Ishwarya Ananthabhotla

Machine Learning | Auditory Cognition & Perception | Auditory Interfaces

(xxx) xxx-xxxx | ishwarya@mit.edu | www.mit.edu/ ishwarya | ishwarya-ananthabhotla

I am interested in statistical methods for modeling auditory cognition and perception for applications in audio interface design. I work at the intersection of machine learning, audio signal processing, cognitive science, and human-computer interaction.

Education

Massachusetts Institute of Technology *Cambridge, MA*

PhD in Media Arts and Science — *August 2021 (expected), GPA: 5.0/5.0*
M.Eng in Electrical Engineering and Computer Science — *June 2016, GPA: 5.0/5.0*
S.B. in Electrical Engineering and Computer Science — *June 2015, GPA: 4.6/5.0*

Publications

2021 **Ishwarya Ananthabhotla**, David B. Ramsay, Clement Duhart, Joseph A. Paradiso. "Cognitive Audio Interfaces: Mediating Sonic Information with an Understanding of How We Hear." IEEE Pervasive Computing

2021 **Ishwarya Ananthabhotla**, Vamsi Krishna Ithapu, W. Owen Brimijoin. "A Framework for Designing Head-related Transfer Function (HRTF) Distance Metrics that Capture Localization Perception." Journal of the Acoustical Society of America Express Letters

2020 **Ishwarya Ananthabhotla**, Sebastian Ewert, Joseph A. Paradiso. "Using a Neural Network Codec Approximation Loss to Improve Source Separation Performance in Limited Capacity Networks". IJCNN Special Session on Deep Neural Audio Processing

2019 **Ishwarya Ananthabhotla**, Sebastian Ewert, Joseph A. Paradiso. "Towards a Perceptual Loss: Using a Neural Network Codec Approximation as a Loss for Generative Audio Models". Proceedings of ACM Multimedia

2019 David B. Ramsay*, **Ishwarya Ananthabhotla***, Joseph A. Paradiso. "The Intrinsic Memorability of Everyday Sounds". Proceedings of AES International Conference on Immersive and Interactive Audio

2019 **Ishwarya Ananthabhotla***, David B. Ramsay*, Joseph A. Paradiso. "HCU400: An Annotated Dataset for Exploring Aural Phenomenology through Causal Uncertainty." Proceedings of the International Conference on Acoustics, Speech, and Signal Processing

2018 **Ishwarya Ananthabhotla** and Joseph A. Paradiso. "SoundSignaling: Realtime, Stylistic Modification of a Personal Music Corpus for Information Delivery". Proceedings of ACM IMWUT

2017 **Ishwarya Ananthabhotla**, Joseph A. Paradiso. "VisualSoundtrack: An Approach to Style Transfer in the Context of Soundtrack Composition", International Computer Music Conference

Recent Awards & Media

2020-2022 Apple Fellowship in Artificial Intelligence and Machine Learning
2016-2019 National Science Foundation Graduate Research Fellowship
2019 AIGrant Recipient
2019 NVIDIA GPU Grant Recipient
2021 Physics Today Spotlight, "Quantifying Perceptual Errors in Virtual Soundscapes"
2019 NPR Spotlight, "Towards New Musics: What the Future Holds for Sound Creativity"
2019 MIT News Spotlight, "Developing tech for, and with, people with disabilities"

Recent Talks

Spring 2021 Northwestern University CS Colloquium Series - "Cognitive Audio: Enabling Auditory Interfaces with an Understanding of How we Hear"
Fall 2020 AES Symposium: Applications of Machine Learning in Audio - "Cognitive Audio: Enabling Auditory Interfaces with an Understanding of How we Hear"
Fall 2020 MIT Media Lab Industry Sponsor Workshops, "Cognition-driven Responsive Environments"
Fall 2019 AES Interactive and Immersive Audio Panel, "Bridging the Gap: Exploiting User Interaction for New Immersive Audio Technologies"
Fall 2019 Guest Lecturer, "Introduction to Music Technology - 21M.080"

Recent Projects

Cognitive Audio

Graduate Research *Fall 2018 - Present*

- A long-term research theme with the goal of modeling pre-conscious auditory cognition (gestalt understanding and memory) and applying them to new auditory interfaces
- Constructed a custom audio dataset with accompanying acoustic and gestalt feature annotations, employing novel techniques to quantify the latter from crowd-sourced data
- Proposed strategies for using sparsely annotated data to estimate gestalt properties from real-world audio data
- Developed an approach to ambient audio summarization employing these models, mapping sample selection strategies to aesthetic/ emotional outcomes

Towards Perceptual Error Metrics for HRTFs

Facebook Reality Labs Internship & Graduate Research *Spring 2020 - Fall 2020*

- Developed a machine learning framework for constructing a perceptual error metric that is aligned with performance in human sound localization
- Presented strategies for constructing models with limited perceptual examples and feedback

Towards Perceptual Error Metrics for Source Separation

Spotify Internship & Graduate Research *Fall 2018 - Summer 2020*

- Developed early methods to introduce principles of spectral masking to error metrics for generative audio neural networks, as an improvement upon traditional sample-level metrics
- Demonstrated a performance improvement on commonplace source separation tasks for limited capacity neural networks

SoundSignaling

Graduate Research *Summer 2017 - Summer 2018*

- Designed and implemented a real-time system capable of modifying a personal corpus of audio in a stylistically relevant manner to convey information
- Incorporated cognitive science and HCI theories on auditory attention, music understanding, and task switch-cost

VisualSoundtrack

Graduate Research *Fall 2016 - Summer 2017*

- Designed algorithms and system architecture for a novel approach to musical style transfer in the context of soundtrack composition

Voice Hiding

Graduate Research *Spring 2017 - Fall 2017*

- Presented algorithms for robust data embedding in compressed audio with relaxed imperceptibility constraints

Recent Internships

Facebook Reality Labs *Redmond, WA*

Audio and Machine Learning PhD Intern *Feb 2020 - June 2020*

- Developed modeling frameworks for constructing perceptually-motivated error metrics for HRTF generation/ selection systems

Spotify *New York, NY*

Audio and Machine Learning PhD Intern *June 2018 - Sept. 2018*

- Developed deep learning architectures for end-to-end audio compression and reconstruction, capitalizing on semantic relations and perception

Teaching

Spring 2016 6.115 Microcomputer Project Laboratory
Spring 2015 6.115 Microcomputer Project Laboratory
Fall 2015 6.811 Principles and Practices of Assistive Technology
Fall 2014 6.811 Principles and Practices of Assistive Technology

Mentorship

Tal Boger

Yale University, Undergraduate *Spring 2021*

Project: Manipulating Causal Uncertainty in Sound Object Perception

Sree Harsha Nelaturu

SRM University/ MIT, Undergraduate *Spring - Summer 2019*

Project: Stylistic Audio Manipulation for Information Delivery

Outreach

2014-2020 MIT ATHack (Assistive Technologies Hackathon), *Co-Direction and Co-Founder*
2020 MIT Media Lab SOS Program, *Mentor for Underrepresented Applicants*
2017-2019 MIT WMBR Radio Host, , *Engineer and Producer*
2019 MIT Beaverworks Summer Institute & PPAT (6.811), *Guest Lecturer*

Skills & Interests

Technical Python & Data Stack, Deep Learning Frameworks, Audio Signal Processing, Audio Production, PCB Layout, Embedded Programming
Music Carnatic Vocal, Keys, Percussion, A Capella, Music Composition
Writing Fiction, One-Acts, Poetry, Spoken Word
Languages English, Telugu, French (Basic)