

**Zafar Rafii**

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**EMPLOYMENT**

<b>2022-now</b>	Research Scientist <i>Audible Magic, Los Gatos, CA, USA</i>
<b>2021-2022</b>	Research Engineer Manager <i>Gracernote, Emeryville, CA, USA</i>
<b>2018-2021</b>	Senior Research Engineer <i>Gracernote, Emeryville, CA, USA</i>
<b>2014-2017</b>	Research Engineer <i>Gracernote, Emeryville, CA, USA</i>
<b>2013</b>	PhD Intern (6 months) <i>Gracernote, Emeryville, CA, USA</i>
<b>2007-2008</b>	Research Engineer (1+ year) <i>Mist Technologies (now Audionamix), Paris, France</i>
<b>2002-2004</b>	Student Internship (3 months) <i>Dalkia, Paris, France</i>

**EDUCATION**

<b>2008-2014</b>	PhD in Electrical Engineering and Computer Science <i>Northwestern University, Evanston, IL, USA</i> Thesis: Source Separation by Repetition
<b>2008-2011</b>	Certificate in Cognitive Science <i>Northwestern University, Evanston, IL, USA</i>
<b>2005-2006</b>	Master of Science in Electrical Engineering <i>Illinois Institute of Technology, Chicago, IL, USA</i>
<b>2003-2006</b>	Master of Electrical Engineering, Computer Science and Telecommunications <i>Ecole Nationale Supérieure d'Electronique et de ses Applications, Cergy, France</i>
<b>2001-2003</b>	Classes Préparatoires aux Grandes Ecoles, Physics and Engineering Science <i>Jacques Decour, Paris, France</i>
<b>1998-2001</b>	Baccalauréat in Sciences <i>Louis-le-Grand, Paris, France</i>

**TEACHING**

<b>2014</b>	Machine Perception of Music and Audio (course evaluation: 5.4/6)
<b>2012</b>	Machine Perception of Music and Audio (course evaluation: 5.0/6)
<b>2010</b>	Introduction to Electrical Engineering (course evaluation: 5.2/6)

**FELLOWSHIPS**

<b>2014</b>	Terminal Year Fellowship
<b>2012</b>	Advanced Cognitive Science Fellowship
<b>2008</b>	Walter P. Murphy Fellowship

**VOLUNTEERING****Organizer**

<b>2023-now</b>	Widening Inclusion in Music Information Retrieval (WIMIR) mentoring program
<b>2015-now</b>	Bay Innovative Signal Hackers (BISH) Bash meetup group
<b>2015-2017</b>	Community-based Signal Separation Evaluation Campaign (SiSEC)

**Chair**

<b>2019-now</b>	IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) reviewer
chair	
<b>2019-2023</b>	IEEE ICASSP session chair

**2021-2023** IEEE Audio and Acoustic Signal Processing (AASP) Technical Committee industry subcommittee chair  
**2021** IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA) industry liaison chair

#### Associate Editor

**2023-now** IEEE Transactions on Audio, Speech and Language Processing (TALSP)  
**2023-now** EURASIP Journal on Audio, Speech, and Music Processing (JASMP)

#### Journal Reviewer

**2025-now** Scientific Reports  
**2024-now** IEEE Open Journal of Signal Processing  
**2023-now** Transactions of the International Society for Music Information Retrieval (TISMIR)  
**2021-now** IEEE Signal Processing Magazine  
**2017-now** EURASIP JASMP  
**2015-now** Journal of the Audio Engineering Society (JAES)  
**2014-now** IEEE Signal Processing Letters  
**2010-now** IEEE TASLP  
**2018** EURASIP Journal on Advances in Signal Processing (JASP)  
**2017** IEEE Access

#### Conference Reviewer

**2015-now** IEEE WASPAA  
**2014-now** European Signal Processing Conference (EUSIPCO)  
**2013-now** IEEE ICASSP  
**2009-now** International Society for Music Information Retrieval (ISMIR)  
**2018** International Conference on Latent Variable Analysis and Signal Separation (LVA/ICA)  
**2013-2016** ACM International Multimedia Conference  
**2013** International Conference on Digital Audio Effects (DAFx)

#### Other

**2020-now** WIMIR mentor  
**2012-now** IEEE Senior member  
**2017-2023** IEEE AASP Technical Committee member  
**2023** IEEE WASPAA meta-reviewer

