Mark Saddler

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77 Massachusetts Ave,
Cambridge, MA 02139

Ph.D. candidate in MIT's Laboratory for Computational Audition developing machine learning models of human hearing. I am interested in how our ears and environment shape auditory perception and my research focuses on pitch perception, hearing loss, and audio enhancement via deep learning.

EDUCATION

Massachusetts Institute of Technology **Cambridge, MA**
Ph.D. Candidate in Brain and Cognitive Sciences Expected 12/2022

The University of Chicago **Chicago, IL**
B.A. in Biological Sciences (specialization in neuroscience) 06/2017
B.S. in Biological Chemistry
B.A. in Chemistry

RESEARCH EXPERIENCE

MIT Laboratory for Computational Audition **Cambridge, MA**
Ph.D. Student Researcher 10/2017 - present

- Developing artificial neural network models of human hearing to investigate underpinnings of normal and impaired auditory behavior and to build more perceptually-aligned audio enhancement systems. Currently examining the role of peripheral auditory representations in everyday speech / voice recognition and sound localization. Advised by Dr. Josh McDermott.

Woods Hole Oceanographic Institution **Woods Hole, MA**
Summer Student Fellow 06/2016 - 08/2016

- Developed MATLAB signal processing software for analyzing audio and accelerometer data from sensor-tagged marine mammals to study the acoustic behavior of Chilean blue whales. Participated in a humpback whale tagging cruise and assisted with a grey seal necropsy. Advised by Dr. Laela Sayigh.

The University of Chicago Epilepsy Lab **Chicago, IL**
Undergraduate Research Assistant 10/2015 - 06/2017

- Developed computational models of spontaneous network activity in neuron cultures to investigate mechanisms of epileptic seizure onset. Advised by Dr. Wim van Drongelen.

UCSD Scripps Institution of Oceanography **San Diego, CA**
Marine Physical Laboratory Intern 06/2015 - 09/2015

- Characterized acoustic behavior of marine mammal species in Antarctic and tropical waters. Wrote MATLAB programs to detect marine mammal echolocation clicks and measure temporal changes in ocean ambient noise in long-term underwater passive acoustic monitoring datasets. Advised by Dr. Simone Baumann-Pickering.

Salk Institute for Biological Studies **San Diego, CA**
Molecular Neurobiology Lab Intern 06/2014- 09/2014

- Studied olfactory behavior of C. elegans by performing behavioral assays and setting up a transgene expression system for worm neurons. Advised by Dr. Laura Hale and Dr. Shrek Chalasani.

TEACHING EXPERIENCE

MIT Department of Brain and Cognitive Sciences

- *TA*: Introduction to Neural Computation (9.40) — Spring 2020
- *TA*: Perception (9.35) — Spring 2019

MIT Educational Studies Program

- *HSSP Teacher*: Sensational Neuroscience — 06/2019 - 08/2019
- *Splash! Instructor*: Braaaaains! The Neuroscience of Zombies — 11/2018
- *HSSP Teacher*: The Foundations of Intelligence: An Intro to Neuroscience — 06/2018 - 08/2018
- *HSSP Teacher*: Memory and Mind Control: An Intro to Neuroscience — 02/2018 - 04/2018
- *Splash! Instructor*: Introduction to Neuroscience — 11/2017

UChicago Biological Sciences Collegiate Division

- *Lab TA*: Biological Dynamics (BIOS 20236) — Spring 2017
- *Lab TA*: Principles of Physiology (BIOS 20242) — Fall 2016
- *Lecture TA*: Principles of Physiology (BIOS 20242) — Fall 2015

PUBLICATIONS

4. **Saddler M***, Gonzalez R*, McDermott JH (in press). Deep neural network models reveal interplay of peripheral coding and stimulus statistics in pitch perception. *Nature Communications*.
3. **Saddler M***, Francl A*, Feather J, Qian K, Zhang Y, McDermott JH (2021). Speech denoising with auditory models. *Proc. Interspeech* 2021, 2681-2685.
2. **Saddler M**, Bocconcelli A, Hickmott L, Chiang G, Landea-Briones R, Bahamonde P, Howes G, Segre P, Sayigh L (2017). Characterizing Chilean blue whale vocalizations with DTAGs: a test of using tag accelerometers for caller identification. *Journal of Experimental Biology* 220, 4119-4129.
1. Bocconcelli A, Hickmott L, Chiang G, Bahamonde P, Howes G, Landea-Briones R, Caruso F, **Saddler M**, Sayigh L (2016). DTAG studies of blue whales (*Balaenoptera musculus*) in the Gulf of Corcovado, Chile. *Proceedings of Meetings on Acoustics* 27, 040002.

