

INTEREST	Audio Processing, Multimodal Learning, Generative AI	
CURRENT POSITION	Senior Applied Scientist at Microsoft Speech team <i>Research on source separation, speech enhancement, audio understanding</i>	
EDUCATION	Carnegie Mellon University <i>Ph.D. in Electrical and Computer Engineering</i> <ul style="list-style-type: none"> Research: Learning Audio Foundation Models for Reasoning Advisor: Prof. Bhiksha Raj 	Pittsburgh, USA 2025 (<i>expected</i>)
	Carnegie Mellon University <i>Masters in Electrical and Computer Engineering</i> <ul style="list-style-type: none"> Research: Self-supervised learning for sound event detection Advisor: Prof. Bhiksha Raj 	Pittsburgh, USA 2019 - 2020
	Veermata Jijabai Technological Institute <i>Bachelors in Technology, Electronics Engineering</i> <ul style="list-style-type: none"> Research: Detecting harmful content in online conversations Advisor: Prof. Faruk Kazi 	Mumbai, India 2015 - 2019
	Senior Applied Scientist, Microsoft Speech team <i>Speech and audio processing. Research used in Microsoft Teams, Azure Edge, Video Translation API</i> Mar 2022 - current	
	Applied Scientist, Microsoft NLP team <i>Task Oriented Dialogue Understanding. Research used in Scheduler, and later Outlook Copilot</i> Jan 2021 - Mar 2022	
	Research Assistant, MLSP Group <i>Advisor: Rita Singh</i> <i>Topic: Physics-based models for vocal fold parameter estimation</i> Aug 2020 - Dec 2020	
EXPERIENCE	Applied Scientist Intern, Microsoft Yammer <i>Feed Recommendation and Information Retrieval</i> May 2020 - Aug 2020	
	Research Assistant, MLSP Group <i>Advisor: Bhiksha Raj</i> <i>Topic: Audio event classification and detection</i> Jan 2020 - May 2020	
	Undergraduate Research Assistant, CoE-CNDS Lab <i>Advisor: Faruk Kazi</i> <i>Topic: Deepfake Detection</i> 2018 - 2019	
	Intern, Siemens R&D <i>Topic: Signal Processing for Predictive Maintenance</i> May 2018 - Aug 2018	
	Undergraduate Research Assistant, CoE-CNDS Lab <i>Advisor: Faruk Kazi</i> <i>Topic: Detecting harmful content in online conversations</i> 2017 - 2018	

PUBLICATIONS

Complete list of publications available at *Google Scholar*

1. ADIFF: Explaining audio difference using natural language
Soham Deshmukh, Shuo Han, Rita Singh, Bhiksha Raj
International Conference on Learning Representations (ICLR) 2025 (spotlight)
2. MACE: Leveraging Audio for Evaluating Audio Captioning Systems
Satvik Dixit, **Soham Deshmukh**, Bhiksha Raj
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Speech and Audio Language Models (SALMA) workshop, 2025
3. Audio entailment: Assessing deductive reasoning for audio understanding
Soham Deshmukh, Shuo Han, Hazim Bukhari, Benjamin Elizalde, Hannes Gamper, Rita Singh, Bhiksha Raj
Association for the Advancement of Artificial Intelligence (AAAI) 2025 (Oral)
4. Domain Adaptation for Contrastive Audio-Language Models
Soham Deshmukh, Rita Singh, Bhiksha Raj
Annual Conference of the International Speech Communication Association (INTER-SPEECH) 2024
5. PAM: Prompting Audio-Language Models for Audio Quality Assessment
Soham Deshmukh, Dareen Alharthi, Benjamin Elizalde, Hannes Gamper, Mahmoud Al Ismail, Rita Singh, Bhiksha Raj, Huaming Wang
Annual Conference of the International Speech Communication Association (INTER-SPEECH) 2024
6. SELM: Enhancing Speech Emotion Recognition for Out-of-Domain Scenarios
Hazim Bukhari, **Soham Deshmukh**, Hira Dhamyal, Bhiksha Raj, and Rita Singh.
Annual Conference of the International Speech Communication Association (INTER-SPEECH) 2024
7. Training Audio Captioning Models without Audio
Soham Deshmukh, Benjamin Elizalde, Dimitra Emmanouilidou, Bhiksha Raj, Rita Singh, and Huaming Wang
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2024
8. Multi-modal Language Models in Bioacoustics with Zero-shot Transfer: A Case Study
Zhongqi Miao, Benjamin Elizalde, **Soham Deshmukh**, Justin Kitzes, Huaming Wang, Rahul Dodhia, Juan Lavista Ferres
Scientific Report, Nature Portfolio
9. Natural Language Supervision for General-Purpose Audio Representations
Benjamin Elizalde*, **Soham Deshmukh***, Huaming Wang.
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2024
10. Prompting Audios Using Acoustic Properties For Emotion Representation
Hira Dhamyal, Benjamin Elizalde, **Soham Deshmukh**, Huaming Wang, Bhiksha Raj, Rita Singh
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2024
11. Pengi: An Audio Language Model for Audio Tasks
Soham Deshmukh, Benjamin Elizalde, Rita Singh, Huaming Wang
Conference on Neural Information Processing Systems (NeurIPS) 2023
12. Audio Retrieval with WavText5K and CLAP Training
Soham Deshmukh, Benjamin Elizalde, Mahmoud Al Ismail, Huaming Wang
Annual Conference of the International Speech Communication Association (INTER-SPEECH) 2023

