

Shoichi Koyama | Resumé

Eng. bldg. 6-242, 7-3-1 Hongo, Bunkyo-ku – Tokyo 113-8656 Japan

☎ +81 3 5841 6904 • ✉ koyama.shoichi@ieee.org • 🌐 www.sh01.org

Personal profile

Shoichi Koyama received the B.E., M.S., and Ph.D. degrees from the University of Tokyo, Tokyo, Japan, in 2007, 2009, and 2014, respectively. He joined Nippon Telegraph and Telephone Corporation (NTT) in 2009 and started the career as a researcher in acoustic signal processing at NTT Cyberspace Laboratories (currently Media Intelligence Laboratories). In 2014, he joined the Graduate School of Information Science and Technology, the University of Tokyo, as an Assistant Professor (Research Associate), and he is now an Assistant Professor (Lecturer). From 2016 to 2018, he was also a visiting researcher at Paris Diderot University (Paris 7) / Institut Langevin, Paris, France. His research interests include sound field analysis and synthesis, sparse signal representation, and acoustic inverse problems.

Dr. Koyama is a member of the Institute of Electrical and Electronic Engineers (IEEE), the Audio Engineering Society (AES), the Institute of Electronics, Information and Communication Engineers (IEICE), and the Acoustical Society of Japan (ASJ). He was awarded the Best Young Researcher Paper Award on Sensors and Micromachines Society by the Institute of Electrical Engineers of Japan (IEEJ) in 2010, the Itakura Prize Innovative Young Researcher Award by ASJ in 2015, and the Telecom System Technology Award by the Telecommunication Advancement Foundation in 2015.

Education

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| The University of Tokyo
<i>B.E. in Mathematical Engineering and Information Physics</i>
Signal processing using a new type of acoustic sensor (Supervisor: Prof. Shigeru Ando) | Tokyo, Japan
2003 Apr. – 2007 Mar. |
| The University of Tokyo
<i>M.S. in Information Physics and Computing</i>
Acoustic source localization with the weighted integral method (Supervisor: Prof. Shigeru Ando) | Tokyo, Japan
2007 Apr. – 2009 Mar. |
| The University of Tokyo
<i>Ph.D. (Information Science and Technology)</i>
Analytical approach to sound field capturing and reproduction (Chief examiner: Prof. Shigeru Ando) | Tokyo, Japan
2014 Jan. |

Professional experience

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|---|---|
| Nippon Telegraph and Telephone Corp.
<i>Researcher</i>
Worked at NTT Cyber Space Laboratories (currently Media Intelligence Laboratories) | Tokyo, Japan
2009 Apr. – 2014 Mar. |
| The University of Tokyo
<i>Assistant Professor (Research Associate)</i>
As a faculty staff of Department of Information Physics and Computing, Graduate School of Information Science and Technology | Tokyo, Japan
2014 Apr. – 2018 Mar. |
| Paris Diderot University (Paris 7) / Institut Langevin
<i>Visiting researcher</i>
As a JSPS Overseas Research Fellow (Host researcher: Prof. Laurent Daudet) | Paris, France
2016 Apr. – 2018 Mar. |
| The University of Tokyo
<i>Assistant Professor (Lecturer)</i>
As a faculty staff of Department of Information Physics and Computing, Graduate School of Information Science and Technology | Tokyo, Japan
2014 Apr. – present |

Teaching and mentoring experience

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|---|----------------------------------|
| Nippon Telegraph and Telephone Corp.
<i>Supervision of research intern</i>
Supervised an undergraduate student from Keio University, Kanagawa, Japan | Tokyo, Japan
2010 Aug. |
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Nippon Telegraph and Telephone Corp. <i>Supervision of research intern</i>	Tokyo, Japan 2012 Jan. – Aug.
Supervised an undergraduate student from University of British Columbia, Vancouver, Canada	
Nippon Telegraph and Telephone Corp. <i>Supervision of research intern</i>	Tokyo, Japan 2013 Aug. – Dec.
Supervised an undergraduate student from Georgia University of Technology, Atlanta, United States	
The University of Tokyo <i>Student experiments</i>	Tokyo, Japan 2014 Apr. – 2016 Mar.
Basic experiments of acoustic signal processing and sensor circuits for undergraduate students	
The University of Tokyo <i>Supervision/supervision aid of students</i>	Tokyo, Japan 2014 Apr. – present
Mentored 2 undergraduate and 3 master students	

