

# MasonBretan, Ph.D.

Staff Machine Learning Research Engineer

## contact

masonbretan@gmail.com  
www.masonbretan.com

## technical skills

Java, Python, Matlab,  
PostgreSQL, C++, Swift,  
PHP, MaxMSP,  
PureData & Android,

## education

- 08/12–08/17 **Ph.D.** Music Technology Georgia Institute of Technology  
Minor in Artificial Intelligence  
Thesis: *Towards an Embodied Musical Mind: Generative Algorithms for Robotic Musicians*
- 08/10–08/12 **M.S.** Music Technology Georgia Institute of Technology
- 09/05–06/09 **B.A.** Interdisciplinary Computing and the Arts University of California, San Diego  
Area of focus in Mathematics

## experience

- 03/20–Present **Samsung Research America** Mountain View, CA  
*Staff Machine Learning Research Engineer*  
Audio signal processing, natural language processing and natural language generation for Samsung's voice assistant, Bixby.
- 01/18–03/20 **Samsung Research America** Mountain View, CA  
*Senior Machine Learning Research Engineer*  
Robotics and AI research.
- 07/17–01/18 **Futurewei (Huawei)** Santa Clara, CA  
*Senior Robotics Software Engineer*  
Research and development of audio perception and motion generation modules for internal social robot platform.
- 08/10–06/17 **Georgia Tech** Atlanta, GA  
*Graduate Research Assistant*  
Member of the Robotic Musicianship Group. Research entails development of intelligent music systems based on artificial intelligence, machine learning, machine listening, human-robotic interaction, and computer vision.  
**Research Highlights:**
- Developed interactive system for the marimba playing robot, **Shimon**, including improvisation, style modeling, automatic accompaniment, and an embodied auditory perception
  - Developed functionality for the **Shimi**, musical companion robot including a natural language interface, musical query by tapping, song recommendation based on sentiment and topic, and automatic robotic dance choreography
  - Led team developing **Robotic Drumming Prosthesis** for an amputee drummer. The system recreated the functionality of the hand through electromechanical means and novel bio-medical sensing methods were developed based on EMG and ultrasound to provide the amputee with a usable control interface. The system enhanced drummer's ability through increased speed and explored shared control paradigms by including an additional autonomous computer controlled drum stick.

- Developed sonification algorithms that generate music from learned models of human performers as part of the **Accessible Aquarium Project** in order to make the Georgia Aquarium more accessible to the visually impaired. Input was based on a vision analysis of the aquarium exhibit. (With Aaron Bobick, Tucker Balch, and Bruce Walker)

05/16–08/16 **Google, Inc** Mountain View, CA  
*Software Engineering Intern*

As a SWE intern in Research and Machine Intelligence I was part of the Deep Dialogue group supervised by Larry Heck and worked on a project called Deep Music. The research entailed learning a compressed semantic representation of music and experimenting with manipulation in this space. Various deep belief networks were developed such as autoencoders and a DSSM using the Tensorflow framework.

09/15–12/15 **Google, Inc** Mountain View, CA  
*Software Engineering Intern*

As a SWE intern in Research and Machine Intelligence I started the Music Mind project which focused on sequential modeling and using deep learning and recurrent neural networks including LSTMs to develop a machine improvisation system that outperformed a baseline HMM model based on perplexity and ranking metrics.

0/09–08/10 **Washington University in St Louis, School of Medicine** St Louis, MO  
*Software Developer*

Worked under Alec Salt in the Cochlear Fluids Lab developing software that models fluid movement and distortion products in the inner ear. Software is currently used in Otology labs around the world.

06/08–09/08 **Calit2-Qualcomm Institute** La Jolla, CA  
*Summer Undergraduate Research Scholar*

Received a scholarship to investigate music perception through cochlear implants and design new DSP functionality for increased musical interpretation.

## teaching

2014-2017 **Robotic Musicianship** Georgia Tech

As a TA for Gil Weinberg for the undergraduate level course in robotic musicianship I advise teams of undergrads doing various projects with our robotic platforms.

