[Curriculum Vitae] Purvi Agrawal

CONTACT INFORMATION

PhD Scholar,
Learning and Extraction of Acoustic Patterns (LEAP) Lab,
Dept. of Electrical Engineering (EE),
Indian Institute of Science, Bangalore (IISc), India

e-mail: purvia@iisc.ac.in
webpage: leap.ee.iisc.ac.in/purvi
linkedin.com/in/purvi-agrawal
github.com/PurviAgrawal

RESEARCH OBJECTIVE

Looking for opportunities in the research and development of cutting-edge technologies, and for providing solutions to real world machine learning problems on speech and audio data.

TOPICS OF INTEREST

Deep learning, speech processing, representation learning, source separation, explainable AI, natural language processing.

CURRENT POSITION

Research Associate in LEAP lab, Indian Institute of Science (IISc) with Dr. Sriram Ganapathy (Aug 2020 - Present). I will be joining Microsoft India as 'Applied Research Scientist-II' from January 2021.

EDUCATION

PhD Scholar   **2015 – 2020**
Indian Institute of Science (IISc), Bangalore, India
Dept. of Electrical Engineering (6/8)
Thesis Title: Neural Representation Learning for Speech and Audio Signals
Supervisor: Dr. Sriram Ganapathy, Dept. EE, IISc

Master of Technology   **2013-2015**
Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT),
Gandhinagar, India
Communication and Signal Processing (8.46/10)
Thesis Title: Analysis of nonlinearity in speech production mechanism for speaker verification:
Phase-based approach (Supervisor: Prof. Hemant Patil)

Bachelor of Engineering   **2009-2013**
College of Technology and Engineering, Udaipur, India
Electronics and Communication Engineering (7.92/10)

INDUSTRY EXPERIENCE

SONY Corporation, Audio Technology Development Dept., System R & D Group,
Tokyo, Japan - [Internship]   **Sept. - Nov., 2017**
Phase modeling for audio source separation using Generative Adversarial Networks (GANs).
Mentors: Naoya Takahashi and Yuki Mitsufuji.

Bharat Heavy Electricals Limited (B.H.E.L.), India [Intership]   **July, 2012**
Dealt with switch gears, electronic controllers, distributed control systems.

Airports Authority of India, Udaipur, India [Internship]   **July, 2011**
Studied about communication, navigational and surveillance facilities.

SKILLS

- Languages: Python, Shell, C, HTML
- Tools: Kaldi, PyTorch, Scikit Learn, Librosa, MATLAB, LaTeX
- Operating System: Unix/Linux, Windows, Mac OS

PhD Research Outline

Title: Neural Representation Learning for Speech and Audio Signals
PhD Supervisor: Dr. Sriram Ganapathy
Research Highlights:

- Focused on developing neural methods for representation learning of speech and audio signals, with the goal of improving downstream applications that rely on these representations (primarily ASR).

- Identifies two stages of representation learning from raw speech/audio waveform. For each stage, we pursue two broad directions - supervised and unsupervised.

- First part of the thesis work - deals with unsupervised learning of representations. It learns first stage of time-frequency representations from raw waveforms, and second stage of modulation representations that are distinct and irredundant. Uses - RBM, AE, VAE, GAN, skip-connection, residual and modified cost function.

- Second part of the work - deals with supervised 2-stage deep representation learning consisting of a relevance weighting mechanism. It acts as a feature selection module and weighs the relevance of the acoustic and modulation representations in predicting the target class.

- 2-stage approach may also use target embeddings to learn representation weighting (word2vec style). The proposed approach is then extended to audio signals for the urban sound classification task. Uses DNN, CNN, LSTM layers with parametric design of layers.

Publications

Peer Reviewed Journals

- P. Agrawal, S. Ganapathy, "Interpretable Representation Learning for Speech and Audio Signals Based on Relevance Weighting,", *Transactions on Audio, Speech and Language Processing,* 28 (2020): 2823-2836. [GitHub]
- P. Agrawal, S. Ganapathy, "Modulation filter learning using deep variational networks for robust speech recognition," *IEEE Journal of Selected Topics in Signal Processing, Special Issue on Data Science: Machine Learning for Audio Signal Processing*, 13, no. 2 (2019): 244-253. [GitHub]
- P. Agrawal, S. Ganapathy, "Unsupervised Modulation Filter Learning for Noise-Robust Speech Recognition," *Journal of Acoustical Society of America*, 142, no. 3 (2017): 1686-1692. [Github]

