

# MARK CARTWRIGHT

Brooklyn, NY  
www.markcartwright.com

## RESEARCH INTERESTS

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*I research tools to support new interactions for understanding and creating sound.*

**Keywords:** machine listening, human computer interaction, machine learning, audio, music, crowd-sourcing, creativity support tools, music information retrieval, digital signal processing

## EDUCATION

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**Northwestern University**, Evanston, IL 2016

Ph.D., Computer Science

Dissertation: Supporting Novice Communication of Audio Concepts for Audio Production Tools

Committee: Bryan Pardo (advisor), Darren Gergle, Doug Downey

**Stanford University**, Stanford, CA 2007

M.A., Music Science and Technology

Advisor: Julius O. Smith III

**Northwestern University**, Evanston, IL 2004

B.Mus., Music Technology (with Honors)

Certificate in Sound Design

Advisor: Gary Kendall

## PROFESSIONAL EXPERIENCE

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**Assistant Professor** *Starting January 2021*

New Jersey Institute of Technology, Newark, NJ

Department of Informatics

**Research Assistant Professor** January 2019 – present

New York University, New York, NY

Department of Computer Science and Engineering

**Research Scientist** January 2019 – present

New York University, New York, NY

Center for Urban Science and Progress

**Postdoctoral Researcher** September 2016 – December 2018

New York University, New York, NY

Music and Audio Research Laboratory

P.I.: Juan Pablo Bello

**Research Assistant** September 2009 – August 2016

Northwestern University, Evanston, IL

Interactive Audio Lab

Department of Electrical Engineering and Computer Science  
P.I.: Bryan Pardo

**Research Intern**

February 2015 – May 2015

Adobe Research, San Francisco, CA  
Creative Technologies Lab  
Mentors: Gautham Mysore and Matt Hoffman

**Visiting Student Researcher**

February 2013 – November 2013

Queen Mary University of London, London, UK  
Center for Digital Music  
Department of Electronic Engineering  
Hosts: Josh Reiss and Andrew McPherson

**Digital Signal Processing Engineer**

September 2007 – August 2009

PacketVideo, Palatine, IL

**Audio Post Production Engineer**

November 2005 – May 2006

Big House Audio, Chicago, IL

**RESEARCH FUNDING**

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**Spatial Sound Scene Description**

07/01/2020–06/30/2023

National Science Foundation – CISE III core program (\$999,875)  
PI: Juan Pablo Bello, Co-PI: Agnieszka Roginska, Mark Cartwright, Brian McFee

**HONORS AND AWARDS**

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ACM CHI Best Paper Award Honorable Mention	2015
ACM Multimedia Best Demo Award	2014
National Science Foundation Graduate Research Fellowship	2011
Helen and Robert Piros Fellowship	2009

**JOURNAL PUBLICATIONS**

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Pardo, B., Cartwright, M., Seetharaman, P., Kim, B. Learning to Build Natural Audio Production Interfaces. In *Arts*, vol. 8(3), 110, 2019

McFee, B., Kim, J.W., Cartwright, M., Salamon, J., Bittner, R., Bello, J.P. Open-Source Practices for Music Signal Processing Research: Recommendations for Transparent, Sustainable, and Reproducible Audio Research. In *IEEE Signal Processing Magazine*, vol. 36(1), 2019.

Lostanlen, V., Salamon, J., Cartwright, M., McFee, B., Farnsworth, A., Kelling, S., Bello, J.P. Per-Channel Energy Normalization: Why and How. In *IEEE Signal Processing Letters*, vol. 26(1), 2019.

Cartwright, M., Seals, A., Salamon, J., Williams, A., Mikloska, S., MacConnell, D., Law, E., Bello, J.P., Nov, O. Seeing Sound: Investigating the Effects of Visualizations and Complexity on Crowdsourced Audio Annotations. In *Proceedings of the ACM on Human-Computer Interaction*, vol. 1(2): *Computer-Supported Cooperative Work and Social Computing 2017*, 2017.

## REFEREED CONFERENCE AND WORKSHOP PUBLICATIONS

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Cartwright, M., Mendez, A.E.M., Cramer, J., Lostanlen, V., Dove, G., Wu, H., Salamon, J., Nov, O., Bello, J.P. SONYC Urban Sound Tagging (SONYC-UST): A Multilabel Dataset from an Urban Acoustic Sensor Network. In *Proceedings of the Workshop on Detection and Classification of Acoustic Scenes and Events (DCASE)*, 2019.