2013 **Interactive Music** Georgia Tech

As a TA for Gil Weinberg for the graduate level course in interactive music systems I gave each lecture, held office hours, created assignments and graded.

2013 **Music Information Retrieval** Georgia Tech

As a TA for Alexander Lerch for the graduate level course in music information retrieval I gave lectures on machine learning, created in class assignments for flipped teaching, graded, and held office hours.

## awards

2019 **AAMAS Most Innovative System Demonstration Honorable Mention** Montreal, Canada

- 2017 **AAAI Best Technical Demonstration Honorable Mention** San Francisco, CA
- 2016 **2nd Place at the Global AI Hackathon: Artificial Intelligence for Social Care** Seoul, South Korea
- 2014 **Foley Scholar** GVU, Georgia Tech  
GVU Center is an interdisciplinary computing research center that spans Georgia Tech and is the primary incubator for a dynamic community of research propelling new partnerships with business, national research agencies and other academic experts. The Foley Scholar is the highest honor from GVU and recognizes graduate students for their innovative research and efforts in shaping technology for a broad range of challenges in modern society.
- 2013 **President's Fellowship** Georgia Tech  
Awarded to U.S. citizens pursuing doctoral degrees at Georgia Tech for exemplary levels of scholarship and innovation to the academic departments who host their study and research
- 2012 **Honorarium** Google Inc  
Commissioned Robotic Musical Performance for Google I/O
- 2011 **NSF Graduate Research Fellowship Honorable Mention** Georgia Tech  
Recognition to meritorious applicants who do not receive Fellowship awards
- 2009 **ICAM Award for Distinguished Research** UCSD  
Recognition for outstanding undergraduate research in the field of Interdisciplinary Computing and the Arts
- 2009 **Calit2-Qualcomm Institute Undergraduate Research Scholarship** La Jolla, CA  
Participant in the Summer Scholars research program
- '05, '04, '03 **Outstanding Musicianship Award** Reno Jazz Festival  
Recognition for outstanding performance on drum set
- 2005 **Outstanding Soloist Award** Santa Cruz Jazz Festival  
Recognition for outstanding solo performance on drum set
- '05, '04, '03 **Musicianship Award** Folsom Jazz Festival  
Recognition for outstanding performance on drum set

## invited performances, installations, and demos

- 2018 **Campus Party** Sao Paolo, Brazil  
Invited talk at the international Campus Party Hackathon.
- 2017 **Purdue Convocations** West Lafayette, Indiana  
Concert and Lecture as part of the Shimon Robot and Friends tour.
- 2016 **Google** Mountain View, California  
Invited talk at Google's internal research forum.

- 2016 **Ableton Loop Summit** Berlin, Germany  
Concert as part of the Shimon Robot and Friends tour.
- 2016 **Shanghai International Interactive Arts Festival** Shanghai, China  
Concert as part of the Shimon Robot and Friends tour.
- 2016 **Future of Story Telling** New York, NY  
Concert as part of the Shimon Robot and Friends tour.
- 2016 **Audi Machine Intelligence Event** Berlin, Germany  
Concert as part of the Shimon Robot and Friends tour.
- 2016 **Moogfest** Durham, North Carolina  
Concert as part of the Shimon Robot and Friends tour.
- 2016 **EI Hormiguero Spanish TV Show** Madrid, Spain  
Performance with the robotic drumming prosthesis and robotic third arm (with Gil Weinberg) - Technical duties and performance on percussion
- 2016 **Vodafone Digital Transformations Summit** Istanbul, Turkey  
Concert as part of the Shimon Robot and Friends tour.
- 2015 **Robotronica** Brisbane, Australia  
Concert as part of the Shimon Robot and Friends tour.
- 2015 **25/40 Celebration** Washington D.C.  
Concert as part of the Shimon Robot and Friends tour.
- 2015 **NBC Today Show** New York, NY  
Performance with Shimon and Shimi robots (with Gil Weinberg) - Technical duties and performance on guitar
- 2015 **Music Tech Metz** Metz, France  
Demo and performance of robotic drumming prosthesis - Technical duties and performance on piano
- 2014 **Geek Picnic** St Petersburg, Russia  
Demo and performance of robotic musicianship (with Gil Weinberg) - Technical duties and performance on guitar
- 2014 **Atlanta Science Festival** Kennesaw State University, GA  
Demo and performance of robotic musicianship (with Gil Weinberg) - Technical duties and composed robotic dance choreography
- 2013 **TechCrunch Disrupt** San Francisco, CA  
Invited demonstration of the Shimi robots (with Gil Weinberg and Guy Hoffman)
- 2013 **TEDx Peachtree** Atlanta, GA  
Performance of the Shimi robot (with Gil Weinberg and Street Lotto) - Technical duties and composed robotic dance choreography
- 2012 **Google I/O** San Francisco, CA  
Robotic performance showcasing the Shimi robots (with Gil Weinberg) - Technical duties and composed music and robotic dance choreography
- 2012 **Drawn Together** Atlanta, GA  
Installation at Stubbins Studio Gallery (collaboration between Georgia Tech College of Architecture and OpenEndedGroup)

