Manas Satish Bedmutha

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I use **signal processing** and **machine learning** on ubiquitous devices to interpret and interact with user behaviors, primarily in **health**. My current focus lies on human-AI interaction with the goal of making AI accessible and trustworthy through novel sensing and interaction systems.

Education

- **University of California San Diego (UCSD)** — San Diego, CA
  Doctor of Philosophy, Computer Science & Engineering — Sep 2021 - Present
  Focus: Human Computer Interaction (HCI), Health, AI/ML — *Advisor:* Nadir Weibel
- **Indian Institute of Technology Gandhinagar (IIT GN)** — Gandhinagar, India
  Bachelor of Technology in Electrical Engineering, Minor in Computer Science — Jul 2016 - Jul 2020
  Focus: Machine Learning, Signal Processing

Selected Publications

P1. Bedmutha et. al. *ConverSense: An Automated Approach to Assess Patient-Provider Interactions using Social Signals* [CHI 2024]
P2. Bedmutha et. al. *Artificial intelligence-generated feedback on social signals in patient–provider communication: technical performance, feedback usability, and impact.* [JAMIA Open 2024]
P3. Bedmutha et. al. *Exploring User Willingness towards Mobile Sensing and Intervention: A Case Study on Mental Health of Undergraduate College Students.* Mental Health Workshop at [UbiComp/ISWC 2024]
P4. Chen, Bedmutha et. al. *Toward Automated Detection of Biased Social Signals from the Content of Clinical Conversations.* [AMIA 2024]
P5. Bedmutha et. al. *Privacy-Aware Respiratory Symptom Detection in-the-Wild.* Computing for Well-being (WellComp) at [UbiComp/ISWC 2023] (*Best Paper*)
P6. Kashyap, Bedmutha, et. al. *Towards Enhanced Human Activity Recognition through Natural Language Generation and Pose Estimation.* Symposium on Generative AI for Pervasive Computing (GenAI4PC) at [UbiComp/ISWC 2023]
P7. Bedmutha et. al. *Towards inferring implicit bias in clinical interactions using social signals.* [AMIA 2023]
P8. Bedmutha et. al. *Towards Designing Visualizations to Understand Social Signals in Patient-Provider Communication.* Workshop on Interactive System in Health (WISH) at [CHI 2023].
P9. Bedmutha and Raman. *Using Class Activations to Investigate Semantic Segmentation.* [CVIP 2021]
P10. Bascom et. al. *Designing Communication Feedback Systems To Reduce Healthcare Providers' Implicit Biases In Patient Encounters* [CHI 2024]
P11. Kaufman, Lee, Bedmutha, et. al. *Predicting Trust In Autonomous Vehicles: Modeling Young Adult Psychosocial Traits, Risk-Benefit Attitudes, And Driving Factors With Machine Learning* [under review]
P12. Bedmutha and Weibel. *UnBIASED-Eye: Unobtrusive Sensing of Implicit Bias in Healthcare Communication.* Student Design Challenge (*smart glass sensing/interaction*) at [MobileHCI 2022]

Research Experience

- **Research Assistant, HXI Lab/UCSD Design Lab** — Feb 2022 - Present
  - Leading the technical R&D for the UnBIASED project aiming to model communication biases in healthcare
  - Created and deployed *ConverSense*, a real-time audio ML system to track and visualize social behaviors
  - Designed a smart-glass system to for social sensing and privacy-aware audio feedback.
  - Developing mobile sensing systems for health (respiratory, mental health) and gestures (activity recognition)
  - Developing large language model (LLM) based pipelines for mental wellbeing, behavior modeling and interaction
  - Conceptualized and conducted user-studies to design LLM based developer support tool for XR/Unity
- **Research Lead, UC San Diego Health** — Jun 2023 - Present
  - Leading design, development & deployment for app and recommender system for Willo (student wellness app)
  - Currently used by over 1000 students; featured in local news [UCSD Guardian] [UC San Diego Today]
- **Research Scientist/Engineer, Billion Labs** — Jan 2024 - Mar 2024
  - Translated research prototypes into robust products in health sensing, primarily for blood pressure
  - Led engineering efforts for iOS, developing sensing routines and supporting ecosystem for force sensing
- **Research Engineer Intern, Dexcom [Best Intern Award]** — Jun 2022 - Sep 2022
  - Led the 0-1 creation of glucose time-series ML product in collaboration with regulatory and business teams
  - Created ML algorithms using signal processing based features for binary classification on imbalanced dataset
  - Co-designed strategic product roadmap and developed software framework for future ML products
- **Summer Research Intern, University at Buffalo** — May 2019 - Jul 2019
  - Designed an earphone-based wearable system for sensor logging, feature extraction and analytics
  - Developed transfer learning pipeline for ear/hearing health monitoring (precursor to EarHealth [MobiSys '22])