Cartwright, M., Cramer, J., Salamon, J., Bello, J.P. TriCycle: Audio Representation Learning from Sensor Network Data Using Self-Supervision. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2019.

Cohen-Hadria, A., Cartwright, M., McFee, B., Bello, J.P. Voice Anonymization in Urban Sound Recordings. In *Proceedings of the IEEE International Workshop on Machine Learning for Signal Processing (MLSP)*, 2019.

Mendez, A.E.M., Cartwright, M., Bello, J.P. Machine-Crowd-Expert Model for Increasing User Engagement and Annotation Quality. In *Proceedings of the ACM CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA)*, 2019.

Kumari, S., Roy, D., Cartwright, M., Bello, J.P., Arora, A. EdgeL3: Compressing L3-Net for Mote Scale Urban Noise Monitoring. In *Proceedings of the Workshop on Parallel AI and Systems for the Edge (PAISE)*, 2019.

Wang, Y., Mendez, A.E.M., Cartwright, M., Bello, J.P. Active Learning for Efficient Audio Annotation and Classification with a Large Amount of Unlabeled Data. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2019.

Cartwright, M., Dove, G., Mendez, A.E.M., Bello, J.P., Nov, O. Crowdsourcing Multi-label Audio Annotation Tasks with Citizen Scientists. In *Proceedings of ACM Conference on Human Factors in Computing Systems (CHI)*, 2019.

Cartwright, M., Bello, J.P. Increasing Drum Transcription Vocabulary Using Data Synthesis. In *Proceedings of the International Conference on Digital Audio Effects (DAFx)*, 2018.

Cartwright, M., Salamon, J., Seals, A., Nov, O., Bello, J.P. Investigating the Effect of Sound-Event Loudness on Crowdsourced Audio Annotations. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2018.

Cartwright, M., Pardo, B., Mysore, G. Crowdsourced Pairwise-Comparison for Source Separation Evaluation. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2018.

Salamon, J., MacConnell, D., Cartwright, M., Li, P., Bello, J.P. Scaper: A Library for Soundscape Synthesis and Augmentation. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2017.

Cartwright, M., Pardo, B. The Moving Target in Creative Interactive Machine Learning. In *Proceedings of the Workshop on Human Centred Machine Learning (HCML)* at the Conference on Human Factors in Computing Systems (CHI), 2016.

Brewer, R., Cartwright, M., Karp, A., Pardo, B., Piper, A.M. An Approach to Audio-Only Editing for Visually Impaired Seniors. In *Proceedings of the ACM SIGACCESS Conference on Computers and Accessibility (ASSETS)*, 2016.

Cartwright, M., Pardo, B., Mysore, G., Hoffman, M. Fast and Easy Crowdsourced Perceptual Audio Evaluation. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2016.

Ford, J., Cartwright, M., Pardo, B. MixViz: A Tool to Visualize Masking in Audio Mixes. In *Proceedings of the 139th International Audio Engineering Society Convention (AES)*, 2015.

Cartwright, M., Pardo, B. VocalSketch: Vocally Imitating Audio Concepts. In *Proceedings of ACM Conference on Human Factors in Computing Systems (CHI)*, 2015. **Best Paper Award Honorable Mention**

Cartwright, M., Pardo, B. SynthAssist: An Audio Synthesizer Programmed With Vocal Imitation. In *Proceedings of the ACM International Conference on Multimedia (ACM MM)*, 2014. **Best Demo Award**

Cartwright, M., Pardo, B. SynthAssist: Querying an Audio Synthesizer by Vocal Imitation. In *Proceedings of New Instruments for Musical Expression (NIME)*, 2014.

Cartwright, M., Pardo, B. Translating Sound Adjectives by Collectively Teaching Abstract Representations. In *Proceedings of the Collective Intelligence Conference*, 2014.

Cartwright, M., Pardo, B., Reiss, J. Mixploration: Rethinking the Audio Mixer Interface. In *Proceedings of the International Conference on Intelligent User Interfaces (IUI)*, 2014.