Honors and Awards

Funai Foundation for Information Technology (FFIT) <i>The Research Award</i>	2018
The Telecommunication Advancement Foundation <i>The Telecom System Technology Award</i>	2015
The Acoustical Society of Japan <i>The Itakura Prize Innovative Young Researcher Award</i>	2015
The Acoustical Society of Japan <i>The Awaya Prize Young Researcher Award</i>	2011
IEEJ Sensors and Micromachines Society <i>The Best Young Researcher Paper Award</i>	2010
SICE Measurement Division <i>The Young Researcher Award</i>	2009

Funding

As representative	
Japan Society for the Promotion of Science <i>JSPS Overseas Research Fellowships</i>	Japan 2016 – 2018
Japan Society for the Promotion of Science <i>JSPS KAKENHI Grant-in-Aid for Young Scientists (A)</i> Grant number: 15H05312, Amount: 29,900,000 JPY (prospect)	Japan 2015 – 2019
Ono Acoustics Research Grant Foundation <i>Research grant</i> Amount: 1,000,000 JPY	Japan 2015
Japan Society for the Promotion of Science <i>JSPS KAKENHI Grant-in-Aid for Young Scientists (Start-up)</i> Grant number: 26880003, Amount: 1,430,000 JPY	Japan 2014 – 2015
The Telecommunications Advancement Foundation <i>Overseas Travel Grant</i> For attending International Workshop on Acoustic Signal Enhancement (IWAENC) 2014, Amount: 290,000 JPY	Japan 2014
As collaborator	
Japan Society for the Promotion of Science <i>JSPS KAKENHI Grant-in-Aid for Scientific Research (A)</i> Grant number: 16H01735, Representative: Prof. Nobutaka Ono (National Institute of Informatics, Japan)	Japan 2016 – 2019
Japan Society for the Promotion of Science <i>JSPS KAKENHI Grant-in-Aid for Scientific Research (A)</i> Grant number: 23240023, Representative: Prof. Hiroshi Saruwatari (The University of Tokyo, Japan)	Japan 2014

Publications

Journal papers.....

- [1] Shoichi Koyama, Toru Kurihara, and Shigeru Ando. A theory and experiment of instantaneous wave source localization from a wave distribution on a small region. *IEEJ Transactions of Sensors and Micromachines*, 129-E(10):350–356, 2009. (in Japanese).
- [2] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Reproducing virtual sound sources in front of a loudspeaker array using inverse wave propagator. *IEEE Transactions on Audio, Speech, and Language Processing*, 20(6):1746–1758, 2012.
- [3] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Analytical approach to wave field reconstruction filtering in spatio-temporal frequency domain. *IEEE Transactions on Audio, Speech, and Language Processing*, 21(4):685–696, 2013.
- [4] Yoichi Haneda, Ken'ichi Furuya, Shoichi Koyama, and Kenta Niwa. Close-talking microphone arrays based on spherical harmonic expansion. *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, J97-A(4):264–273, 2014. (in Japanese).
- [5] Yoichi Haneda, Ken'ichi Furuya, Shoichi Koyama, Kenta Niwa, and Kazunori Kobayashi. Sound field simulation for circular array based on spatial circular convolution. *Acoustical Science and Technology*, 35(2):99–107, 2014.
- [6] Shoichi Koyama, Ken'ichi Furuya, Yusuke Hiwasaki, Yoichi Haneda, and Yôiti Suzuki. Wave field reconstruction filtering in cylindrical harmonic domain for with-height recording and reproduction. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 22(10):1546–1557, 2014.
- [7] Shoichi Koyama, Ken'ichi Furuya, Hisashi Uematsu, Yusuke Hiwasaki, and Yoichi Haneda. Real-time sound field transmission system by using wave field reconstruction filter and its evaluation. *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, E97-A(9):1840–1848, 2014.
- [8] Jorge Trevino, Shoichi Koyama, Shuichi Sakamoto, and Yôiti Suzuki. Mixed-order ambisonics encoding of cylindrical microphone array signals. *Acoustical Science and Technology, Acoustical Letter*, 35(3):174–177, 2014.
- [9] Shoichi Koyama, Ken'ichi Furuya, Yoichi Haneda, and Hiroshi Saruwatari. Source-location-informed sound field recording and reproduction. *IEEE Journal of Selected Topics in Signal Processing*, 9(5):881–894, 2015.
- [10] Shoichi Koyama, Ken'ichi Furuya, Keigo Wakayama, Suehiro Shimauchi, and Hiroshi Saruwatari. Analytical approach to transforming filter design for sound field recording and reproduction using circular arrays with a spherical baffle. *Journal of the Acoustical Society of America*, 139(3):1024–1036, 2016.
- [11] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Sparse sound field decomposition for super-resolution in recording and reproduction. *Journal of the Acoustical Society of America*, 2018. (to appear).
- [12] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Sound field recording using distributed microphones based on harmonic analysis of infinite order. *IEEE Signal Processing Letters*, 25(1):135–139, 2018.