PUBLICATIONS	13. Multi-View Learning for Speech Emotion Recognition With Categorical Emotion, Categorical Sentiment, & Dimensional Scores. Daniel Tompkins, Dimitra Emmanouilidou, Soham Deshmukh , Benjamin Elizalde <i>IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)</i> , 2023	
	14. CLAP: Learning Audio Concepts from Natural Language Supervision Benjamin Elizalde, Soham Deshmukh , Mahmoud Al Ismail, Huaming Wang <i>IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)</i> , 2023	
	15. Improving weakly supervised sound event detection with self-supervised auxiliary tasks Soham Deshmukh , Bhiksha Raj, Rita Singh. <i>Annual Conference of the International Speech Communication Association (INTER-SPEECH)</i> 2021	
	16. Interpreting glottal flow dynamics for detecting COVID-19 from voice Soham Deshmukh , Mahmoud Al Ismail, Rita Singh <i>IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)</i> , 2021	
	17. Detection of COVID-19 through the analysis of vocal fold oscillations Mahmoud Al Ismail, Soham Deshmukh , Rita Singh <i>IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)</i> , 2021	
	18. Temporal and Stochastic Modelling of Attacker Behaviour Rahul Rade, Soham Deshmukh , Raturaj Nene, Amey Wadekar, Ajay Unny <i>International Conference on Intelligent Information Technologies (ICIIT)</i> , 2019	
	19. Tackling Toxic Online Communication with Recurrent Capsule Networks Soham Deshmukh , Rahul Rade <i>Conference on Information and Communication Technology (CICT)</i> , 2018	
PATENTS	1. Training framework for automated tasks involving multiple machine learning models Charles Yin-che Lee, Ruijie Zhou, Neha Nishikant, Soham Deshmukh , Jeremiah D Greer <i>US Patent, US-17/516940</i> , 2023	
TEACHING	Teaching Assistant, Carnegie Mellon University Course: <i>Graph Signal Processing</i> by José Moura	2024.08 - 2024.12
	Teaching Assistant, Carnegie Mellon University Course: <i>Machine Learning for Signal Processing</i> by Bhiksha Raj	2023.08 - 2023.12
	Teaching Assistant, Carnegie Mellon University Course: <i>Introduction to Machine Learning</i> by Gauri Joshi	2020.01 - 2020.05
INVITED TALKS	• Towards zero-shot audio models, Robust MLSP, Carnegie Mellon University	2023
	• Learning audio concepts from natural language supervision, Microsoft Research, Audio Group	2022
	• Weakly and semi-supervised learning with its applications in audio and speech, Spoken Language Systems group (SLS), CSAIL, MIT	2020
	• Attacker behaviour profiling and modelling framework for honeypot data: CoE-CNDS, ICICI bank, Cyber Peace Foundation	2018

ACADEMIC SERVICE

- **Organizer:**
Workshop Speech and Audio Language Models (SALMA) at ICASSP 2025
Special Session on Synergy between human and machine approaches to sound/scene recognition and processing at ICASSP 2023
- **Reviewer:**
International Conference on Acoustics, Speech, and Signal Processing (ICASSP)
Conference of the International Speech Communication Association (INTERSPEECH)
Conference on Neural Information Processing Systems (NeurIPS)
International Conference on Learning Representations (ICLR)
Detection and Classification of Acoustic Scenes and Events (DCASE)
IEEE/ACM Transactions on Audio, Speech, and Language Processing (TASLP)

RESEARCH ADVISING

Interns advised at Microsoft

- Hira Dharmyal, PhD student, Carnegie Mellon University (co-advised with Benjamin Elizalde) $\xrightarrow{\text{next}}$ Siri, Apple
- Ruijie Zhuo, PhD student, University of California, Berkeley $\xrightarrow{\text{next}}$ Applied Scientist, Microsoft
- Neha Nishikant, Bachelors, Carnegie Mellon University $\xrightarrow{\text{next}}$ Data scientist, Palantir

Students mentored

- Shuo Han, Masters student, Carnegie Mellon University
- Hazim Bukhari, Masters student, Carnegie Mellon University

OPEN-SOURCE

1. **Models:** CLAP (400+ stars), Pengi (200+ stars), PAM (40+ stars)
2. **Datasets:** Audio Entailment, Style transfer for Audio Captioning, WavText5K

PRESS COVERAGE

- **Microsoft Unlocked** Audio AI used for bioacoustics in Amazon Rainforest
- **Microsoft Research Blog** Research on Automated Audio Captioning featured in Microsoft Research Blog
- **Analytics India Magazine 2023:** Microsoft launches Pengi, an Audio Language Model for Open-ended Tasks
- **Business Insider 2020:** Do I sound sick to you? Researchers are building AI that would diagnose COVID-19 by listening to people talk
- **Pittsburgh News 2020:** Coronavirus detected by voice? Carnegie Mellon researchers Develop app to 'listen' for signs of COVID-19
- **Forbes 2020:** AI and medical diagnostics: can a smartphone app detect COVID-19 from speech or cough?
- **Indiatimes 2020:** News coverage of Deepfake efforts in VJTI CoE-CNDS
- **CoE-CNDS 2019:** 4.49 Crore funding from MHA for AI Deepfake work and detection in the wild
- **DNIF newsletter 2019:** Modelling attacker behavioral patterns using statistical machine learning algorithms