Cartwright, M., Pardo, B. Social-EQ: Crowdsourcing an Equalization Descriptor Map. In *Proceedings of the International Conference on Music Information Retrieval (ISMIR)*, 2013.

Cartwright, M., Pardo, B. Novelty Measures as Cues for Temporal Salience in Audio Similarity. In *Proceedings of the Workshop on Music Information Retrieval with User-Centered and Multimodal Strategies (MIRUM)* at the ACM International Conference on Multimedia (ACM-MM), 2012.

Cartwright, M., Pardo, B. Building a Music Search Database Using Human Computation. In *Proceedings of the Sound and Music Computing Conference (SMC)*, 2012.

Cartwright, M., Rafii, Z., Han, J., Pardo, B. Making Searchable Melodies: Human vs. Machine. In *Proceedings of the Workshop on Human Computation (HCOMP)* at the AAAI Conference on Artificial Intelligence (AAAI), 2011.

Huq, A., Cartwright, M., Pardo, B. Crowdsourcing a Real-World On-Line Query By Humming System. In *Proceedings of the Sound and Music Computing Conference (SMC)*, 2010.

Cartwright, M., Jones, M., Terasawa, H. Rage in Conjunction with the Machine. In *Proceedings of New Instruments for Musical Expression (NIME)*, 2007.

## NON-REFEREED PUBLICATIONS

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Cartwright, M., Pardo, B. Audio Production with Intelligent Machines. Presented at Workshop on *Collaborating with Intelligent Machines: Interfaces for Creative Sound*, ACM Conference on Human Factors in Computing Systems (CHI), 2015.

Cartwright, M., Pardo, B. Interactive Learning for Creativity Support in Music Production. Presented at Workshop on *Semi-Automated Creativity*, ACM Creativity and Cognition, 2011.

## PATENTS

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Cartwright, M., Pardo, B. “Systems, Methods, and Apparatus to Search Audio Synthesizers using Vocal Imitation,” U.S. Patent 20160133240, filed October 27, 2015, and issued May 12, 2016.

## INVITED LECTURES AND SEMINARS

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New Jersey Institute of Technology	February 24, 2020
“Machine Listening with Limited Labeled Data: From Crowdsourcing to Self-Supervision”	
New York University Center for Data Science Seminar	February 6, 2019
“Building a Machine-Listening System to Monitor, Analyze, and Mitigate Urban Noise Pollution”	
Audio Engineering Society Latin American Conference Keynote	September 24, 2018
“Building a Machine-Listening System to Monitor, Analyze, and Mitigate Urban Noise Pollution”	
Cornell Tech	May 11, 2018
“Crowdsourcing Audio Annotations”	
University of Victoria	March 8, 2018
“Human-Centered Audio Processing”	
Midwest Music and Audio Day (MMAD)	June 23, 2017
“A Study on Best Practices for Crowdsourced Annotation of Sound Events”	
Workshop on Cross-Disciplinary and Multi-Cultural Perspectives on Musical Rhythm and Improvisation III, NYU Abu Dhabi	March 21, 2017
“Towards Data-Driven Models of Rhythm”	
New York University Music and Audio Research Lab (MARL) Seminar	October 20, 2016
“Give me a <ka-CHUNK>’: Rethinking the Interaction Paradigm of Audio Production Tools”	
University of Washington DUB Seminar	June 1, 2016
“Give me a <ka-CHUNK>’: Rethinking the Interaction Paradigm of Audio Production Tools”	
University of Toronto	April 7, 2016
“Give me a <ka-CHUNK>’: Rethinking the Interaction Paradigm of Audio Production Tools”	
University of Illinois at Chicago	March 2, 2016
“Give me a <ka-CHUNK>’: Rethinking the Interaction Paradigm of Audio Production Tools”	
Bay Innovative Signal Hackers (BISH) Bash	September 17, 2015
“Crowdsourced Audio Quality Evaluation”	
KAIST (Korea Advanced Institute of Science and Technology)	April 24, 2015
“Natural Communication and Exploration in Audio Production Interfaces”	
Birmingham City University	August 6, 2014
“Natural Communication and Exploration in Audio Production Interfaces”	
Institut de Recherche et Coordination Acoustique/Musique (IRCAM)	July 4, 2014
“Natural Communication and Exploration in Audio Production Interfaces”	
Midwest Music Information Retrieval Gathering (MMIRG)	June 14, 2014
“SynthAssist: Querying a Synthesizer Using Vocal Imitation”	

