MARK CARTWRIGHT

Brooklyn, NY
www.markcartwright.com

RESEARCH INTERESTS

I research systems that enable new interactions for observing and creating sound.

Keywords: machine listening, human computer interaction, machine learning, audio, music, crowdsourcing, creativity support tools, music information retrieval, digital signal processing

EDUCATION

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

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

HONORS AND AWARDS

Northwestern University Terminal Year Fellowship	2016
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

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

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

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

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

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"

Telecom Paristech — June 13, 2013
"Building a Personalized Audio Equalizer Interface"

ACADEMIC SERVICE

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 — 2019–2020

of Acoustic Scenes and Events

Journal Reviewer

IEEE Transactions on Audio, Speech and Language Processing	2010–2012, 2014, 2019
Journal of the Audio Engineering Society	2019
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

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 Conference on Computer-Supported Cooperative Work and Social Computing	2018
International Conference on Digital Audio Effects	2018
International Society for Music Information Retrieval Conference	2009–2010, 2012–2018
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

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

Teaching Assistant, DSGN 395-20 Data as Art — 2014
Northwestern University / School of the Art Institute of Chicago

Teaching Assistant, EECS-349 Machine Learning — 2012
Northwestern University

Teaching Assistant, EECS-348 Introduction to Artificial Intelligence — 2011
Northwestern University

STUDENT MENTORSHIP

Sangeeta Kumari, Doctoral, Ohio State University	2018–2019
Yu Wang, Doctoral, New York University	2018–2019
Jason Cramer, Doctoral, New York University	2018–2019
Ana Elisa Mendez Mendez, Doctoral, New York University	2017–2019
Alice Cohen-Hadria, Doctoral, IRCAM	2019
Bianca Brusco, Masters, New York University	2018–2019

Marin Hyatt, High School Senior, New York University ARISE 2019
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

ADDITIONAL EDUCATION

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

PRESS AND INTERVIEWS

Big Picture Science January 20, 2020
"The ears have it—Noise: noxious or necessary?"

NPR Here and Now May 29, 2019
"Noise is New York City's biggest civic complaint. Researchers are trying to help turn it down"

The New Yorker May 6, 2019
"Is noise pollution the next big public-health crisis?"

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"

MUSICAL DISCOGRAPHY

"Piñata" with *volcano!*, The Leaf Label 2012

"Piñata (single)" with *volcano!*, The Leaf Label 2012

"So Many Lemons (single)" with *volcano!*, The Leaf Label 2009

"Paperwork" with *volcano!*, The Leaf Label 2008
- New York Times "Critic's Choice" (September, 2008)

"Africa Just Wants To Have Fun (7-inch)" with *volcano!*, The Leaf Label 2008

"Apple or a Gun (7-inch)" with *volcano!*, The Leaf Label 2006

"Beautiful Seizure" with *volcano!*, The Leaf Label 2005
- DrownedInSound.com's #2 Album of the Year (2006)

"Chicago Union Station" with *Cartwright, Moorefield, Weeter* 2004
- Organised Sound DVD, Cambridge University Press (2004)
- International Computer Music Conference DVD (2004)

CONFERENCE / FESTIVAL PRESENTATION OF COMPOSITIONS

"Six Corners" by *Cartwright, Moorefield, Weeter*
- Third Practice 2006
- New Music Northwestern Festival 2005

"Chicago Union Station" by *Cartwright, Moorefield, Weeter*
- Electronic Music Midwest 2005
- Society for Electro-Acoustic Music in the United States 2005
- International Computer Music Conference 2004

SELECTED MUSICAL PERFORMANCES

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

REFERENCES

Juan P. Bello, Professor at New York University	jpbello@nyu.edu
Bryan Pardo, Professor at Northwestern University	pardo@northwestern.edu
Oded Nov, Professor at New York University	onov@nyu.edu
Darren Gergle, Professor at Northwestern University	dgergle@northwestern.edu
Gautham Mysore, Principal Scientist at Adobe Research	gmysore@adobe.com

Josh Reiss, Professor at Queen Mary University of London josh.reiss@eecs.qmul.ac.uk