a member of the IIIT Table Tennis, Badminton and the 400m relay teams and was a member of the high school Throwball team.