## ACADEMIC SERVICE

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### Conference Organization

General Co-Chair, Workshop on Detection and Classification of Acoustic Scenes and Events 2019  
Local Organizing Committee, Midwest Music Information Retrieval Gathering 2011, 2014

### Challenge Organization

Task Organizer, IEEE AASP Challenge on Detection and Classification of Acoustic Scenes and Events 2019–2020

### Journal Reviewer

Journal of the Acoustical Society of America 2020  
IEEE Transactions on Audio, Speech and Language Processing 2010–2012, 2014, 2019  
Journal of the Audio Engineering Society 2019–2020  
Applied Sciences 2019  
Acta Acustica united with Acustica 2019  
IEEE Transactions on Multimedia 2018–2019  
IEEE Signal Processing Magazine 2018  
ACM Transactions on Interactive Intelligent Systems 2017  
Journal on Multimodal User Interfaces 2016  
IEEE Signal Processing Letters 2015  
Information Retrieval 2011

### Conference Program Committee / Reviewer

International Society for Music Information Retrieval Conference 2009–2010, 2012–2018, 2020  
ACM Conference on Computer-Supported Cooperative Work and Social Computing 2018, 2020  
International Conference on Digital Audio Effects 2018, 2020  
International Conference on Web and Social Media 2020  
IEEE International Conference on Acoustics, Speech, and Signal Processing 2014–2020  
Workshop on Detection and Classification of Acoustic Scenes and Events 2018–2019  
ACM IUI Workshop on Intelligent Music Interfaces for Listening and Creation 2018–2019  
ACM International Conference on Intelligent User Interfaces 2019  
ACM SIGCHI Conference on Human Factors in Computing Systems 2014, 2016, 2019  
ACM International Conference on Multimedia 2013–2016  
ACM International Conference on Tangible, Embedded and Embodied Interaction 2016  
IEEE Workshop on Applications of Signal Processing to Audio and Acoustics 2015  
International Computer Music Conference 2012  
International Conference on Human-Computer Interaction with Mobile Devices and Services 2011  
IEEE International Workshop on Multimedia Signal Processing 2010

## TEACHING EXPERIENCE

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Teaching Assistant, EECS-352 Machine Perception of Audio and Music 2015  
Northwestern University

Teaching Assistant, DSGN 395-20 Data as Art Northwestern University / School of the Art Institute of Chicago	2014
Teaching Assistant, EECS-349 Machine Learning Northwestern University	2012
Teaching Assistant, EECS-348 Introduction to Artificial Intelligence Northwestern University	2011

## DOCTORAL THESIS READING

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Ana Elisa Mendez Mendez, Doctoral, New York University	Expected 2021
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## STUDENT MENTORSHIP

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Sangeeta Kumari, Doctoral, Ohio State University	2018–2020
Yu Wang, Doctoral, New York University	2018–2020
Jason Cramer, Doctoral, New York University	2018–2020
Ana Elisa Mendez Mendez, Doctoral, New York University	2017–2020
Alice Cohen-Hadria, Doctoral, IRCAM	2019
Bianca Brusco, Masters, New York University	2018–2020
Marin Hyatt, High School Senior, New York University ARISE	2019–2020
Center for Urban Science and Progress capstone project, New York University	2020
Center for Data Science capstone project, New York University	2019
Center for Urban Science and Progress capstone project, New York University	2019
Gregory Reardon, Masters, New York University	2018
Giordan Escalona, High School Junior, New York University ARISE	2018
Ariadna Paltis, High School Junior, New York University ARISE	2017
Naomi Horsford, High School Senior, New York University ARISE	2017
Ayanna Seals, Doctoral, New York University	2016–2017
Aaron Karp, Undergraduate Junior, Northwestern University	2016
Jonathan Ford, Masters Student, Northwestern University	2015
David Sumber, Undergraduate Senior, Northwestern University	2012