PRESENTATIONS

23. **Saddler M**, McDermott JH (November, 2021). The role of auditory nerve phase-locking in human hearing: evidence from deep neural networks. *Advances and Perspectives in Auditory Neuroscience*. Virtual conference. (**Invited Talk**).
22. **Saddler M***, Francl A*, Feather J, Qian K, Zhang Y, McDermott JH (August, 2021). Speech denoising with auditory models. *Interspeech.* Brno, Czechia. (**Poster**).
21. **Saddler M**, Feather J, Francl A, McDermott JH (June, 2021). Hearing-impaired artificial neural networks replicate speech recognition deficits of hearing-impaired humans. *Virtual Conference on Computational Audiology.* Virtual conference. (**Talk**).
20. **Saddler M**, Gonzalez R, McDermott JH (February, 2021). Deep neural networks reveal interplay of peripheral coding and stimulus statistics in human pitch perception. *Association for Research in Otolaryngology*. Virtual conference. (**Poster**).
19. **Saddler M**, McDermott JH (February, 2021). The role of auditory nerve phase-locking in human hearing: evidence from deep neural networks. *Association for Research in Otolaryngology*. Virtual conference. (**Poster**).

18. **Saddler M**, Gonzalez R, McDermott JH (October, 2020). Deep neural networks reveal interplay of peripheral coding and stimulus statistics in human pitch perception. *Advances and Perspectives in Auditory Neuroscience*. Virtual conference. (**Poster**).
17. Medina B, **Saddler M**, McDermott JH (October, 2020). Investigating deep artificial neural networks trained to do ecological tasks as a normative model for pitch perception. *Society for Advancement of Chicanos/Hispanics and Native Americans in Science*. Virtual conference.
16. Medina B, **Saddler M**, McDermott JH (October, 2020). Investigating deep artificial neural networks trained to do ecological tasks as a normative model for pitch perception. *Central European Conference on Information and Intelligent Systems*. Virtual conference.
15. **Saddler M**, Feather J, Francl A, McDermott JH (March, 2020). Hearing-impaired deep neural networks replicate behavioral deficits of hearing-impaired humans. *Computational and Systems Neuroscience (COSYNE)*. Denver, CO. (**Poster**).
14. **Saddler M**, Feather J, Francl A, Gonzalez R, McDermott JH (January, 2020). Deep neural networks with simulated hearing impairment replicate behavioral deficits of hearing-impaired listeners. *Association for Research in Otolaryngology*. San Jose, CA. (**Talk**).
13. **Saddler M**, Gonzalez R, McDermott JH (October, 2019). Characteristics of human pitch perception emerge in neural networks optimized to estimate F0 from natural sounds. *Advances and Perspectives in Auditory Neuroscience*. Chicago, IL. (**Poster**).
12. **Saddler M** (October, 2019). Artificial Neural Network Models of Normal and Impaired Hearing. *MIT Department of Brain and Cognitive Sciences Cog Lunch*. Cambridge, MA. (**Talk**).
11. McDermott JH, Feather J, Francl A, **Saddler M**, Zhang Y, Sarker H (September, 2019). Next-generation hearing aids via neural network models of the auditory system. *MIT-IBM AI Horizons Colloquium*. Cambridge, MA. (**Poster**).
10. **Saddler M**, Gonzalez R, McDermott JH (June, 2019). Neural networks trained to estimate F0 from natural sounds replicate properties of human pitch perception. *McGovern Institute Retreat*. Falmouth, MA (**Poster**).
9. **Saddler M**, Gonzalez R, McDermott JH (February, 2019). Neural networks trained to estimate F0 from natural sounds replicate properties of human pitch perception. *Association for Research in Otolaryngology*. Baltimore, MD. (**Poster**).
8. **Saddler M**, Gonzalez R, McDermott JH (November, 2018). neural networks trained to estimate F0 from natural sounds replicate properties of human pitch perception. *MIT Quest Symposium on Robust, Interpretable Deep Learning Systems*. Cambridge, MA. (**Poster**).
7. **Saddler M** (November, 2018). Neural network models of pitch perception. *MIT Department of Brain and Cognitive Sciences Cog Lunch*. Cambridge, MA. (**Talk**).
6. **Saddler M**, Gonzalez R, McDermott JH (October, 2018). Neural networks trained to estimate f0 from natural sounds replicate properties of human pitch perception. *Speech and Audio in the Northeast*. Cambridge, MA. (**Poster**).
5. McDermott JH, Gonzalez R, Feather J, Francl A, **Saddler M**, Sarker H, Zhang Y (October, 2018). Next-generation hearing aids via neural network models of the auditory system. *MIT-IBM AI Horizons Colloquium*. Cambridge, MA. (**Poster**).
4. **Saddler M**, Bocconcelli A, Hickmott LS, Chiang G, Landea-Briones R, Bahamonde PA, Howes G, Sayigh L (June, 2017). Characterizing Chilean blue whale vocalizations with digital acoustic recording tags: a test of using tag accelerometers for caller identification. *Acoustical Society of America and European Acoustics Association*. Boston, MA. (**Poster**).

