

# ETHAN MANILOW

ethman.github.io ♦ ethanm@u.northwestern.edu

## RESEARCH INTERESTS

---

Music Information Retrieval, Machine Listening, Audio Signal Processing, Interpretable Machine Learning, Open Source Software & Data, Audio Source Separation, Automatic Music Transcription

## EDUCATION

---

**Northwestern University**, Evanston, IL *2015 - Present*  
Ph.D. in Computer Science & Communication

**University of Michigan**, Ann Arbor, MI *2008 - 2013*  
Bachelor of Science in Physics

**University of Michigan**, Ann Arbor, MI *2008 - 2013*  
Bachelor of Fine Arts in Jazz Studies (Guitar)

## PROFESSIONAL EXPERIENCE

---

**Northwestern University** *2015 - Present*  
*Research Assistant* *Evanston, IL*  
Interactive Audio Lab  
Advisor: Bryan Pardo

**Google Brain** *June 2020 - Present*  
*Research Intern* *Mountain View, CA (Remote)*  
Magenta Project  
Mentors: Jesse Engel and Curtis “Fjord” Hawthorne

**Mitsubishi Electric Research Labs (MERL)** *Sept 2018 - Jan 2020*  
*Research Intern* *Cambridge, MA (Remote after April 2019)*  
Speech and Audio Group  
Mentors: Jonathan Le Roux and Gordon Wichern

**National Instruments** *2013 - 2015*  
*Software Engineer* *Austin, TX*  
LabVIEW Core/Compiler Team

**University of Michigan** *2011 - 2013*  
*Research Assistant* *Ann Arbor, MI*  
Physics Department, ATLAS Group, Large Hadron Collider (LHC)  
Mentor: Dan Levin

**University of Michigan** *2012*  
*Research Assistant* *Ann Arbor, MI*  
Department of Mechanical Engineering, Mechanosynthesis Group  
Mentors: Justin Beroz and A. John Hart

## HONORS

---

**Merit-Based Travel Grant**  
WASPAA

Oct 2017

**Segal Design Cluster Fellowship**  
Northwestern University

Winter 2017

**University Honors**  
University of Michigan

Winter 2008, Winter 2009, Fall 2011

## PUBLICATIONS

---

11. **Ethan Manilow**, Gordon Wichern, Jonathan Le Roux. Hierarchical Musical Instrument Separation. In *Proceedings of the International Society of Music Information Retrieval (ISMIR)*, 2020.
10. **Ethan Manilow**, Bryan Pardo. Bespoke Neural Networks for Score-Informed Source Separation. Late-Breaking Demo at *International Society of Music Information Retrieval (ISMIR)*, 2020. <https://ethman.github.io/bespoke-demo>
9. Verena Haunschmid, **Ethan Manilow**, Gerhard Widmer. audioLIME: Listenable Explanations Using Source Separation. *13th International Workshop on Machine Learning and Music*, 2020.
8. Verena Haunschmid, **Ethan Manilow**, Gerhard Widmer. Towards Musically Meaningful Explanations Using Source Separation. *Preprint*, 2020. [arxiv/2009.02051](https://arxiv.org/abs/2009.02051).
7. **Ethan Manilow**, Prem Seetharaman, Bryan Pardo. Simultaneous Separation and Transcription of Mixtures with Multiple Polyphonic and Percussive Instruments. In *Proceedings of IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020. <https://interactiveaudiolab.github.io/demos/cerberus>
6. **Ethan Manilow**, Gordon Wichern, Prem Seetharaman, Jonathan Le Roux. Cutting Music Source Separation Some Slakh: A Dataset to Study the Impact of Training Data Quality and Quantity. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2019. [www.slakh.com](http://www.slakh.com)
5. Gordon Wichern, Joe Antognini, Michael Flynn, Licheng Richard Zhu, Emmett McQuinn, Dwight Crow, **Ethan Manilow**, Jonathan Le Roux. WHAM!: Extending Speech Separation to Noisy Environments. In *Proceedings of the 20th Annual Conference of the International Speech Communication Association (InterSpeech)*, 2019. <http://wham.whisper.ai/>
4. **Ethan Manilow**, Prem Seetharaman, and Bryan Pardo. The Northwestern University Source Separation Library. In *Proceedings of the International Society of Music Information Retrieval (ISMIR)*, 2018. <https://interactiveaudiolab.github.io/demos/nussl.html>
3. **Ethan Manilow\***, Prem Seetharaman\*, Fatemeh Pishdadian\*, and Bryan Pardo. Predicting Algorithm Efficacy for Adaptive Multi-Cue Source Separation. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2017. (\*Authors contributed equally.) **Merit-based Travel Grant Recipient** <https://interactiveaudiolab.github.io/demos/multicue.html>
2. **Ethan Manilow** and Bryan Pardo. Leveraging Repetition to Do Audio Imputation. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2017.
1. N. Amram, et al. (**ATLAS Group**). Streamlined Calibrations of the ATLAS Precision Muon Chambers for Initial LHC Running. In *Nuclear Instruments and Methods in Physics Research Section A*, April 2012.