## PRESS AND INTERVIEWS

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New York Times “The Coronavirus Quieted City Noise. Listen to Whats Left”	May 22, 2020
NBC 4 New York “The City That Never Makes a Peep: NYCs Quietest Days on Record Have Come Amid Shutdown”	May 22, 2020
NPR Here and Now “Volunteers Flock To Sign Up As Citizen Scientists”	April 14, 2020
Big Picture Science “The ears have it—Noise: noxious or necessary?”	January 20, 2020
NPR Here and Now “Noise is New York City’s biggest civic complaint. Researchers are trying to help turn it down”	May 29, 2019
The New Yorker “Is noise pollution the next big public-health crisis?”	May 6, 2019

Gizmodo	March 11, 2019
“You can help train AI to pinpoint NYCs noisiest neighborhoods in an effort to shut them up”	
The Verge	March 10, 2019
“Help fight noise pollution by identifying these sound clips collected from urban sensors”	
NBC 4 New York	March 6, 2019
“NYU Project Could Help Alleviate NYC Noise Pollution”	
AM New York	March 5, 2019
“Think you know the sounds of the city? Noise pollution experts needed”	
Metro	February 28, 2019
“You can help researchers curb NYC noise pollution as a citizen scientist”	
MIT Technology Review	July 23, 2010
“Query-by-Humming Musical Search Engine Launched”	

## ADDITIONAL EDUCATION

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Stanford University, Stanford, CA	July 2007
Summer Institute for Entrepreneurship	
Graduate School of Business	

## MUSICAL DISCOGRAPHY

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“Piñata” with <i>volcano!</i> , The Leaf Label	2012
“Piñata (single)” with <i>volcano!</i> , The Leaf Label	2012
“So Many Lemons (single)” with <i>volcano!</i> , The Leaf Label	2009
“Paperwork” with <i>volcano!</i> , The Leaf Label	2008
- New York Times “Critic’s Choice” (September, 2008)	
“Africa Just Wants To Have Fun (7-inch)” with <i>volcano!</i> , The Leaf Label	2008
“Apple or a Gun (7-inch)” with <i>volcano!</i> , The Leaf Label	2006
“Beautiful Seizure” with <i>volcano!</i> , The Leaf Label	2005
- DrownedInSound.com’s #2 Album of the Year (2006)	
“Chicago Union Station” with <i>Cartwright, Moorefield, Weeter</i>	2004
- Organised Sound DVD, Cambridge University Press (2004)	
- International Computer Music Conference DVD (2004)	

## CONFERENCE / FESTIVAL PRESENTATION OF COMPOSITIONS

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“Six Corners” by <i>Cartwright, Moorefield, Weeter</i>	
- Third Practice	2006
- New Music Northwestern Festival	2005
“Chicago Union Station” by <i>Cartwright, Moorefield, Weeter</i>	
- Electronic Music Midwest	2005
- Society for Electro-Acoustic Music in the United States	2005



## SELECTED MUSICAL PERFORMANCES

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<i>volcano!</i> at Daytrotter.com, Rock Island, IL	December 7, 2012
<i>volcano!</i> at WBEZ's 848, Chicago, IL	June 12, 2012
<i>volcano!</i> at Millenium Park, Chicago, IL	May 31, 2010
<i>volcano!</i> at Tabula Rasa, Moscow, Russia	April 29, 2009
<i>volcano!</i> at SWN Festival, Cardiff, UK	November 24, 2008
<i>volcano!</i> at Botanique, Brussels, Belgium	November 5, 2008
<i>volcano!</i> at Interzona, Verona, Italy	October 25, 2008
<i>volcano!</i> at Radio RAI (Italian National Radio), Bolzano, Italy	October 23, 2008
<i>volcano!</i> at Lido, Berlin, Germany	October 21, 2008
<i>volcano!</i> at Harbourfront Centre, Toronto, Canada	August 25, 2006
<i>volcano!</i> at Villette Sonique Festival, Paris, France	June 24, 2006
<i>volcano!</i> at Huw Stephens Session (BBC Radio 1), London, UK	June 27, 2006
<i>volcano!</i> at SXSW, Austin, TX	March 17, 2006
<i>Cartwright, Moorefield, Weeter</i> at New Music Northwestern, Evanston, IL	May 22, 2005

## PROFESSIONAL MEMBERSHIPS

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ACM (Association for Computing Machinery)

IEEE (Institute of Electrical and Electronics Engineers)