MARK CARTWRIGHT

Brooklyn, NY

www.markcartwright.com

RESEARCH INTERESTS

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

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

CURRENT APPOINTMENT

New Jersey Institute of Technology, Newark, NJ
Assistant Professor, Department of Informatics   Jan. 2021 - present
Core Faculty, Center for AI Research   Sep. 2021 - present

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

New Jersey Institute of Technology, Newark, NJ
Assistant Professor, Department of Informatics   Jan. 2021 - present
Core Faculty, Center for AI Research   Sep. 2021 - present

New York University, New York, NY
Research Assistant Professor, Dept. of Computer Science and Engineering   Jan. 2019 – Dec. 2020
Research Scientist, Center for Urban Science and Progress   Jan. 2019 – Dec. 2020
Postdoctoral Researcher, Dept. Music and Performing Arts Professions   Sep. 2016 – Dec. 2018
Music and Audio Research Laboratory; P.I.: Juan Pablo Bello

Northwestern University, Evanston, IL
Research Assistant, Dept of Electrical Engineering and Computer Science   Sep. 2009 – Aug. 2016

Interactive Audio Lab; P.I.: Bryan Pardo

Adobe Systems, San Francisco, CA
Research Intern, Adobe Research   Feb. 2015 – May 2015
Creative Technologies Lab; Mentors: Gautham Mysore and Matt Hoffman

Queen Mary University of London, London, UK
Visiting Student Researcher, Department of Electronic Engineering   Feb. 2013 – Nov. 2013
Center for Digital Music; Hosts: Josh Reiss and Andrew McPherson

PacketVideo, Palatine, IL
Digital Signal Processing Engineer   Sep. 2007 – Aug. 2009

Big House Audio, Chicago, IL
Audio Post Production Engineer   Nov. 2005 – May 2006

RESEARCH FUNDING

Spatial Sound Scene Description   Jul 1, 2020 – Jun 30, 2023
National Science Foundation – CISE III core program ($1,022,555)
PI: Juan Pablo Bello, Co-PI: Agnieszka Roginska, Mark Cartwright, Brian McFee

Open World Sound Event Recognition in Longitudinal Audio Data   2021–2022
NJIT Faculty Seed Grant ($7,500)
PI: Mark Cartwright

HONORS AND AWARDS

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

PUBLICATIONS

Journal Publications

5. Mendez, A.E.M., Cartwright, M., Bello, J.P., Nov, O. Eliciting Confidence for Improving Crowd-sourced Audio Annotations. *Accepted for publication in Proceedings of the ACM on Human-Computer Interaction in 2022.*

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

3. 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.

2. 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.

1. 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

33. Fuentes, M., Zhao, D., Lostanlen, V., Cartwright, M., Mydlarz, C., Bello, J.P. MONYC: Music of New York City Dataset. In *Proceedings of the Workshop on Detection and Classification of Acoustic Scenes and Events (DCASE)*, 2021.

32. Cramer, A. Cartwright, M., Pishdadian, F., Bello, J.P. Weakly Supervised Source-Specific Sound Level Estimation in Noisy Soundscapes. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2021.

31. Wang, Y. Bryan, N., Salamon, J., Cartwright, M., Bello, J.P. Who calls the shots? Rethinking few-shot learning for audio. In *Proceedings of the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, 2021.

30. Wang, Y., Bryan, N., Cartwright, M., Bello, J.P., Salamon, J. Few-Shot Continual Learning for Audio Classification. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2021.

29. Srivastava, S., Roy, D., Cartwright, M., Bello, J.P., Arora, A. Specialized Embedding Approximation for Edge Intelligence: A Case Study in Urban Sound Classification. In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2021.

28. Cartwright, M., Cramer, J., Mendez, A.E.M., Wang, Y., Wu, H., Lostanlen, V., Fuentes, M., Dove, G., Mydlarz, C., Salamon, J., Nov, O., Bello, J.P. SONYC-UST-V2: An Urban Sound Tagging Dataset with Spatiotemporal Context. In *Proceedings of the Workshop on Detection and Classification of Acoustic Scenes and Events (DCASE)*, 2020.

27. Wang, Y., Salamon, J., Cartwright, M., Bryan, N.J., Bello, J.P. Few-Shot Drum Transcription in Polyphonic Music. In *Proceedings of the International Conference on Music Information Retrieval (ISMIR)*, 2020.

26. 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.

25. 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.

24. 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.

23. 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.

22. 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.

21. 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.

20. 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.

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

18. 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.

17. 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.

16. 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.

15. 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.

14. 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.

13. 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.

12. 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.

11. 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**

10. 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**

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

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

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

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

5. 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.

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

3. 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.

2. 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.

1. 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

2. 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.

1. 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

1. Cartwright, M., Pardo, B. "Systems, Methods, and Apparatus to Search Audio Synthesizers using Vocal Imitation," U.S. Patent US9390695B2, filed October 27, 2015, and issued July 12, 2016.