## PUBLICATIONS

### Patents

- Zafar Rafii, Markus Cremer, and Bongjun Kim. "Methods and Apparatus to Identify Sources of Network Streaming Services," US Patent App. 19/029,710, 2025.
- Zafar Rafii. "Methods and Apparatus for Harmonic Source Enhancement," US Patent App. 19/021,910, 2025.
- Markus Kurt Cremer, Robert Coover, Zafar Rafii, Aneesh Vartakavi, Andreas Schmidt, and Todd Hodges. "Methods and Apparatus to Control Light Pulsing Effects based on Media content," US Patent App. 19/005,774, 2025.
- Zafar Rafii, Erling Wold, Todd Patrick McGee, and Richard Boulderstone. "Detecting and Removing Media Modifications for Identification Services and Copyright Compliance," US Patent App. 18/482,655, 2025.
- Zafar Rafii, Robert Coover, David Gish, Alexander Topchy, Christen V Nielsen, Sadhana Gupta, Girish Khavasi, John Steven Stavropoulos. "Use of Audio Classification as Basis to Control Audio Identification," US Patent App. 18/348,202, 2025.
- Zafar Rafii and Prem Seetharaman. "Audio Identification based on Data Structure," US Patent App. 18/824,127, 2024.
- Markus Cremer, Zafar Rafii, Robert Coover, and Prem Seetharaman. "Automated Cover Song Identification," US Patent App. 18/790,730, 2024.
- Alexander Berrian, Todd Hodges, Robert Coover, Matthew Wilkinson, and Zafar Rafii. "Audio Content Recognition Method and System," US Patent App. 18/790,749, 2024.

- Xiaochen Liu, Joseph Renner, Joshua Morris, Todd Hodges, Robert Coover, and Zafar Rafii. "Cover Song Identification Method and System," US Patent App. 18/768,497, 2024.
- Zafar Rafii. "Methods and Apparatus to Extract a Pitch-independent Timbre Attribute from a Media Signal," US Patent App. 18/743,215, 2024.
- Zafar Rafii. "Methods and Apparatus to Improve Detection of Audio Signatures," US Patent App. 18/740,270, 2024.
- Markus Kurt Cremer, Robert Coover, Zafar Rafii, Aneesh Vartakavi, Andreas Schmidt, Todd Hodges. "Methods and Apparatus to Control Lighting Effects," US Patent 12,035,431, 2024.
- Zafar Rafii, Markus Cremer, and Bongjun Kim. "Methods and Apparatus to Identify Sources of Network Streaming Services using Windowed Sliding Transforms," US Patent 11,430,454, 2022.
- Zafar Rafii. "Audio Matching based on Harmonogram," US Patent 11,366,850, 2022.
- Zafar Rafii. "Methods and Apparatus to Perform Windowed Sliding Transforms," US Patent 10,726,852, 2020.
- Robert Coover and Zafar Rafii. "Methods and Apparatus to Fingerprint an Audio Signal via Normalization," US Patent App. 16/453,654, 2020.
- Bryan Pardo and Zafar Rafii. "Audio Separation System and Method," US Patent 9,093,056, 2015.

#### Journal Articles

- Zafar Rafii, Erling Wold, and Richard Boulterstone. "How to Design a Cheap Music Detection System Using a Simple Multilayer Perceptron With Temporal Integration," *IEEE Signal Processing Magazine*, vol. 41, no. 4, October 2024.
- Zafar Rafii. "The Constant-Q Harmonic Coefficients: A Timbre Feature Designed for Music Signals," *IEEE Signal Processing Magazine*, vol. 39, no. 3, May 2022.
- Zafar Rafii. "Sliding Discrete Fourier Transform with Kernel Windowing," *IEEE Signal Processing Magazine*, vol. 35, no. 6, November 2018.
- Zafar Rafii, Antoine Liutkus, Fabian-Robert Stöter, Stylianos Ioannis Mimilakis, Derry FitzGerald, and Bryan Pardo. "An Overview of Lead and Accompaniment Separation in Music," *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, vol. 26, no. 8, August 2018.
- Zafar Rafii, Zhiyao Duan, and Bryan Pardo. "Combining Rhythm-based and Pitch-based Methods for Background and Melody Separation," *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, vol. 22, no. 12, December 2014.
- Antoine Liutkus, Derry FitzGerald, Zafar Rafii, Bryan Pardo, and Laurent Daudet. "Kernel Additive Models for Source Separation," *IEEE Transactions on Signal Processing*, vol. 62, no. 16, August 2014.
- Zafar Rafii and Bryan Pardo. "REpeating Pattern Extraction Technique (REPET): A Simple Method for Music/Voice Separation," *IEEE Transactions on Audio, Speech, and Language Processing*, vol. 21, no. 1, January 2013.
- Andrew Todd Sabin, Zafar Rafii, and Bryan Pardo. "Weighting-Function-Based Rapid Mapping of Descriptors to Audio Processing Parameters," *Journal of the Audio Engineering Society*, vol. 59, no. 6, June 2011.

