Vinayak Agarwal

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EDUCATION

PhD, School of Engineering, Massachusetts Institute of Technology — Cambridge, MA | 2018-Present
- Research on generative sound synthesis and computational models of machine/human intelligence
- **Advisor:** Prof. Josh McDermott at Laboratory of Computational Audition
- K Lisa Yang computational neuroscience graduate fellow

S.M. in Mechanical Engineering (Acoustics and Automation), IIT Bombay — Mumbai, India | June, 2018
- **Advisors:** Prof. Sripriya Ramamoorthy and Prof. Shankar Krishnan
- Nominated for the Best Masters Thesis Award 2018

B.S. (Honors) in Mechanical Engineering, IIT Bombay — Mumbai, India | June, 2017
- Undergraduate Research Award 2016

WORK EXPERIENCE (INDUSTRY)

Biostate AI | Consulting Research Scientist — Palo Alto, CA | Jul 2024 – present
- Working on developing multi-modal transformers for biological system representation using omics data
- Developing an LLM-based online tool using Claude for large scale data analysis and gene sequencing

Meta | Research Scientist Intern — Redmond, WA | May 2023 – Aug 2023
- Worked on generative audio synthesis and spatial audio rendering on AR glasses and MR headsets
- Developed and successfully demoed two new product-ready generative spatial audio renderers to the Meta leadership tested through large-scale human UX experiments
- Advised the audio team at **FAIR** on adding physical correctness and perceptual accuracy to their experimental audio foundation model

SELECTED PUBLICATIONS

ContactGPT: Prompt-based Synthesis Of Reverberant Contact Sounds Using A Mixture Of Acoustical Experts — in prep 2024
V Agarwal, JH McDermott

Physics, Ecological Acoustics, And The Auditory System — Current Biology 2024 (in press)
V Agarwal, J Traer, JH McDermott

Sample-efficient Learning Of Auditory Object Representations Using Differentiable Impulse Response Synthesis — ICML 2023
V Agarwal, J Traer, JH McDermott

Object-based Synthesis Of Scraping And Rolling Sounds Based On Non-linear Physical Constraints — DAFx 2021 (Oral)
V Agarwal, M Cusimano, J Traer, JH McDermott

Perception Of Physics From Contact Sounds Using Generative Priors — in prep, 2024
V Agarwal, J Traer, JH McDermott

Reviewer at **ICLR**, **ICML** and **IEEE** transactions on audio, **speech** and language processing

DOCTORAL THESIS

Computational Models Of Sound Synthesis And Auditory Inference Reveal Auditory Intuitive Physics

- **ContactGPT**- A novel GPT 4.0 based text/image prompt to audio model based on mixture of experts
- Physics-based differentiable synthesis of instantaneous and sustained contact sounds
- **Differentiable generative models** predict perceptual separation of space and object in human audition
- Developed the real-time sound synthesis and rendering capabilities of **ThreeDWorld** (Open-source 3D multimodal physics simulator) in collaboration with **IBM Research**

SKILLS

- **Languages and Packages**: Python, PyTorch, TensorFlow, JavaScript, MATLAB, HTML