Other Experience

- **Hardware Engineer, Enphase Energy (2020-2021):** Led the hardware design and development of IoT smart switches (PCBAs) for Asia and EMEA. Devised and conducted system-integration and qualification tests.
- **Lead Data Scientist, Hotel Cloud (2020-2020):** Developed statistical and machine learning models for booking demand estimation. Developed Flask API for real-time integration. Currently used by over 200 hotels.
- **Co-founder, IpLockchain LLC (2018-2019):** Founded blockchain company aimed at solving the issue of verification in hiring. Led the product and business verticals, and supported core development. [News Feature]
- **Knockout Venture Capital Fellow (2022):** Identifying investment opportunties and conducting due-diligence on pre-seed stage startups in healthcare, robotics and agriculture (Winter 2022)

Other Projects

- **Spoken Question Answering:** Created customizable python package for speech based question answering using **ASR (Speech-to-text)** and **Large Language Models**; expanding smart assistant to wearables [Repo]
- **Detecting predatory journals from text:** Formulated a text based NLP algorithm to identify journals with inadequate review systems. Scraped, cleaned and published a dataset for the task [JCDL'20][CODS-COMAD'22]
- **Anemia Detection from Conjunctiva Images:** Developed a CNN based Hemoglobin estimation model from a small imbalanced dataset using a transfer learning approach to attain a mean squared error of 1.95
- **Single Image Superresolution:** Developed new deep learning models using Generative Adversarial Networks in Tensorflow/Keras. Conducted evaluation studies to match state-of-the-art Mean Opinion Scores
- **Acoustic reflection based ear disease classification:** Developed a transfer learning based audio machine learning pipeline that used voice activity detection and spectral transforms; collected and analyzed dataset
- **Blood Pressure and Lifestyle Anomaly Detection :** Analyzed multimodal sensor data to build correlational and statistical signal processing modules for lifestyle anomaly notifications to alert care teams
- **Sound source localization from microphone arrays:** Constructed array, experimented different beamforming and computational approaches. Final rank **15th worldwide** at IEEE Signal Processing Cup (ICASSP 2019)
- **Neural Networks for ARM Cortex Microprocessors:** Developed library for low-level implementation of CNNs. Optimized math functions with Assembly to achieve an inference **speedup of 1.8x** in no. of states [Repo]

Awards

- **Norman Design Award:** For work on respiratory sensing at WellComp 2023 (at UbiComp/ISWC 2023)
- **Best Paper:** For work on respiratory sensing at WellComp 2023 (at UbiComp/ISWC 2023)
- **UCSD ECE Service Award:** For contributions to community building and service (2021-2022)
- **Undergraduate Fellowships:** Gita & Prithwish (2016), Class of 2016 (2017, 2018), Bipin and Rekha Shah (2019)

Service

- **Program Committee:** CHI (Late-Breaking Work 2024-25), AcademyHealth 2025, WellComp at UbiComp/ISWC 2024
- **Reviewer:** Reviewer for conferences/journals in Human Computer Interaction and Mobile Computing – CHI (2023-24), alt.CHI (2023), MobileHCI (2023), EICS (2023), UbiComp/ISWC (2023-24), IMWUT (2023-24), IUI (2024)
- **Organizing Committee:** Web Chair (UbiComp/ISWC 2023), Registration Chair (UbiComp/ISWC 2024)
- **Student Leadership:** ECE Graduate Student Council (Award for Student Service 2022), UCSD Graduate & Professional Student Association (elected representative 2022, 2023), President of Coding Club IITGN (2017)
- **Talk Host:** UCSD Design Lab Research Meeting (2023), ECE 290 Seminar Course (2021, 2022)

Technical Skills

- **Programming:** Python, MATLAB, R, C, Assembly ARM, Nodejs, HTML, CSS, SQL, NoSQL (MongoDB)
- **Libraries:** Keras, Tensorflow, Pytorch, OpenCV, scikit-learn, pandas, Flask
- **Tools:** Weights & Biases (WandB), Tensorboard, Docker, AWS, Git, SVN, Jira, Confluence, BigQuery
- **Embedded:** Arduino, Raspberry Pi, Keil uvision, Processing, OrCAD CIS Schematic Capture

Teaching Experience

- **System Design/Development:** ECE 16 - Rapid Prototyping (UCSD, Fall 2021), ECE 140A - The Art of Product Engineering I (UCSD, Winter 2022), ECE 172A - Introduction to Intelligent Systems (UCSD, Winter 2022)
- **Programming:** ES102 - Introduction to Computing (IITGN, Summer 2018), ES112 - Computing (IITGN, Fall 2018)
- **Entrepreneurship:** MS 403 - Engineering Entrepreneurship (IITGN, Fall 2019), MS 406 - Business Skills for Entrepreneurs (IITGN, Spring 2020)