Prachi Singh

Research Scholar

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RESEARCH INTERESTS

Machine Learning, Self-supervised learning, Graph Neural Networks, Speech & Audio, Multimodal representation learning.

EDUCATION

Indian Institute of Science, Electrical Engineering, *Bangalore, India*
PhD in Speech & Audio Processing [*GPA : 8.0*] *Aug. 2017 – Feb. 2024*

College of Engineering, Pune, *Pune, India*
Bachelors of Engineering in Electronics & Telecommunication [*GPA : 8.7*] *Aug. 2011 – Apr. 2015*

WORK EXPERIENCES

Fraunhofer IIS Institute, *Erlangen, Germany*
Research Scientist *June. 2024 – Nov. 2024*
Speech representation learning using neural audio codec.

Indian Institute of Science, *Bangalore, India*
Research Associate *Aug. 2023 – April. 2024*
Organized speaker and language diarization challenge, mentored students and interns

Adobe Research, *Bangalore, India*
PhD Research Intern *June. 2022 – Aug. 2022*
Developed method and dataset for cross-modal music retrieval for design documents using cross-attention.

Observe.AI, *Bangalore, India*
ML Research Intern *Oct. 2021 – Feb. 2022*
Built in-house diarization system for contact centres' call recordings. Involved in data pre-processing and training setup which achieved state-of-the-art performance.

Fiat Chrysler Automobiles, *Chennai, India*
Software Modelling Engineer *July. 2015 – June. 2017*
Instrument Panel Cluster validation, Hardware In Loop Testing and Validation of Infotainment system.

RESEARCH PROJECTS

DISPLACE Speaker and Language Diarization for multilingual conversations
Guide: Prof. Sriram Ganapathy, Electrical Engineering, IISc *Aug. 2023 – April. 2024*
- Involved in organizing DISPLACE 2024 challenge and setting up baselines.
- Working towards developing robust language diarization system.

End to end supervised heirarchical graph clustering for speaker diarization
Guide: Prof. Sriram Ganapathy, Electrical Engineering, IISc *Aug. 2022 – Aug. 2023*
- Developed a supervised heirarchical clustering algorithm using graph neural networks for speaker diarization (task of audio segmentation based on speaker identity) [IEEE ICASSP 2023].
- In collaboration with British Telecom-Indian Research Centre. (BTIRC).

Music retrieval and augmentation for design documents
Guide: Dr. Srikrishna Karanam, Adobe Research *June. 2022 – Aug. 2022*
- Framed a novel task of music audio retrieval to best match the document containing design images and text.
- Created one-of-its-kind multimodal dataset and performed audio retrieval using cross-modal attention.[Webpage]

Self-supervised learning approaches for speaker diarization
Guide: Prof. Sriram Ganapathy, Electrical Engineering, IISc *Aug. 2019 – Aug. 2021*
- Designed algorithm for representation learning using pseudo-labels clustering [ISCA INTERSPEECH, 2020].
- Introduced graph based path integral clustering to perform speaker diarization [IEEE TASLP, 2021].
- Developed method to jointly perform representation learning and metric learning [IEEE ASRU, 2021].
- In collaboration with BTIRC.

System for Third DIHARD speech diarization challenge
Guide: Prof. Sriram Ganapathy, Electrical Engineering, IISc *Aug. 2020 – Jan. 2021*
- Contributed in baseline system setup for the DIHARD-III challenge. It involved task to partition an audio into speaker segments, in challenging environment [ISCA INTERSPEECH 2021].
- Participated in challenge and was among top 10 teams across globe.[ISCA INTERSPEECH 2021].

ACHIEVEMENTS

- **Scholarships**: Awarded MHRD PhD Scholarship (2017-2023). Awarded Full-Tuition Dhirubhai Ambani Foundation Undergraduate Scholarship (2011-2015).
- **Travel Grants:** Institute Travel Grant (2019,2023), SPS ICASSP Travel Grant 2023, ISCA Interspeech Travel Grant 2019.
- **Memberships:** IEEE-HKN lifetime honorary member.

PUBLICATIONS

Conferences:

1. Kalluri, S.B., **P. Singh**, P. Roy Chowdhuri, A. Kulkarni, S. Baghel, P. Hegde, S. Sontakke, D. K T, S.R.M. Prasanna, D. Vijayasenan, S. Ganapathy, The Second DISPLACE Challenge: DIarization of SPeaker and LAnguage in Conversational Environments, in Interspeech 2024 [Link].
2. S. Baghel, S. Ramoji, Sidharth, R. H, **P. Singh**, S. Jain, P. Chowdhuri, K. Kulkarni, S. Padhi, D. Vijayasenan and S. Ganapathy, "DISPLACE Challenge: DIarization of SPeaker and LAnguage in Conversational Environments", in Interspeech 2023[Link].
3. **P. Singh**, S. Karanam and S. Shekhar, "Audio Retrieval For Multimodal Design Documents: A New Dataset And Algorithms", arXiv preprint arXiv:2302.14757 (2023) [Link].
4. **P. Singh**, A. Kaul and S. Ganapathy, "Supervised Hierarchical Clustering using Graph Neural Networks for Speaker Diarization", in IEEE ICASSP 2023 [Link].
5. **P. Singh** and S. Ganapathy, "Self-Supervised Metric Learning with Graph Clustering for Speaker Diarization", in IEEE ASRU 2021 [Link].
6. **P. Singh**, R. Varma, V. Krishnamohan, S. R. Chetupalli, and S. Ganapathy. "LEAP Submission for the Third DIHARD Diarization Challenge." in Interspeech 2021 [Link].
7. N. Ryant, **P. Singh**, V. Krishnamohan, R. Varma, K. Church, C. Cieri, J. Du, S. Ganapathy, and M. Liberman. "The Third DIHARD Diarization Challenge." in Interspeech 2021 [Link].
8. **P. Singh** and S. Ganapathy, "Deep Self-Supervised Hierarchical Clustering for Speaker Diarization", INTERSPEECH 2020 [Link].
9. S. Ramoji, P. Krishnan, B. Mysore, **P. Singh**, S. Ganapathy, "LEAP System for SRE19 Challenge – Improvements and Error Analysis", Speaker Odyssey Workshop 2020 [Link].
10. **P. Singh**, Harsha Vardhan MA, S. Ganapathy, A. Kanagasundaram, "LEAP Diarization System for the Second DIHARD Challenge", INTERSPEECH 2019 [Link].
11. A. Kanagasundaram, S. Sridharan, S. Ganapathy, **P. Singh**, C. Fookes, "A Study of X-vector Based Speaker Recognition on Short Utterances", INTERSPEECH 2019 [Link].
12. S. Ramoji, A. Mohan, B. Mysore, A. Bhatia, **P. Singh**, Harsha Vardhan, S. Ganapathy, "The LEAP Speaker Recognition System for NIST SRE 2018 Challenge", ICASSP 2019 [Link].

Journals:

1. **P. Singh** and S. Ganapathy, " End-to-End Supervised Hierarchical Graph Clustering for Speaker Diarization", in IEEE/ACM Transactions on Audio, Speech, and Language Processing (under review) [Draft].
2. S. Baghel, S. Ramoji, , S. Jain, P. Chowdhuri, **P. Singh**, D. Vijayasenan and S. Ganapathy, "Summary of the DISPLACE challenge 2023-DIarization of SPeaker and LAnguage in Conversational Environments", in Speech Communication 2024 [Link].
3. **P. Singh** and S. Ganapathy, "Self-supervised Representation Learning With Path Integral Clustering For Speaker Diarization", in IEEE/ACM Transactions on Audio, Speech, and Language Processing (2021) [Link].

SKILLS & OTHERS

- **Deep learning Tools:** PyTorch, Tensorflow, Matlab, Kaldi.
- **Coding Language:** Excellent in Python, Knowledge of C, C++, Java.
- **Courses taken:** Stochastic Models, Computational Methods for Optimization, Matrix theory, Pattern Recognition & Neural Networks, Detection & Estimation Theory, Adaptive Signal Processing, Speech Information Processing.

ACADEMIC SERVICES

- **Teaching Assistant (3):** Machine Learning and Signal Processing [E9:205, Fall 2019] , Deep learning theory and Practice [CCE, Spring 2020] and Advanced Deep Learning [E9:309, Fall 2020].
- **Reviewer (12):** IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions of Audio Speech and Language Processing, Sadhana- Journal of Indian Academy of Sciences, IEEE ICASSP, Interspeech.
- **Presentations (11):** paper presentations (5) in ICASSP 2023, ASRU 2021, Interspeech 2019-2021. Doctoral symposiums (3) in EECS IISc 2021-2022, ACM/IEEE AI-ML systems 2022. Invited talks (3) at IEEE-IISc Shannon's day talk series 2021, DIHARD-III challenge workshop 2020 [link], women in research, PyConIndia 2020 [link].
- **Memberships:** Chair, IEEE-IISc, Women in Science and Engineering Affinity Group (2021-2022), Member, IEEE-IISc SPS student chapter. Organized talks and events for high school, undergrad and graduate students.

CO-CURRICULAR & EXTRA-CURRICULAR

- Invited for Google Research week at Google Research, India (2022-2024).
- Speech Processing Professional Interview in theinterviewportal.com.
- Article: Probabilistic Linear Discriminant Analysis Explained in towardsdatascience.com
- Member of IISc Notebook Drive, a college initiative to teach government school children.
- Hobbies: Enjoy playing Badminton and table tennis, playing Violin, part of college Bhangra group.

REFERENCES

1. Prof. Sriram Ganapathy
Associate Professor, Department of Electrical Engineering, Indian Institute of Science. **Mail Id:** sriramg@iisc.ac.in

2. Prof.Emanuël Habets
Professor, Internation Audio Laboratories Erlangen,Germany. **Mail Id:** emanuel.habets@audiolabs-erlangen.de

3. Dr. Srikrishna Karanam
Research Scientist, Adobe Research, India. **Mail Id:** skaranam@adobe.com