Invited articles.....

- [1] Shoichi Koyama. Mathematical formulation of sound field reproduction –mathematics in wave field synthesis and higher order ambisonics–. *Journal of the Acoustical Society of Japan*, 68(11):584–589, 2012. (in Japanese).
- [2] Ken'ichi Furuya and Shoichi Koyama. Wave field synthesis; principles and applications. *Journal of the Institute of Image Information and Television Engineers*, 68(8):621–624, 2014. (in Japanese).
- [3] Shoichi Koyama. Sparse sound field representation for super-resolution in recording and reproduction. *Journal of the Acoustical Society of Japan*, 71(11):632–638, 2015. (in Japanese).

Conference papers.....

- [1] Shigeru Ando, Shoichi Koyama, Nobutaka Ono, and Naoki Ikeuchi. Silicon cochlear microphone “fishbone” with complex filtering and hilbert transform capability for instantaneous signal detection and analysis. In *Proceedings of Transducers '07*, pages 1295–1298, Lyon, Jun. 2007.
- [2] Shoichi Koyama, Toru Kurihara, and Shigeru Ando. A direct algebraic method of instantaneous wave source localization. In *Proceedings of SICE Annual Conference*, pages 532–537, Aug. 2008.
- [3] Shoichi Koyama and Risa Suzuki. Scape synthesis: Generation of a novel acoustical space based on auditory perceptual features. In *Proceedings of the 2009 International Computer Music Conference (ICMC)*, pages 533–536, Montreal, Aug. 2009.
- [4] Shoichi Koyama, Yusuke Hiwasaki, Ken’ichi Furuya, and Yoichi Haneda. Inverse wave propagation in wave field synthesis. In *Proceedings of 40th AES International Conference*, Tokyo, Oct. 2010.
- [5] Shoichi Koyama, Ken’ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Design of transform filter for sound field reproduction using microphone array and loudspeaker array. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pages 5–8, New Paltz, Oct. 2011.
- [6] Shoichi Koyama, Ken’ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Sound field recording and reproduction using transform filter designed in spatio-temporal frequency domain. In *Proceedings of 131st AES Convention*, New York, Oct. 2011.
- [7] Shoichi Koyama, Yusuke Hiwasaki, Ken’ichi Furuya, and Yoichi Haneda. Inverse wave propagation for reproducing virtual source in front of loudspeaker array. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 1322–1326, Barcelona, Sep. 2011.
- [8] Satoru Emura, Shoichi Koyama, Ken’ichi Furuya, and Yoichi Haneda. Posterior residual echo canceling and its complexity reduction in the wave domain. In *Proceedings of International Workshop on Acoustic Signal Enhancement (IWAENC)*, Aachen, Sep. 2012.
- [9] Shoichi Koyama, Ken’ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Design of transform filter for reproducing arbitrary shifted sound field using phase-shift of spatio-temporal frequency. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 381–384, Kyoto, 2012.
- [10] Shoichi Koyama, Ken’ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Sound field reproduction method in spatio-temporal frequency domain considering directivity of loudspeakers. In *Proceedings of 132nd AES Convention*, Budapest, Apr. 2012.
- [11] Shoichi Koyama, Ken’ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. MAP estimation of driving signals of loudspeakers for sound field reproduction from pressure measurements. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, Oct. 2013.
- [12] Shoichi Koyama, Ken’ichi Furuya, Yusuke Hiwasaki, Yoichi Haneda, and Yôiti Suzuki. Sound field reproduction using multiple linear arrays based on wave field reconstruction filtering in helical wave spectrum domain. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 271–275, Vancouver, Mar. 2013.
- [13] Shoichi Koyama, Ken’ichi Furuya, Hisashi Uematsu, Yusuke Hiwasaki, and Yoichi Haneda. Real-time sound field transmission system by using wave field reconstruction filter and its subjective listening test. In *Proceedings of 52nd AES International Conference*, Guildford, Sep. 2013.
- [14] Shoichi Koyama, Timothy Lee, Ken’ichi Furuya, Yusuke Hiwasaki, and Yoichi Haneda. Improvement using circular harmonics beamforming on reverberation problem of wave field reconstruction filtering. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 276–280, Vancouver, Mar. 2013.
- [15] Hideaki Takada, Munekazu Date, Shoichi Koyama, Shiro Ozawa, Satoshi Mieda, and Akira Kojima. High-reality space composition using stably-positioned imaging and acoustic wave field

- synthesis. In *Proceedings of 36th European Conference on Visual Perception (ECVP)*, page 224, Bremen, Aug. 2013.
- [16] Yoichi Haneda, Ken'ichi Furuya, Shoichi Koyama, and Kenta Niwa. Close-talking spherical microphone array using sound pressure interpolation based on spherical harmonic expansion. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 604–608, Florence, May 2014.
- [17] Shoichi Koyama, Suehiro Shimauchi, and Hitoshi Ohmuro. Sparse sound field representation in recording and reproduction for reducing spatial aliasing artifacts. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 4443–4447, Florence, May 2014.
- [18] Shoichi Koyama, Prakhar Srivastava, Ken'ichi Furuya, Suehiro Shimauchi, and Hitoshi Ohmuro. STSP: Space-time stretched pulse for measuring spatio-temporal impulse response. In *Proceedings of International Workshop on Acoustic Signal Enhancement (IWAENC)*, pages 309–313, Antibes, Sep. 2014.
- [19] Shoichi Koyama, Koichiro Ito, and Hiroshi Saruwatari. Source-location-informed sound field recording and reproduction with spherical arrays. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, Oct. 2015.
- [20] Shoichi Koyama, Atsushi Matsubayashi, Naoki Murata, and Hiroshi Saruwatari. Sparse sound field decomposition using group sparse bayesian learning. In *Proceedings of Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC)*, pages 850–855, Hong Kong, Dec. 2015.
- [21] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Structured sparse signal models and decomposition algorithm for super-resolution in sound field recording and reproduction. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 619–623, Brisbane, Apr. 2015.
- [22] Naoki Murata, Shoichi Koyama, Norihiro Takamune, and Hiroshi Saruwatari. Sparse sound field decomposition with parametric dictionary learning for super-resolution recording and reproduction. In *Proceedings of IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, pages 69–72, Cancun, Dec. 2015.
- [23] Yuki Murota, Daichi Kitamura, Shoichi Koyama, Hiroshi Saruwatari, and Satoshi Nakamura. Statistical modeling of binaural signal and its application to binaural source separation. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 494–498, Brisbane, Apr. 2015.
- [24] Shoichi Koyama. Source-location-informed sound field recording and reproduction: A generalization to arrays of arbitrary geometry. In *Proceedings of 2016 AES International Conference on Sound Field Control*, Guildford, Jul. 2016.
- [25] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Super-resolution in sound field recording and reproduction based on sparse representation. In *5th Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan*, Honolulu, Nov. 2016.
- [26] Shoichi Koyama and Hiroshi Saruwatari. Sound field decomposition in reverberant environment using sparse and low-rank signal models. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 345–349, Shanghai, Mar. 2016.
- [27] Yuki Mitsufuji, Shoichi Koyama, and Hiroshi Saruwatari. Multichannel blind source separation based on non-negative tensor factorization in wavenumber domain. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 56–60, Shanghai, Mar. 2016.
- [28] Naoki Murata, Hirokazu Kameoka, Keisuke Kinoshita, Shoko Araki, Tomohiro Nakatani, Shoichi Koyama, and Hiroshi Saruwatari. Reverberation-robust underdetermined source separation with non-negative tensor double deconvolution. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 1648–1652, Budapest, Aug. 2016.

- [29] Naoki Murata, Shoichi Koyama, Hirokazu Kameoka, Norihiro Takamune, and Hiroshi Saruwatari. Sparse sound field decomposition with multichannel extension of complex NMF. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 395–399, Shanghai, Mar. 2016.
- [30] Hiroaki Nakajima, Daichi Kitamura, Norihiro Takamune, Shoichi Koyama, Hiroshi Saruwatari, Nobutaka Ono, Yu Takahashi, and Kazunobu Kondo. Music signal separation using supervised NMF with all-pole-model-based discriminative basis deformation. In *Proceedings of European Signal Processing Conference (EUSIPCO)*, pages 1143–1147, Budapest, Aug. 2016.
- [31] Hiroaki Nakajima, Daichi Kitamura, Norihiro Takamune, Shoichi Koyama, Hiroshi Saruwatari, Yu Takahashi, and Kazunobu Kondo. Audio signal separation using supervised NMF with time-variant all-pole-model-based basis deformation. In *Proceedings of Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC)*, Jeju, Dec. 2016.
- [32] Shoichi Koyama and Laurent Daudet. Comparison of reverberation models for sparse sound field decomposition. In *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pages 214–218, New Paltz, Oct. 2017.
- [33] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Effect of multipole dictionary in sparse sound field decomposition for super-resolution in recording and reproduction. In *Proceedings of International Congress on Sound and Vibration (ICSV)*, London, Jul. 2017.
- [34] Naoki Murata, Shoichi Koyama, Norihiro Takamune, and Hiroshi Saruwatari. Spatio-temporal sparse sound field decomposition considering acoustic source signal characteristics. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 441–445, New Orleans, Mar. 2017.
- [35] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Listening-area-informed sound field reproduction based on circular harmonic expansion. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pages 111–115, New Orleans, Mar. 2017.
- [36] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Listening-area-informed sound field reproduction with gaussian prior based on circular harmonic expansion. In *Proceedings of Hands-free Speech Communication and Microphone Arrays (HSCMA)*, pages 196–200, San Francisco, Mar. 2017.
- [37] Shoichi Koyama, Gilles Chardon, and Laurent Daudet. Joint source and sensor placement for sound field control based on empirical interpolation method. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Calgary, 2018. (to appear).
- [38] Natsuki Ueno, Shoichi Koyama, and Hiroshi Saruwatari. Sound field reproduction with exterior radiation cancellation using analytical weighting of harmonic coefficients. In *Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Calgary, 2018. (to appear).
- [Invited/seminar talks](#)
- [1] Shoichi Koyama. Sound field recording and reproduction and its extension to super-resolution. In *IEEE NZ North Section Technical seminar, University of Auckland*, Apr. 2015.
- [2] Shoichi Koyama. Sound field recording and reproduction and its extension to super-resolution. In *IEEE NZ Central Section Invited Lecture, Victoria University of Wellington*, Apr. 2015.
- [3] Shoichi Koyama, Atsushi Matsubayashi, Naoki Murata, and Hiroshi Saruwatari. Sparse sound field decomposition using group sparse bayesian learning. In *Proceedings of Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC)*, pages 850–855, Hong Kong, Dec. 2015.
- [4] Shoichi Koyama. Source-location-informed sound field recording and reproduction: A generalization to arrays of arbitrary geometry. In *Proceedings of 2016 AES International Conference on Sound Field Control*, Guildford, