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

Publications

1. **[In progress]** **Suhas BN**, R. Hridoy, S. Ganna, A. Rebar, S. Abdullah. "Automated Interviewer Dialog Generation with Large Language Models and Reinforcement Learning for Enhanced Outcomes in Cardiovascular and Pulmonary Diseases"
2. **[In progress]** **Suhas BN**, S. Rajtmajer, S. Abdullah. "Privacy-Preserving Dementia Classification with Differential Privacy: An Exploration of the Privacy-Accuracy Tradeoff in Speech Signal Data"
3. **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: DOI:10.1007/978-3-031-14771-5_29)
4. **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 Link: DOI: 10.1109/ICASSP43922.2022.9746827)
5. **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 Link: DOI: 10.1109/CogMI50398.2020.00035) (Github Code)
6. **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 Link: DOI: 10.1109/SPCOM50965.2020.9179503) (Gitlab Code)
7. **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 Link: DOI:10.1109/ICASSP40776.2020.9053682)
8. **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 Link: DOI:10.21437/Interspeech.2019-1285)
9. **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 Link: DOI: 10.1109/CETIC4.2018.8531029)

Work Experience

Penn State — University Park, PA
Graduate Teaching Assistant — 01/2020–05/2022

- Engaged with over 500+ students over 5 semesters to resolve doubts in course material.
- Conducted bi-weekly lab sessions on implementing theoretical concepts.
- Assisted in: Data Visualization (Spring '22), Data Integration & Fusion (Fall '21), Data Analytics for Healthcare (Spring '21), Data Analytics for Machine Learning (Spring & Fall '20).

3M Health (M∗Modal) — Pittsburgh, PA
Speech Recognition R&D Intern — 06/2020–08/2020

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

Indian Institute of Science (IISc) — Bangalore, India
Research Assistant — 05/2018–08/2019

- Developed a novel automated method to detect neurological disorders from speech.
- Interviewed **300+ subjects** with ALS & Parkinson's disease and recorded Speech (**150+ hours**), Video (**10+ hours**), and Electromagnetic articulography (EMA) data. Extracted audio-visual features and performed classification experiments.
- Communicated with clinical staff, and research coordinators routinely regarding scheduling, and documentation.
- Led the product deployment of a smartphone app to supplement neurologist's diagnosis at NIMHANS, Bangalore.

Fellowship, Honors, and Service

* Paper Reviewer for IEEE Signal Processing Letters — 02/2023
* Google CS Research Mentorship Scholar (2022b Cohort) Mentor: Jo Schaeffer. — 09/2022
* Selected for Google Developers Machine Learning Bootcamp (2022) — 07/2022
* Awarded the **NSF NRT LinDiv Fellowship** (2022-23). [Program Website] — 06/2022

Select Projects

- **UX Research** -
  1. **Competitor Analysis of Netflix**: Compared with it's direct/indirect competitors. Looked at publicly reported numbers, target base, product specific information, and brand positioning. Performed usability heuristics and suggested improvements to the product offering. [Slides],
  2. **Heuristic Evaluation of Target App**: Evaluated the app using Nielsen's 10 points heuristic scale. Suggested improvements across login, item selection, search, and checkout screens. [Slides],
  3. **User Testing of BuzzFeed Website** (Moderated & Unmoderated Usability Testing) [Slides]
- **ML & Health**:
  1. **Federated Learning** to identify Depression (see Talks section),
  2. **Interpretable** multiple online time-series analysis to identify relapse of Bipolar,
  3. **Multi-modal analysis** of subjects with Dementia: **Winner** of AAAI 2022 Hackallenge
  4. **Differential Privacy**: Clipped gradients for training ML-Dementia models
  5. Identifying Obstructive Sleep Apnea from a subject's snore recording using HMM.
- **Other ML**:
  1. **SwingSense**: Collected & analyzed real-time cricket bat swing data (IMU sensors + video) to improve athletic performance through Data Visualization and feedback.
  2. Proposed wavelet-based features for real-time detection of bird sounds.(Github Code)
  3. Language identification via I-Vectors and Dimensionality Reduction: using Mann-ki-Baat dataset among 13 languages for a given speech utterance using PCA + LDA.

Talks

1. Privacy-preserving assessment of depression using Speech signal processing
   (MS EE Thesis Defense) [School of EECS, Penn State] – View the Thesis here — 04/2021
2. Neural interfacing and mapping using electrochemical sensors
   (Biosensors Presentation) [School of EECS, Penn State] — 12/2020
3. MIMO in 5G Wireless Systems
   [School of EECS, Penn State] — 12/2019
4. Performance characterization of Sound Recorders
   [EE Department, Indian Institute of Science] — 08/2019
5. Introduction to Music Information Retrieval, Audio licensing & Blockchains
   [EE Department, Indian Institute of Science] — 11/2018

Skills

Bash, SQL, Python, MATLAB, GCP, AWS, Git, JIRA, Tableau, LaTeX, SoX, FFmpeg, Kaldi
Keras, Tensorflow, PyTorch, TF Federated, PySyft

Positions of Responsibility

1. **President, Indian Graduate Student Association, Penn State** — **05/2022 - 05/2023**
   I work closely with the executive board to provide vision and leadership for the organization, with over 600+ graduate student members. This includes organizing large-scale events, setting the board meeting agenda, facilitating discussions and decision-making, and representing the organization to external stakeholders such as university staff, vendors, and funding agencies.
2. **Treasurer, Indian Graduate Student Association, Penn State** — **05/2021 - 05/2022**
   Managed the organization's financial affairs and ensured all transactions were accounted for. Prepared and presented data to the executive board, oversaw the organization's budget and ensured that the organization's funds were used responsibly and transparently.
3. **EGT Chair, Engineering Graduate Student Council, Penn State** — **06/2020 - 05/2021**
4. **Editor of CERS, Engineering Graduate Student Council, Penn State** — **06/2020 - 05/2021**
   Supervise 200+ students to publish an engineering journal every year, informing the University community of Penn State's cutting-edge engineering research

(Note: The blue texts are web links)