# Suhas Bettapalli Nagaraj

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## Education

**Pennsylvania State University**                                                             University Park, PA

* **Ph.D. in Informatics** (Machine Learning & Human-Computer Interaction) GPA **4.0/4.0**      2021–2025
* **M.S. in Electrical Engineering** (Communications & Signal Processing)                      2019–2021
  with a Graduate minor in Engineering Leadership and Innovation Management

Relevant Coursework: Deep Learning, Natural Language Processing, Machine Learning, Neural Networks, Computer Vision, Probability, Signal Processing, Data Privacy, Human-Centered Design, UX Evaluation, Wireless Networks, Virtual Reality

## Select Publications

1. **[In progress]** Suhas BN, JP. Cohen, HC. Shing, JC. Moriarty, L. Xu, M. Strong, J. Burnsky, J. Ofor, J.R. Mason, S. Chen, C. Shivade, S. Srinivasan. "**Fact-Controlled Diagnosis of Hallucinations in Medical Text Summarization**"

2. **[In progress]** Suhas BN, D. Mattioli, A. Sherrill, and S. Abdullah. "**Thousand Voices of Trauma: Generative AI Therapy Transcripts Representing Diverse Populations as a Resource for Psychological Care**"

3. **[Submitted to IEEE JSTSP]** Suhas BN, T. Bhattacharjee, B. K. Yamini, N. Atchayaram, R. Yadav, D. Gope, and PK Ghosh. "**Contrastive Audio-Video Pretraining for Classification of Amyotrophic Lateral Sclerosis, Parkinson's Disease, and Healthy Controls Using Smartphone Recordings**"

4. **INTERSPEECH 2024** Suhas BN, A. Rebar, S. Abdullah. "**Speaking of Health: Leveraging Large Language Models to assess Exercise Motivation and Behavior of Rehabilitation Patients**" In Proc. Interspeech 2024, pp. 3155-3159. (Paper)

5. **ICASSP 2024** Suhas BN, R.S. Srinivasa, Y.M. Saidatta, J. Cho, C.H. Lee, C. Yang, Y. Shen, H. Jin. "**End-to-End Personalized Cuff-less Blood Pressure Monitoring using ECG and PPG Signals**" In ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 2101-2105. IEEE, 2024. (Paper)

6. **INTERSPEECH 2023** Suhas BN, S. Rajtmajer, S. Abdullah. "**Privacy-Preserving Dementia Classification with Differential Privacy**: An Exploration of the Privacy-Accuracy Tradeoff in Speech Signal Data" In INTERSPEECH, pp. 346-350. 2023. (Paper)

7. **Springer Nature 2023** HJ. Han, Suhas BN, L. Qiu, S. Abdullah. "Automatic classification of dementia using text and speech data." In Multimodal AI in Healthcare, pp. 399-407. Springer, Cham, 2023. (Chapter Link)

8. **ICASSP 2022** Suhas BN, S. Abdullah. "**Privacy Sensitive Speech Analysis using Federated Learning to assess Depression.**" In ICASSP 2022-2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 6272-6276. IEEE, 2022. (Paper)

9. **CogMI 2020** Suhas BN. "Automatic bird sound detection in long range field recordings using Wavelets & Mel filter bank features". In 2020 IEEE Second International Conference on Cognitive Machine Intelligence (CogMI), pp. 218-226. IEEE, 2020. (Paper) (Code)

10. **SPCOM 2020** Suhas BN, J. Mallela, A. Illa, B. K. Yamini, N. Atchayaram, R. Yadav, D. Gope, and PK Ghosh. "**Speech task-based automatic classification of ALS and Parkinson's Disease and their severity using log Mel spectrograms.**" In 2020 International Conference on Signal Processing and Communications (SPCOM), pp. 1-5. IEEE, 2020. (Paper) (Code)

11. **ICASSP 2020** Mallela, J, A Illa, Suhas BN, S. Udupa, Y. Belur, N. Atchayaram, R. Yadav, P. Reddy, D. Gope, and PK Ghosh. "Voice-based classification of patients with Amyotrophic Lateral Sclerosis, Parkinson's Disease and Healthy Controls with CNN-LSTM using transfer learning." In ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 6784-6788. IEEE, 2020. (Paper)

