Suhas Bettapalli Nagaraj

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Education

Pennsylvania State University — University Park, PA
* Ph.D. in Informatics (Applied ML & HCI for Healthcare) GPA **4.0/4.0** — 2021–2025
* M.S. in Electrical Engineering (Communications & Signal Processing) — 2019–2021

Publications

1. **[In progress]** **Suhas BN**, S. Rajtmajer, S. Abdullah. "DEPENDABLE: DiffErential Privacy ENableD clAssification of suBjects with dementia and healthy controls using signaL procEssing"
2. **[Proofing] Springer Nature 2023** HJ. Han, **Suhas BN**, L. Qiu, S. Abdullah. "Automatic Classification of Dementia Using Text and Speech data" (Chapter Link: DOI:10.1007/978-3-031-14771-5_29)
3. **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)
4. **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)
5. **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)
6. **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)
7. **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)
8. **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 (SP '22), Data Integration & Fusion (FA '21), Data Analytics for Healthcare (SP '21), Data Analytics for Machine Learning (SP & FA '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 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

* 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) [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
Pandas, NumPy, SciPy, Scikit-learn, Matplotlib, spaCy, OpenCV, LIME, Alibi, SHAP

Positions of Responsibility

1. **President**, Indian Graduate Student Association - Interact with funding agencies, university staff, and vendors for organizing events at Penn State by managing a USD 40,000 budget every year.
2. **Editor of CERS** - 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)