Anil Palepu

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EDUCATION

Harvard-MIT Health Sciences and Technology, Cambridge, MA — Sep 2020 – Anticipated Feb 2025
PhD Student: Medical Engineering & Medical Physics
Topic: Self-supervised learning for medical images & text
Coursework: Statistics, NLP, Medicine (Pathology, Neuroscience, Cardiology, Genetics)

Johns Hopkins University, Baltimore, MD — Sep 2019 – May 2020
M.S.E: Biomedical Engineering (Biomedical Data Science focus), GPA: 4.0
Topic: Early prognosis of neurological trauma patients in the ICU
Coursework: Machine Learning, Computer Vision, Genomics

Johns Hopkins University, Baltimore, MD — Sep 2016 – May 2020
B.S: Biomedical Engineering (Computer Science minor), GPA: 3.81
Coursework: Signal Processing, Biomedical Data Science, Data Structures, Optimization

RESEARCH EXPERIENCE

Google Research, Boston, MA — May 2023 – Present
AMIE: Conversational Diagnostic AI
Student Researcher on AMIE team

- Designed a self-play based simulated environment to scale LLM fine-tuning with synthetic dialogue
- Developed inference-time approaches to enable more complex logic and improve reasoning capabilities
- Wrote four co-first author manuscripts and led evaluation of results, ablations, and visualization

Beam Lab, Boston, MA — Mar 2021 – Present
Self-supervised learning for medical images and text
PhD Student under Dr. Andrew Beam, Harvard T.H Chan School of Public Health, Epidemiology

- Trained a novel regularized "CLIP-style" architecture resulting in state-of-the-art performance for zero-shot chest x-ray interpretation
- Developed synthetic datasets to assess the robustness of deep learning models to shortcut learning
- Designed conformal prediction frameworks for reliable zero-shot queries for CLIP-style models and quantifying LLM uncertainty in multiple choice question-answering
- Leveraged deep learning models for neonatal applications including bronchopulmonary dysplasia prediction from EHR data and pre-term birth and pre-eclampsia from fetal ultrasounds

MonitOR, Baltimore, MD — Apr 2018 – Sep 2020
AI and Computer Vision-based tracking of surgical instruments in the operating room
Researcher at Johns Hopkins University, Biomedical Engineering

- Collaborated with Johns Hopkins Hospital to reduce costly inefficiencies and "hospital never-events" by developing a CNN-based system for identifying surgical instruments in the operating room
- Designed various critical modules including optical flow-based video compression, temporal post-processing, and event-level processing to provide instrument usage statistics to hospital administrators

Precision Care Medicine, Baltimore, MD — Sep 2019 – May 2020
Early prognosis of neurological trauma patients in the ICU
Team Lead under Dr. Robert Stevens, Johns Hopkins Medicine, Anesthesiology and Critical Care Medicine

- Leveraged first-day physiology and lab data to predict end-of-stay mortality and neurological function for ICU patients presenting with traumatic brain injury, exceeding performance of the standard-of-care model

Neuromedical Control Systems Lab, Baltimore, MD — May 2017 – May 2020
Automating EEG analysis for medically refractory focal-onset epilepsy
Undergraduate Researcher under Dr. Sridevi Sarma, Johns Hopkins University, Biomedical Engineering

- Developed a signal-processing algorithm for automated spike detection in electroencephalography (EEG)
- Demonstrated that concordance between non-invasive scalp EEG and invasive electrode placement is predictive of surgical resection success, suggesting potential for non-invasive epilepsy localization

EmboQuant, Baltimore, MD Dec 2016 – May 2019
Establishing a quantitative endpoint for transarterial embolization
Co-founder at Johns Hopkins University, Biomedical Engineering

- Designed and validated a pressure-sensing catheter for transarterial embolization cancer treatments
- Demonstrated that occluded vessel pressure served as a targetable embolization endpoint and used computer vision to characterize off-target embolization as a function of injection and vessel pressures

TEACHING AND WORK EXPERIENCE

Google Research, *Student Researcher* May 2023 – Present

- Fine-tuning and evaluating LLMs for diagnostic dialogue and management reasoning

Harvard Medical School, *Teaching Fellow* Mar 2023 – May 2023

- Teaching assistant for Deep Learning for Biomedical Data course at Harvard

Inspirit AI, *Instructor* Sep 2021 – Jan 2023

- Taught project-based courses introducing simple AI concepts to high school students

Medtronic, *Data Science Intern* Jun 2019 – Aug 2019

- Built machine learning models to predict capacity fade of pacemaker batteries after manufacturing

Johns Hopkins University, *Teaching Assistant* Sep 2018 – May 2020

- Delivered weekly recitation lectures as TA for Systems & Controls *Spring 2020*
- Developed course materials as head-TA for Gateway Computing course *Fall 2018 & Fall 2019*
- Provided homework and project help as TA for Data Structures *Fall 2018*

ACTIVITIES

HST MEMP Application Assistance Program (MAAP), *Lead* Sep 2020 – Present

- Organized and managed the application-assistance program for my department

Veterans Affairs Hospital, West Roxbury MA, *Clinical Student* June 2023 – June 2024

- Underwent 12 weeks of clinical immersion across a wide range of specialties
- Cardiac ICU, Opthalmology, Rheumatology & Urology Clinics, Pharmacy, and Neonatal ICU (BIDMC)

Conference on Health, Inference, and Learning (CHIL), *Communications co-chair* Sep 2022 – May 2023

- Organized communications and advertising efforts for 2023 conference

MIT Graduate Student Council/HST Joint Council, *Representative* Sep 2020 – May 2022

- Represented the health sciences & technology (HST) department at meetings

AWARDS

- Recipient, NIH Neuroimaging Training Program (NTP) Grant Sep 2020 – Aug 2022
- Inducted into Johns Hopkins HKN and AEMB Honor Societies May 2019 & Nov 2019
- 1st Place, Carnegie Mellon McGinnis Venture Competition (EmboQuant) Mar 2018
- Johns Hopkins University Dean's List Dec 2016 – May 2020

FIRST AUTHOR PUBLICATIONS

Jan 2024 "Towards Conversational Diagnostic AI"
*Tu, T., *Palepu, A., *Schaekermann, M., Saab, K., …
Preprint

Nov 2023 "Towards Accurate Differential Diagnosis with Large Language Models"
*McDuff, D., *Schaekermann, M., *Tu, T., *Palepu, A., …
Preprint

Aug 2023 "TIER: Text-Image Entropy Regularization for Medical CLIP-style models"
*Palepu, A., & Beam, A.
Conference Publication (Poster), Machine Learning for Healthcare (MLHC)

Nov 2022 "Towards Reliable Zero Shot Classification in Self-Supervised Models with Conformal…"
*Kumar, B., *Palepu, A., Tuwani, R., & Beam, A.
Conference Publication (Poster), Self-Supervised Learning: Theory and Practice Workshop, NeurIPS

July 2022 "Self-Supervision on Images and Text Reduces Reliance on Visual Shortcut Features"
*Palepu, A., & Beam, A.
Conference Publication (Oral), Workshop on Spurious Correlations, Invariance, and Instability, ICML

Oct 2021 "Digital signatures for early traumatic brain injury outcome prediction in the intensive…"
*Palepu, A. K., Murali, A., Ballard, J. L., Li, R., …
Journal Publication, Scientific Reports, Vol 11, Issue 1 p. 1-9.

July 2019 "Evaluating Invasive EEG Implantations with Structural Imaging Data and Functional…"
*Palepu, A., *Li, A., Fitzgerald, Z., Hu, K, …
Conference Publication on (Oral), IEEE Engineering in Medicine & Biology

July 2017 "Automating interictal spike detection: Revisiting a simple threshold rule"
*Palepu, A., Premanathan, S., Azhar, F., Vendrame, M., …
Conference Publication (Poster), IEEE Engineering in Medicine & Biology

ADDITIONAL PUBLICATIONS

Apr 2024 "Capabilities of Gemini Models in Medicine"
*Saab, K., *Tu, T., *Weng, W. H., *Tanno, R., … Palepu, A., …
Preprint

Nov 2023 "Genetic Discovery Enabled by A Large Language Model"
*Tu, T., *Fang, Z., Cheng, Z., Spasic, S., Palepu, A., …
Preprint

Aug 2023 "Assessment of ChatGPT success with specialty medical knowledge using anaesthesiology…"
*Shay, D., Kumar, B., Bellamy, D., Palepu, A., …
Journal Correspondance, British Journal of Anaesthesia. Vol 131, ISSUE 2, E31-E34

May 2023 "Conformal Prediction with Large Language Models for Multi-Choice Question…"
*Kumar, B., *Lu, C., Gupta, G., Palepu, A., …
Conference Publication (Poster), Neural Conversational AI workshop, ICML

May 2022 "Artificial intelligence based on machine learning in pharmacovigilance: a scoping review"
*Kompa, B., Hakim, J. B., Palepu, A., Kompa, K, …
Journal Publication, Drug Safety Vol 45 Issue 5 p. 477-491

June 2021 "Establishing a Quantitative Endpoint for Transarterial Embolization from Real-Time…"
*Gowda, P. C., Chen, V. X., Sobral, M. C., Bobrow, T. L., … Palepu, A., …
Journal Publication, Journal of Medical Devices, Vol 15, Issue 2

Invited Presentations

May 2024	"AMIE: Self-critique and Auto-Evaluation of a Conversational Diagnostic AI" *Seminar, COGnition: Complex Output Grading of AI in Biomedical Applications at UCSD*
April 2024	"Towards Conversational Diagnostic AI" *Podcast, Stanford MLSys Seminar*
March 2024	"A Practical Guide to Fine-tuning and Inference with LLMs" *Lecture, Center for Computational Biomedicine, DBMI, Harvard Medical School*
July 2022	"Self-Supervision on Images and Text Reduces Reliance on Visual Shortcut Features" *Spotlight Talk, Workshop on Spurious Correlations, Invariance, and Instability, ICML*
July 2019	"Evaluating Invasive EEG Implantations with Structural Imaging Data and Functional…" *Oral Presentation, IEEE Engineering in Medicine & Biology*