## PRESENTATIONS

---

8. Open Source Tools & Data for Music Source Separation: A Pragmatic Guide for the MIR Practitioner. **Ethan Manilow**, Prem Seetharaman, Justin Salamon. *International Society of Music Information Retrieval (ISMIR)*, Montreal, ON (Virtual). October 11, 2020. Tutorial.
7. Synthesize, Separate, and Repeat: Some Notes on Incorporating Notes into Source Separation. *Audio Engineering Society (AES) Virtual Symposium: Applications of Machine Learning in Audio*. September 28-29, 2020. Talk.
6. Cutting Music Source Separation Some Slakh: A Dataset to Study the Impact of Training Data Quality and Quantity. *Speech and Audio in the Northeast (SANE)*, New York, NY. October 24, 2019. Poster.
5. Libraries and Datasets to Power the Next Generation of Source Separation Research, *Midwest Music and Audio Day (MMAD)*, Bloomington, IN. June 17, 2019. Talk.
4. The Northwestern University Source Separation Library, *Speech and Audio in the Northeast (SANE)*, Google, Cambridge, MA. October 18, 2018. Poster.
3. WUT? A New Interface for Interactive Audio Source Separation, *Human Computer Interaction Consortium (HCIC)*, Pajaro Dunes, Watsonville, CA. June 24 - June 28, 2018. Poster.
2. Leveraging Repetition to Do Audio Imputation, *Speech and Audio in the Northeast (SANE)*, Google, New York, NY. October 19, 2017. Poster.
1. nussl: A Flexible Python Audio Source Separation Library, *Midwest Music and Audio Day (MMAD)*. Evanston, IL. June 23, 2017. Talk.

## OPEN SOURCE PROJECTS

---

### Slakh

2019 - Present

Slakh2100 is an open dataset of 2,100 audio files and mixtures, synthesized from MIDI data using professional-grade virtual instruments. The first release contains an order of magnitude more data (in terms of hours of mixture data) than comparable datasets for source separation, and contains time-aligned transcription data for many more instruments than previously released datasets. Code to generate virtually unlimited amounts of data also available.

More info at <http://www.slakh.com/>

### nussl

2015 - Present

nussl is a flexible, object oriented Python audio source separation library that contains implementations of many classic and state-of-the-art source separation algorithms and models. Users can train their own models with the included hooks for common datasets, or download pretrained models from our zoo.

More info at <https://github.com/nussl/nussl>

## TEACHING

---

### Teaching Assistant

Fall 2016, Spring 2019

*Northwestern University*

EECS 349 – Intro to Machine Learning

### Course Designer and Teaching Assistant

Spring 2018

*Northwestern University*

EECS 397/SAI 402 – Digital Luthier

Article/Video: <http://bitly.com/2A9jprL>

## SERVICE

---

**Member - Organizing Committee** 2020 - Present  
*Music Demixing Challenge – Signal Separation Evaluation Campaign 2021 (SiSEC).*

**Board Member** Summer 2017 - Fall 2019  
*Northwestern University Computer Science PhD Advisory Counsel (CSPAC).*

**Organizing Staff** Summer 2017  
*Midwest Music and Audio Day (MMAD), Evanston, IL.*

**Student Volunteer** Summer 2012  
*New Interfaces for Musical Expression (NIME), Ann Arbor, MI.*

### Conference Reviewer

- IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP). 2017-2020.
- IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA). 2017, 2019.
- IEEE Signal Processing Magazine. 2018.
- European Signal Processing Conference (EUSIPCO). 2018.
- ACM International conference on Tangible, Embedded and Embodied Interaction (TEI). 2018.

## AS A MUSICIAN

---

**Freelance Musician** 2008 - Present  
Performed as a professional guitarist across the U.S. and Mexico playing in dance ensembles, pit orchestras, jazz combos, and rock groups. I have worked with Woody Goss (Vulfpeck), Diane McIntyre, Christine Hucal (Woman Believer), Jeremy Daly (Lou Breed), as well as on my own projects.

### RECORDINGS

**Dreams for Days – LP** Forthcoming  
*Woman Believer*  
Composer on 2 songs.

**Technicolor – EP** 2015  
*The Voluptuous Neighbors*  
Lead Guitar.  
<https://thevoluptuousneighbors.bandcamp.com/album/technicolor>

**Stoned Out Two: Morning of the Way to Love – LP** 2013  
*Lou Breed*  
Guitar on 2 songs.  
<https://loubreed.bandcamp.com/album/stoned-out-two-morning-of-the-way-to-love>

**Senior Recital – Live Recording** 2013  
*Ethan Manilow*  
Guitar & Composer.  
<http://ethanmanilow.bandcamp.com/>

**AAURAL II – Compilation** 2012  
Composer on 1 song.  
<http://grlmtn.com/album/aaural-ii>