#### Conference Proceedings

- Geoffroy Peeters, Zafar Rafii, Magdalena Fuentes, Zhiyao Duan, Emmanouil Benetos, Juhan Nam, Yuki Mitsufuji. "Twenty-Five Years of MIR Research: Achievements, Practices, Evaluations, and Future Challenges," *50<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Hyderabad, India, April 6-11, 2025.
- Aneesh Vartakavi, Amanmeet Garg, and Zafar Rafii. "Audio Summarization for Podcasts," *29<sup>th</sup> European Signal Processing Conference*, Dublin, Ireland, August 23-27, 2021.
- Bongjun Kim and Zafar Rafii. "Lossy Audio Compression Identification," *26<sup>th</sup> European Signal Processing Conference*, Rome, Italy, September 3-7, 2018.
- Prem Seetharaman and Zafar Rafii. "Cover Song Identification with 2d Fourier Transform Sequences," *42<sup>nd</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, New Orleans, USA, March 5-9, 2017.
- Derry FitzGerald, Zafar Rafii, and Antoine Liutkus. "User Assisted Separation of Repeating Patterns in Time and Frequency using Magnitude Projections," *42<sup>nd</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, New Orleans, USA, March 5-9, 2017.
- Antoine Liutkus, Fabian-Robert Stöter, Zafar Rafii, Daichi Kitamura, Bertrand Rivet, Nobutaka Ito, Nobutaka Ono, and Lujie Fontecave. "The 2016 Signal Separation Evaluation Campaign," *13<sup>th</sup> International Conference on Latent Variable Analysis and Signal Separation*, Grenoble, France, February 21-23, 2017.

- Nobutaka Ono, Zafar Rafii, Daichi Kitamura, Nobutaka Ito, and Antoine Liutkus. "The 2015 Signal Separation Evaluation Campaign," *12<sup>th</sup> International Conference on Latent Variable Analysis and Signal Separation*, Liberec, Czech Republic, August 25-28, 2015.
- Zafar Rafii, Antoine Liutkus, and Bryan Pardo. "A Simple User Interface System for Recovering Patterns Repeating in Time and Frequency in Mixtures of Sounds," *40<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Brisbane, Australia, April 19-24, 2015.
- Antoine Liutkus, Derry FitzGerald, and Zafar Rafii. "Scalable Audio Separation with Light Kernel Additive Modelling," *40<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Brisbane, Australia, April 19-24, 2015.
- Derry FitzGerald, Antoine Liutkus, Zafar Rafii, Bryan Pardo, and Laurent Daudet. "Harmonic/Percussive Separation using Kernel Additive Modelling," *25<sup>th</sup> IET Irish Signals and Systems Conference*, Limerick, Ireland, June 26-27, 2014.
- Antoine Liutkus, Zafar Rafii, Bryan Pardo, Derry FitzGerald, and Laurent Daudet. "Kernel Spectrogram Models for Source Separation," *4<sup>th</sup> Joint Workshop on Hands-free Speech Communication and Microphone Arrays*, Nancy, France, May 12-14, 2014.
- Zafar Rafii, Bob Coover, and Jinyu Han. "An Audio Fingerprinting System for Live Version Identification using Image Processing Techniques," *39<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Florence, Italy, May 4-9, 2014.
- Zafar Rafii, François G. Germain, Dennis L. Sun, and Gautham J. Mysore. "Combining Modeling of Singing Voice and Background Music for Automatic Separation of Musical Mixtures," *14<sup>th</sup> International Society for Music Information Retrieval*, Curitiba, PR, Brazil, November 4-8, 2013.
- Zafar Rafii and Bryan Pardo. "Online REPET-SIM for Real-time Speech Enhancement," *38<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Vancouver, BC, Canada, May 26-31, 2013.
- Zafar Rafii and Bryan Pardo. "Music/Voice Separation using the Similarity Matrix," *13<sup>th</sup> International Society for Music Information Retrieval*, Porto, Portugal, October 8-12, 2012.
- Antoine Liutkus, Zafar Rafii, Roland Badeau, Bryan Pardo, and Gaël Richard. "Adaptive Filtering for Music/Voice Separation Exploiting the Repeating Musical Structure," *37<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Kyoto, Japan, March 25-30, 2012.
- Mark Cartwright, Zafar Rafii, Jinyu Han, and Bryan Pardo. "Making Searchable Melodies: Human vs. Machine," *3<sup>rd</sup> Human Computation Workshop*, San Francisco, CA, USA, August 8, 2011.
- Zafar Rafii and Bryan Pardo. "A Simple Music/Voice Separation Method based on the Extraction of the Repeating Musical Structure," *36<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Prague, Czech Republic, May 22-27, 2011.
- Zafar Rafii and Bryan Pardo. "Degenerate Unmixing Estimation Technique using the Constant Q Transform," *36<sup>th</sup> IEEE International Conference on Acoustics, Speech and Signal Processing*, Prague, Czech Republic, May 22-27, 2011.
- Zafar Rafii and Bryan Pardo. "Learning to control a Reverberator using Subjective Perceptual Descriptors," *10<sup>th</sup> International Society for Music Information Retrieval*, Kobe, Japan, October 26-30, 2009.

