

# Prachi Singh

PhD Scholar

Indian Institute of Science, Bangalore

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Webpage, LinkedIn

Speech and AI researcher with 5+ years of experience in speech processing and deep learning seeking research positions in applied machine learning and deep learning.

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## RESEARCH INTEREST

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

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## EDUCATION

**Indian Institute of Science, Electrical Engineering, Bangalore, India**

PhD in Speech & Audio [GPA : 8.0]

Aug. 2017 – Present.

Awarded MHRD Scholarship

**College of Engineering, Pune, Pune, India**

Bachelors of Engineering in Electronics & Telecommunication [GPA : 8.7]

Aug. 2011 – Apr. 2015

Awarded Full-Tuition Dhirubhai Ambani Foundation Scholarship

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## RELEVANT WORK EXPERIENCE

**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

Electronic Control Unit(ECU) modelling, Hardware In Loop Testing and Validation of Infotainment system.

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## RESEARCH PROJECTS

**End to end supervised hierarchical graph clustering for speaker diarization**

Guide: Prof. Sriram Ganapathy, Electrical Engineering, IISc

Aug. 2022 – Present.

- Developed a supervised hierarchical 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 containing image-caption-music pairs based on mood/themes for retrieval and classification tasks.
- Developed method to perform audio retrieval using cross-modal attention.
- Evaluated performance of baseline approaches for benchmarking dataset. [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. Our system involved combination of End-to-End diarization based on transformers for telephone conversation and graph based clustering for multi-speaker conversations [ISCA INTERSPEECH 2021].

**Speaker Diarization using Posterior Scaled VB-HMM**

Guide: Prof. Sriram Ganapathy, Electrical Engineering, IISc

Aug. 2020 – Jan. 2021

- Performed speaker diarization on challenging DIHARD-II dataset using posterior scaled Variational Bayes - Hidden Markov Model. Runner-up in DIHARD-II 2019. [ISCA INTERSPEECH 2019].
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## PUBLICATIONS

Websites: Google Scholar, GitHub

### Conference:

- o 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.
- o **P. Singh**, S. Karanam and S. Shekhar, "Audio Retrieval For Multimodal Design Documents: A New Dataset And Algorithms", arXiv preprint arXiv:2302.14757 (2023).
- o **P. Singh**, A. Kaul and S. Ganapathy, "Supervised Hierarchical Clustering using Graph Neural Networks for Speaker Diarization", in IEEE ICASSP 2023.
- o **P. Singh** and S. Ganapathy, "Self-Supervised Metric Learning with Graph Clustering for Speaker Diarization", in IEEE ASRU 2021.
- o **P. Singh**, R. Varma, V. Krishnamohan, S. R. Chetupalli, and S. Ganapathy. "LEAP Submission for the Third DIHARD Diarization Challenge." in Interspeech 2021.
- o 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.
- o **P. Singh** and S. Ganapathy, "Deep Self-Supervised Hierarchical Clustering for Speaker Diarization", INTERSPEECH 2020.
- o S. Ramoji, P. Krishnan, B. Mysore, **P. Singh**, S. Ganapathy, "LEAP System for SRE19 Challenge – Improvements and Error Analysis", Speaker Odyssey Workshop 2020.
- o **P. Singh**, Harsha Vardhan MA, S. Ganapathy, A. Kanagasundaram, "LEAP Diarization System for the Second DIHARD Challenge", INTERSPEECH 2019.
- o A. Kanagasundaram, S. Sridharan, S. Ganapathy, **P. Singh**, C. Fookes, "A Study of X-vector Based Speaker Recognition on Short Utterances", INTERSPEECH 2019.
- o 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.

### Journal:

- o **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).

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## SKILLS & OTHERS

**Courses taken:** Stochastic Models and Applications, Computational Methods for Optimization, Matrix theory, Pattern Recognition and Neural Networks, Detection and Estimation Theory, Adaptive Signal Processing.

**Deep learning Tools:** PyTorch, Tensorflow, Matlab.

**Coding Language:** Excellent in Python, Knowledge of C, C++, Java.

**Presentations:** 4 paper presentations in ASRU 2021, Interspeech 2019-2021. 3 doctoral symposiums in EECS IISc 2021-2022, ACM/IEEE AI-ML systems 2022.

**Invited Talks:** 3 Invited talks at IEEE-IISc Shannon's day talk series 2021, DIHARD-III challenge workshop 2020 [link], women in research, PyConIndia 2020 [link].

**Teaching Assistant:** Assisted in 3 courses: 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]. Involved in assignments and exams question-set formulation, evaluation and tutorials on basics.

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## CO-CURRICULAR & EXTRA-CURRICULAR

- o **Recent Awards:** IEEE-HKN lifetime honorary member, SPS ICASSP Travel Grant 2023, ISCA Interspeech Travel Grant 2019.
- o Reviewer of 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.
- o Invited for Google Research week at Google Research, India (2022, 2023).
- o Speech Processing Professional Interview in [theinterviewportal.com](http://theinterviewportal.com).
- o Article: Probabilistic Linear Discriminant Analysis Explained in [towardsdatascience.com](http://towardsdatascience.com)
- o Chair, IEEE-IISc, Women in Science and Engineering Affinity Group (2021-2022), Member, IEEE-IISc SPS student chapter. Involved in organising talks and events for high school, undergrad and graduate students.
- o Member of IISc Notebook Drive, a college initiative to teach government school children.
- o Hobbies: Enjoy playing Badminton and table tennis, playing Violin, part of college Bhangra group.

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## REFERENCES

Prof. Sriram Ganapathy

Associate Professor, Department of Electrical Engineering, Indian Institute of Science.

**Mail Id:** sriramg@iisc.ac.in

Dr. Srikrishna Karanam

Research Scientist, Adobe Research, India.

**Mail Id:** skaranam@adobe.com

Prof. K V S Hari

Professor, Department of Electrical Communication Engineering, Indian Institute of Science.

**Mail Id:** hari@iisc.ac.in

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