2006 **Opening for SF Jazz Collective at Mandeville Auditorium**  
Performance on drum set (with UCSD Music Faculty)

La Jolla, CA

2006 **Chance, Discovery, Design**

DVD

Drum set performance on David Borgo's DVD of electroacoustic improvisation

## publications/patents

\*

### books

Gil Weinberg, Mason Bretan, Guy Hoffman, Scott Driscoll. *Robotic Musicianship: Embodied Artificial Creativity and Mechatronic Musical Expression*. Vol. 8. Springer Nature, 2020.

\*

### article in peer-reviewed journal

A Robotic Prosthesis for an Amputee Drummer

Mason Bretan, Deepak Gopinath, Philip Mullins, Gil Weinberg

Submitted (2017), 2017

A Survey of Robotic Musicianship: Motivations, Challenges, and Opportunities

Mason Bretan, Gil Weinberg

Communications of the ACM (2016). *ACM*, 2016

Emotionally Expressive Dynamic Physical Behaviors in Robots

Mason Bretan, Guy Hoffman, Gil Weinberg

International Journal of Human-Computer Studies (2015). *Elsevier*, 2015

Anticipation Based Visual Cues for Human-Robot Percussion Ensemble

Marcelo Cicconet, Mason Bretan, Gil Weinberg

IEEE Robotics and Automation Magazine (2013). *IEEE*, 2013

\*

### international peer-reviewed conferences/proceedings

Robot Learning by Collaborative Network Training: A Self-Supervised Method using Ranking

Mason Bretan, Sageev Oore, Siddharth Sanan, Larry Heck

*Proceedings of the 18th International Conference on Autonomous Agents and MultiAgent Systems*, 2019

Learning an Effective Control Policy for a Robotic Drumstick via Self-Supervision

Mason Bretan, Siddharth Sanan, Larry Heck

*Proceedings of the 18th International Conference on Autonomous Agents and MultiAgent Systems*, 2019

A comparison of music input domains for self-supervised feature learning

Siddharth Gururani, Alexander Lerch, Mason Bretan

*Proc. of ICML Workshop on Machine Learning for Music Discovery Workshop (ML4MD)*, Extended Abstract, Long Beach, California, USA, 2019

Learning Object Models For Non-prehensile Manipulation

Siddharth Sanan, Mason Bretan, Larry Heck

*2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2019

Learning and Evaluating Musical Features with Deep Autoencoders

Mason Bretan, Sageev Oore, Douglas Eck, Larry Heck

*Machine Learning for Creativity Workshop at the 23rd SIGKDD Conference on Knowledge Discovery and Data Mining (KDD '17)*, 2017, Halifax, Nova Scotia

Deep Music: Towards Musical Dialogue \*\*\*Best Demonstration Honorable Mention\*\*\*

Mason Bretan, Sageev Oore, Jesse Engel, Douglas Eck, Larry Heck

*31st AAAI Conference on Artificial Intelligence (AAAI '17)*, 2017, San Francisco, CA

### Integrating the Cognitive with the Physical: Musical Path Planning for an Improvising Robot

Mason Bretan, Gil Weinberg

*31st AAAI Conference on Artificial Intelligence (AAAI '17)*, 2017, San Francisco, CA

### A Unit Selection Methodology for Music Generation Using Deep Neural Networks

Mason Bretan, Gil Weinberg, Larry Heck

*ICCC 2017*, 2017

### A Reflection of Timing as It Relates to Robotic Musicianship

Mason Bretan, Gil Weinberg

*Workshop at 9th ACM/IEEE International Conference on Human-Robot Interaction (HRI '14)*, 2014, Bielefeld, Germany

### Chronicles of a Robotic Musical Companion

Mason Bretan, Gil Weinberg

*Proceedings of the 2014 Conference on New Interfaces for Musical Expression (NIME '14)*, 2014, London, UK

### Musical Query by Movement

Jay Clark, Mason Bretan, Gil Weinberg

*Proceedings of the 2nd International Conference on Multimedia and Human-Computer Interaction (MHCI '14)*, 2014, Prague, Czech Republic

### Developing and Composing for a Robotic Musician Using Different Modes of Interaction

Mason Bretan, Marcelo Cicconet, Ryan Nikolaidis, Gil Weinberg

*Proceedings of the 2012 International Computer Music Conferences (ICMC '12)*, 2012, Ljubljana, Slovenia

### Sonification for the Art Installation Drawn Together

Mason Bretan, Gil Weinberg, Jason Freeman

*Proceedings of the 2012 International Conference on Auditory Display (ICAD '12)*, 2012, Atlanta, GA

### Visual cues-based anticipation for percussionist-robot interaction

Marcelo Cicconet, Mason Bretan, Gil Weinberg

*7th ACM/IEEE International Conference on Human-Robot Interaction (HRI '12)*, 2012, Boston, MA

### Substances Enter Perilymph Near the Stapes as well as through the Round Window Membrane following Intratympanic Applications in Guinea Pigs

J Hartsock, E Thomas, M Bretan, R Gill, S O'Leary, Salt AN

*34th Midwinter Research Meeting of the ARO*, 2011, Baltimore, MR

### Evaluation of a Ten-Compartment Computer Model of the Inner Ear Fluid Spaces

AN Salt, J Hartsock, M Bretan, R Gill

*34th Midwinter Research Meeting of the ARO*, 2011, Baltimore, MR

\*

### Technical Reports

#### You Are What You Eat... Listen to, Watch, and Read

Mason Bretan

arXiv preprint arXiv:1612.04403, 2014

\*

### Patents

#### Techniques, Methods, and a System for Ultrasound Based Robotic Prosthetic Limb

, Filed November 28, 2016

## Press

IEEE Spectrum **Four-Armed Marimba Robot Uses Deep Learning to Compose Its Own Music**

June 14, 2017

Phys.Org **Robot uses deep learning and big data to write and play its own music**

June 14, 2017

MIT Technology Review **This Marimba-Playing Robot Invents Surprisingly Nice Tunes** June 14, 2017

Gizmodo **This Artificially Intelligent Robot Composes and Performs Its Own Music**  
June 14, 2017

The Atlantic Magazine **The Cyborg Drummer** September 17, 2015

NBC Today **The Future of Music** May 15, 2015

Washington Post **Watch a human musician and his robots improvise together** Jan 21, 2015

Mashable **These robots really know how to drop a beat** Jan 21, 2015

New Scientist **Robot jazz band showcases its freestyling skills** Jan 23, 2015

Classicalite **Mason Bretan and His Artificial Musicians Jam Jazz at Georgia Tech's Center for Music**  
Jan 22, 2015

Daily Mail **Nice! Watch the robot jazz band that can automatically accompany humans**  
Jan 27, 2015

ZME Science **How a musician and his robots improvise together** Jan 26, 2015

Boing Boing **Watch robots generate improvisational jazz music and dance** Jan 21, 2015

Technique **Robot prepares to sweep future Grammys** Feb 13, 2015