12. **INTERSPEECH 2019** Suhas BN, D. Patel, NR Koluguri, Y. Belur, P. Reddy, A. Nalini, R. Yadav, D. Gope, and PK Ghosh. "**Comparison of Speech Tasks and Recording Devices for Voice-Based Automatic Classification of Healthy Subjects and Patients with Amyotrophic Lateral Sclerosis.**" In INTERSPEECH, pp. 4564-4568. 2019. (Paper)

13. **IC4 2018** Suhas BN, S. Bhagavat, V. Vimalanand, and P. Suresh. "**Wireless Sensor Networks** Based Monitoring of Railway Tracks." In 2018 International CET Conference on Control, Communication, and Computing (IC4), pp. 187-192. IEEE, 2018. (Paper)

## Work Experience

**Amazon, Inc. (AWS Health AI)**                                                              Seattle, WA
*Applied Scientist Intern*                                                                   08/2024–11/2024
- Working on clinical text summarization with an emphasis on improving accuracy and identifying hallucinations.

**Samsung Research America**                                                                 Mountain View, CA
*AI Research Intern*                                                                          05/2023–08/2023
- Developed multimodal cuff-less blood pressure monitoring methods, achieving state-of-the-art **MAE of 0.29/0.19 mmHg**.
- **Filed a patent** & published a part of our work in ICASSP 2024 (Check publications)

**Penn State**                                                                               University Park, PA
*Graduate Research Assistant, NSF Grant Project (titled TEAMMAIT)*                            04/2023–Present
- Developing computational methods utilizing LLM's and Generative modelling to augment clinical therapy dataset.
- Assessed clinical therapy sessions to furnish actionable feedback for enhancing mental health worker training.

**3M Health Information Systems (M∗Modal)** — Pittsburgh, PA

*Speech Recognition R&D Intern* — 06/2020–08/2020

- Improved speaker-separation in reverberant environments for physician-patient conversations.
- Extended ConvTasNet using phase difference information for far-field audio, achieving a **Si-SDR of 11.96-12.69**.

**Indian Institute of Science (IISc)** — Bangalore, India

*Research Assistant* — 05/2018–08/2019

- Developed an automated method to detect neurological disorders from speech, interviewing 300+ subjects with ALS and Parkinson's disease and recording **speech, video, and electromagnetic articulography (EMA) data**.
- Extracted audio-visual features and performed classification experiments, communicating regularly with cross-functional team of clinical staff and research coordinators.
- Led the product deployment of a smartphone app to supplement neurologist's diagnosis at NIMHANS, Bangalore.

## TEACHING

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|---|---|
| FALL 2023 | IST 504 - Theories & Methods of Information Science Research (Supervisor: Dr. Luke Zhang) |
| FALL 2023 | SRA 450 - Cyber-Crime & Cyber-Warfare (Supervisor: John G Hodgson) |
| SPRING 2022 | Data Visualization (Supervisor: Dr. Yasser Elmanzalawi) |
| FALL 2021 | Data Integration & Fusion (Supervisor: Dr. Yasser Elmanzalawi) |
| SPRING 2021 | Data Analytics for Healthcare (Supervisor: Dr. Fenglong Ma) |
| SPRING & FALL 2020 | Data Analytics for Machine Learning (Supervisor: Dr. Fenglong Ma) |

## FELLOWSHIP, HONORS, AND SERVICE

- Judge, 3 Minute Thesis Competition - Graduate School @ Penn State [**Link**] — 10/2024-Present
- Awarded the College of IST Graduate Student Travel Grant (USD 1000) — 10/2024
- Judge, 2024 Undergraduate Exhibition @ Penn State [**Link**] — 04/2024-Present
- Member of Hiring Committee, Millennium Scholars Program @ Penn State [**Link**] — 01/2024-Present
- Member, Program Committee for IEEE ICHI 2024 — 01/2024-Present
- Paper Reviewer for CHI — 01/2024-Present
- Paper Reviewer for ACM CUI 2023 — 03/2023-Present
- Paper Reviewer for IEEE Signal Processing Letters — 02/2023-Present
- Google CS Research Mentorship Scholar (2022b Cohort) Mentor: Jo Schaeffer. — 09/2022
- Google Developers Machine Learning Bootcamp Scholar (2022) — 07/2022
- Awarded the NSF NRT LinDiv Fellowship (2022-23). [**Program Website**] — 06/2022