INVITED LECTURES AND SEMINARS

17. New Jersey Institute of Technology   February 24, 2020
    "Machine Listening with Limited Labeled Data: From Crowdsourcing to Self-Supervision"

16. New York University Center for Data Science Seminar   February 6, 2019
    "Building a Machine-Listening System to Monitor, Analyze, and Mitigate Urban Noise Pollution"

15. Audio Engineering Society Latin American Conference Keynote   September 24, 2018
    "Building a Machine-Listening System to Monitor, Analyze, and Mitigate Urban Noise Pollution"

14. Cornell Tech   May 11, 2018
    "Crowdsourcing Audio Annotations"

13. University of Victoria   March 8, 2018
    "Human-Centered Audio Processing"

12. Midwest Music and Audio Day (MMAD)   June 23, 2017
    "A Study on Best Practices for Crowdsourced Annotation of Sound Events"

11. Workshop on Cross-Disciplinary and Multi-Cultural Perspectives on   March 21, 2017
    Musical Rhythm and Improvisation III, NYU Abu Dhabi
    "Towards Data-Driven Models of Rhythm"

10. 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"

9. University of Washington DUB Seminar   June 1, 2016
  "'Give me a <ka-CHUNK>': Rethinking the Interaction Paradigm of Audio Production Tools"

8. University of Toronto   April 7, 2016
  "'Give me a <ka-CHUNK>': Rethinking the Interaction Paradigm of Audio Production Tools"

7. University of Illinois at Chicago   March 2, 2016
  "'Give me a <ka-CHUNK>': Rethinking the Interaction Paradigm of Audio Production Tools"

6. Bay Innovative Signal Hackers (BISH) Bash   September 17, 2015
  "Crowdsourced Audio Quality Evaluation"

5. KAIST (Korea Advanced Institute of Science and Technology)   April 24, 2015
  "Natural Communication and Exploration in Audio Production Interfaces"

4. Birmingham City University   August 6, 2014
  "Natural Communication and Exploration in Audio Production Interfaces"

3. Institut de Recherche et Coordination Acoustique/Musique (IRCAM)   July 4, 2014
  "Natural Communication and Exploration in Audio Production Interfaces"

2. Midwest Music Information Retrieval Gathering (MMIRG)   June 14, 2014
  "SynthAssist: Querying a Synthesizer Using Vocal Imitation"

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

ACADEMIC SERVICE

University-wide
Faculty Search Committee of the Department of Informatics   2021–2022

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

Program Committee
ACM Conference on Computer-Supported Cooperative Work and Social Computing   2021
International Society for Music Information Retrieval Conference   2020–2021
International Conference on Digital Audio Effects   2018

Journal Reviewing
IEEE Transactions on Multimedia, Elsevier Machine Learning with Applications, Journal of the Acoustical Society of America, Journal of the Audio Engineering Society, IEEE Transactions on Audio, Speech and Language Processing, MDPI Applied Sciences, Acta Acustica united with Acustica, IEEE Signal

Processing Magazine, ACM Transactions on Interactive Intelligent Systems, Springer Journal on Multimodal User Interfaces, IEEE Signal Processing Letters, Springer Information Retrieval Journal

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

Other Academic Service
Mentor, Women in Music Information Retrieval mentoring program   2019–2021

TEACHING EXPERIENCE

Courses

Instructor, IS-247 Designing the User Experience   *2022*
New Jersey Institute of Technology

Instructor, IS-657 Spatiotemporal Urban Analytics   2021
New Jersey Institute of Technology

Instructor, IS-485/698 Machine Listening   2021
New Jersey Institute of Technology

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

Doctoral Advising

Keita Ohshiro, New Jersey Institute of Technology   Expected 2025

Sripathi Sridhar, New Jersey Institute of Technology   Expected 2025

Masters Advising

Aaron Basch, New Jersey Institute of Technology   Expected 2022

Doctoral Thesis Reading

Ana Elisa Mendez Mendez, Doctoral, New York University	Expected 2022
Toni Heittola, Doctoral, Tampere University	2021

Student Mentorship

Danzel Serrano, Undergraduate, New Jersey Institute of Technology	2021
Sangeeta Srivastava, Doctoral, Ohio State University	2018–2021
Yu Wang, Doctoral, New York University	2018–2021
Aurora Cramer, Doctoral, New York University	2018–2021
Ana Elisa Mendez Mendez, Doctoral, New York University	2017–2021
Alice Cohen-Hadria, Doctoral, IRCAM	2019
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
Bianca Brusco, Masters, New York University	2018–2019
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

New York Times	May 22, 2020
"The Coronavirus Quieted City Noise. Listen to Whats Left"	
NBC 4 New York	May 22, 2020
"The City That Never Makes a Peep: NYCs Quietest Days on Record Have Come Amid Shutdown"	
NPR Here and Now	April 14, 2020
"Volunteers Flock To Sign Up As Citizen Scientists"	
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"	

ADDITIONAL EDUCATION

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

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

PROFESSIONAL MEMBERSHIPS

ACM (Association for Computing Machinery)

IEEE (Institute of Electrical and Electronics Engineers)

National Academy of Inventors