#### Book Chapters

- Bryan Pardo, Zafar Rafii, and Zhiyao Duan. "Audio Source Separation in a Musical Context," *Handbook of Systematic Musicology*, Springer, Berlin, Heidelberg, 2018.
- Zafar Rafii, Antoine Liutkus, and Bryan Pardo. "REPET for Background/Foreground Separation in Audio," *Blind Source Separation*, Springer, Berlin, Heidelberg, 2014.

#### Technical Reports

- Zafar Rafii and Bryan Pardo. "A Digital Reverberator Controlled through Measures of the Reverberation," Northwestern University, EECS Department Technical Report NWU-EECS-09-08, 2009.

#### Data Sets

- Zafar Rafii, Antoine Liutkus, Fabian-Robert Stöter, Stylianos Ioannis Mimilakis, and Rachel Bittner. "MUSDB18-HQ – an uncompressed version of MUSDB18," <https://doi.org/10.5281/zenodo.3338373>, 2019.
- Zafar Rafii, Antoine Liutkus, Fabian-Robert Stöter, Stylianos Ioannis Mimilakis, and Rachel Bittner. "The MUSDB18 corpus for music separation," <https://doi.org/10.5281/zenodo.1117372>, 2017.

#### PRESENTATIONS

##### Tutorials

- Josh McDermott, Bryan Pardo, and Zafar Rafii. "Leveraging Repetition to Parse the Auditory Scene," *13<sup>th</sup> International Society for Music Information Retrieval*, Porto, Portugal, October 8-12 2012.

### Workshops

- Zafar Rafii. "An Audio Fingerprinting System for Live Version Identification using Image Processing Techniques," *Midwest Music Information Retrieval Gathering*, Northwestern University, Evanston, IL, USA, June 14, 2014.
- Zafar Rafii. "REPET," *Midwest Music Information Retrieval Gathering*, Northwestern University, Evanston, IL, USA, June 24, 2011.
- Zafar Rafii, Raphael Blouet, and Antoine Liutkus. "Discriminant Approach within Non-negative Matrix Factorization for Musical Components Recognition," *DMRN+2: Digital Music Research Network One-day Workshop 2007*, Queen Mary University of London, London, UK, December 18, 2007.

### Talks

- Zafar Rafii. "Sliding DFT with Kernel Windowing," Tokyo-BISH Bash, Tokyo, Japan, March 30, 2021.
- Zafar Rafii. "Identifying Video Sources by Identifying Audio Compression," Télécom ParisTech, Paris, France, April 13, 2018.
- Zafar Rafii. "Source Separation by Repetition," Center for Computer Research in Music and Acoustics, Stanford University, Stanford, CA, USA, July 15, 2015.
- Zafar Rafii. "Source Separation by Repetition," Center for New Music and Audio Technologies, University of California at Berkeley, Berkeley, CA, USA, May 11, 2015.
- Zafar Rafii. "A Simple Music/Voice Separation Method based on the Extraction of the Underlying Repeating Structure," Télécom ParisTech, Paris, France, July 29, 2011.

### Lectures

- Zafar Rafii. "Audio Fingerprinting," EECS 352: Machine Perception of Music and Audio, Northwestern University, 2014.
- Zafar Rafii. "REpeating Pattern Extraction Technique (REPET)," EECS 352: Machine Perception of Music and Audio, Northwestern University, 2014.
- Zafar Rafii. "Rhythm Analysis in Music," EECS 352: Machine Perception of Music and Audio, Northwestern University, 2014.
- Zafar Rafii. "Time-frequency Masking," EECS 352: Machine Perception of Music and Audio, Northwestern University, 2014.

### PERSONAL

#### Languages

- English (fluent), French (native), German (beginner), Italian (beginner), Persian (beginner), Vietnamese (beginner).

#### Hobbies

- Biking, brewing, cooking, drinking, eating, gardening, reading, running, traveling, other things in ing.

#### Travel

- Andorra, Australia, Austria, Belgium, Canada, China, Czech Republic, Earth, France, Germany, Greece, Hungary, Indonesia, Italy, Iran, Japan, Malta, Netherlands, Portugal, South Korea, Spain, United Kingdom, United States, Vietnam.