## OTHER PROJECTS

- **UI/UX Research** -
    1. **Competitor Analysis of Netflix**: Conducted a comprehensive analysis of Netflix and its direct/indirect competitors. Analyzed publicly reported numbers, target base, product-specific information, and brand positioning. Performed usability heuristics and recommended improvements to the product offering. [**Slides**].
    2. **Heuristic Evaluation of Target App**: Conducted a heuristic evaluation of the Target app using Nielsen's 10 points heuristic scale. Identified areas of improvement across login, item selection, search, and checkout screens. [**Slides**].
    3. **User Testing of BuzzFeed Website** (Moderated & Unmoderated Usability Testing): Conducted user testing of the BuzzFeed website through moderated and unmoderated usability testing. [**Slides**].

- **ML & Health**:
    1. **Multi-modal data-driven analysis** of subjects with Dementia: **Winner** of AAAI 2022 Hackallenge
    2. Identifying Obstructive Sleep Apnea from a subject's snore recording using HMM.

- **Sensor-based ML**:
    1. **SwingSense**: Collected and analyzed real-time cricket bat swing data using 9 axis IMU sensors (accelerometer, gyroscope, angle) and video. Designed and implemented a data visualization and feedback system to provide insights on swing patterns and improve athletic performance. Collaborated with coaches and athletes to fine-tune the system and ensure its effectiveness.
    2. **SeniorSync**: Leading a team in the Nittany AI Challenge 2023 to develop a system to track the movements and behavior of elderly individuals using data from wearable devices and qualitative surveys. Enabled proactive care by providing actionable insights to family members and healthcare providers. [**News article**]

## Talks

1. **Privacy-preserving assessment of depression using Speech signal processing** [Slides] [Thesis]
   (MS EE Thesis Defense in School of EECS, Penn State) 04/2021

2. **Neural interfacing and mapping using electrochemical sensors** [Slides]
   (School of EECS, Penn State) 12/2020

3. **MIMO in 5G Wireless Systems** [Slides]
   (School of EECS, Penn State) 12/2019

4. **Performance characterization of Sound Recorders** [Slides]
   (EE Department, Indian Institute of Science) 08/2019

5. **Introduction to Music Information Retrieval, Audio licensing & Blockchains** [Slides]
   (EE Department, Indian Institute of Science) 11/2018

## Skills

**Programming**: Python, C++, MATLAB, UNIX/Bash, SQL | **Audio and Speech Recognition**: FFmpeg, Kaldi |
**Deep Learning**: PyTorch, TensorFlow, Keras | **Cloud**: AWS, Google Cloud | **Tools**: Git, JIRA, Tableau, LaTeX |
**Other libraries**: Pandas, NumPy, SciPy, Scikit-learn, Matplotlib, spaCy, OpenCV, Transformers, Huggingface, CUDA, LIME, Alibi, SHAP
**Soft Skills**: Leadership, Team Collaboration, Problem-Solving, Effective Communication

## Positions of Responsibility

1. **President, Indian Graduate Student Association, Penn State** 05/2022 - 05/2023
   Provide vision and leadership for an organization of 600+ graduate student members. Organize large-scale events, set meeting agendas, facilitate discussions, and represent the organization to external stakeholders. Manage a yearly budget of $40,000 by interacting with funding agencies, university staff, and vendors.

2. **EGT Chair, Engineering Graduate Student Council, Penn State** 06/2020 - 05/2021

3. **Editor of CERS, Engineering Graduate Student Council, Penn State** 06/2020 - 05/2021
   Supervised 200+ students to publish an engineering journal every year, informing the university community of Penn State's cutting-edge engineering research. Managed the editorial process, provided feedback to authors, and ensured the publication met high standards of quality and accuracy.