3. **Saddler M**, Sayigh L (October, 2016). Characterizing the acoustic behavior of Chilean blue whales using DTAG accelerometers. *UChicago Undergraduate Research Symposium*. Chicago, IL. (**Poster**).
2. **Saddler M**, Sayigh L (August, 2016). Characterizing the acoustic behavior of Chilean blue whales using DTAG accelerometers. *WHOI Summer Student Research Forum*. Woods Hole, MA. (**Poster**).
1. Bocconcelli A, **Saddler M**, Hickmott L, Chiang G, Bahamonde P, Caruso F, Sayigh L (July, 2016). Acoustic behavior of blue whales (Balaenoptera musculus) in the Gulf of Corcovado, Chile, recorded on DTAGs. *4th International Conference on The Effects of Noise on Aquatic Life*. Dublin, Ireland. (**Poster**).

LEADERSHIP AND SERVICE

MIT Division of Student Life **Cambridge, MA**
Graduate Resident Advisor in Baker House 08/2018 - present
- Mentoring 35 first-year students, supervising student leaders, responding to physical and mental health crises, planning events, upholding institute policies, and promoting a safe and inclusive community for ~300 undergraduates.

MIT Center for Brains Minds + Machines **Cambridge, MA**
Summer Research Program Mentor 04/2020 - present
- Supervising two undergraduate research projects using deep learning to investigate the impaired hearing of cochlear implant users and the role of pitch in everyday auditory tasks.

MIT OpenMind High-Performance Computing Cluster **Cambridge, MA**
Group Representative 06/2019 - present
- Helping manage computing resources and new member onboarding for the lab and department.

Journal Reviewer (Ad Hoc) **Cambridge, MA**
JASA, Nature Machine Intelligence, Nature Communications 06/2019 - present

UChicago College Housing **Chicago, IL**
Assistant Resident Head (RA) of Thangaraj / Tufts House 04/2015 - 06/2017

UChicago Emergency Medical Service **Chicago, IL**
Emergency Medical Responder (EMR) 03/2014 - 01/2017

AWARDS

2021 Travel Grant (Interspeech 2021, Brno, Czechia)
2020 Best Poster Award (Advances and Perspectives in Auditory Neuroscience)
2020 Angus MacDonald Award for Excellence in Undergraduate Teaching (MIT)
2019 Best Poster Award (IBM AI Week, Cambridge)
2019 Travel Award (Association for Research in Otolaryngology, Baltimore)
2017 Best Student Paper Award (Acoustical Society of America, Boston)
2017 Phi Beta Kappa (The University of Chicago)
2017 Francis E. Knock Prize in Biological Chemistry for highest GPA in major (The University of Chicago)
2016 Woods Hole Oceanographic Institution Academic Programs Office Conference Travel Grant
2016 Woods Hole Oceanographic Institution Summer Student Fellowship
2013 University Scholar Award (The University of Chicago)
2013 National Merit Scholarship

GRADUATE COURSEWORK

Cumulative GPA: 5.0 / 5.0

- Systems Neuroscience (9.011)
- Quantitative Methods and Computational Models in Neurosciences (9.014)
- Computational Cognitive Science (9.660)
- Applied Machine Learning (6.862)
- Audition: Neural Mechanisms, Perception and Cognition (9.285)
- Matrix Methods in Data Analysis, Signal Processing, and Machine Learning (18.0651)
- Automatic Speech Recognition (6.345)

SKILLS AND INTERESTS

Software: Python, MATLAB, Tensorflow, Keras, PyTorch, Amazon MTurk, SLURM, LaTeX
Interests: hiking, running, soccer, skiing, teaching, whales, cars