Peer Reviewed Conferences

- P. Agrawal, S. Ganapathy, "Representation Learning For Speech Recognition Using Feedback Based Relevance Weighting," manuscript under review, 2020.
- P. Agrawal, S. Ganapathy, "Robust Raw Waveform Speech Recognition Using Relevance Weighted Representations", *Proc. of Interspeech*, pp. 1649-1653, 2020. [GitHub]
- P. Agrawal, S. Ganapathy, "Unsupervised Raw Waveform Representation Learning for ASR," *Proc. of Interspeech*, pp. 3451-3455, 2019. [GitHub]
- P. Agrawal, S. Ganapathy, "Deep variational filter learning models for speech recognition," *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pp. 5731-5735, 2019.
- P. Agrawal, S. Ganapathy, "Comparison of unsupervised modulation filter learning methods for ASR," *Proc. of Interspeech*, pp. 2908-2912, 2018.
- N. Takahashi, P. Agrawal, N. Goswami, Y. Mitsufuji, "PhaseNet: Discretized phase modeling with deep neural networks for audio source separation," *Proc. of Interspeech*, pp. 2713-2717, 2018.
- P. Agrawal, S. Ganapathy, "Speech Representation Learning Using Unsupervised Data-Driven Modulation Filtering for Robust ASR," *Proc. of Interspeech*, pp. 2446-2450, 2017.
- P. Agrawal, Hemant A. Patil, "Fusion of a Novel Volterra-Wiener Filter based Nonlinear Residual Phase and MFCC for Speaker Verification," *Int. Conf. on Speech and Computer (SPECOM)*, pp. 389-397. Springer, Cham, 2017.
- P. Agrawal, Hemant A. Patil, "Fusion of TEO phase with MFCC features for speaker verification," *Proc. Int. Conf. on Perception and Machine Intelligence (PerMIn)*, C-DAC, pp. 161-166, 2015.

Research Challenges

- "Interspeech 2018 Special Session: Low Resource Speech Recognition Challenge for Indian Languages - by Microsoft Research," finished 3rd on leaderboard with team CSALT-LEAP - P. Agrawal, S. Singh, J. Shankar, S. Ganapathy, P. Jyothi.
- "The 5th CHiME Speech Separation and Recognition Challenge 2018," finished in top 10 teams for single-array track with team LEAP - S. Ganapathy, P. Agrawal.

Google Scholar: scholar.google.com/citations-PurviAgrawal

Courses in Research

Speech Information Processing, Time Frequency Analysis, Machine Learning in Signal Processing, Mathematical methods and techniques in signal processing, Random process, Signal quantization and compression, Matrix theory, Signals and systems.

Teaching Assistantship

- Deep learning - theory and practice, IISc — **Jan-May 2019**
- Speech information processing, IISc — **Jan-May 2018**
- Analog and digital communication, DA-IICT — **Jan-Apr 2015**
- Communication skills, DA-IICT — **July-Nov 2014**
- Signals and systems, DA-IICT — **May-Jun 2014**
- Analog and digital communication, DA-IICT — **Jan-Apr 2014**
- Communication skills, DA-IICT — **July-Nov 2013**

Awards and Achievements

- Received student best paper award, "Neural Representation Learning of Speech Signals", in 'Speech, Data Analytics and Machine Learning' Track, EECS Research Students' Symposium, IISc, 2020.
- Ph.D. Thesis Colloquium, P. Agrawal, "Neural Representation Learning of Speech and Audio Signals", IISc, July 2020.
- Received best poster award, "Unsupervised Representation Learning for Speech Recognition", in AI/ML category, EECS Research Students Symposium, IISc, 2019.
- Pratiksha Travel Fellowship (PTF) to attend Interspeech 2019, Graz, Austria.
- International Speech Communication Association (ISCA) student travel grant to attend Interspeech 2017, Stockholm, Sweden.
- Research Associate Fellowship from British Telecom India Research Center (BTIRC), IISc, Aug-Nov 2020.
- Ministry of Human Resource and Development (MHRD) Postgraduate Research Scholarship, 2015-2020.
- University Grants Commission (UGC) GATE Scholarship during M.Tech, 2013-2015.

Workshops and Conferences

- "Unsupervised Representation Learning for Robust Speech Recognition", 5th Doctoral Consortium, ISCA event, Interspeech 2019, Graz, Austria.
- Panel Discussion (Invited), "Workshop for Young Female Researchers in Speech Science & Technology," Interspeech 2018.
- Invited talk at Convergence-2, The Machine Learning Conference 2018, Sony India Software Centre Pvt. Ltd., Feb 2018.
- Workshop on Brain, Computation, and Learning (BCL) 2017 to 2019 - IISc, Bangalore.
- Winter School on Speech and Audio Processing (WiSSAP) - 2014 to 2020.

Referees

- Dr. Sriram Ganapathy — leap.ee.iisc.ac.in/sriram
- Mr. Yuki Mitsifuji — linkedin.com/in/YukiMitsifuji
- Mr. Naoya Takahashi — linkedin.com/in/naoyatakahashi
- Prof. Hemant Patil — sites.google.com/site/hemantpatildaiict
- Prof. Chandra Sekhar Seelamantula — sites.google.com/site/chandrasekharseelamantula

Prefessional Memberships

- IEEE, IEEE-Signal Processing Society — Student Member
- International Speech Communication Association (ISCA) — Student Member

Media Interaction

- 'Hey Computer, can you hear me well minus all the noise' - Research Matters magazine, India.
  researchmatters.in/news/hey-computer-can-you-hear-me-well-minus-all-noise

Extra-curricular Activities

- Volunteer of the EE Student Seminar Series, EE, IISc, Bangalore (2017 - 2020).
- Volunteer in the organization team of workshops SPICE 2018, WiSSAP 2017, WISSAP 2015.
- Worked as Student Placement Cell member from 2013- 2014 at DA-IICT, Gandhinagar.
- On personal note - Dancing, trekking, cycling, badminton, cooking, writing poems, reading novels.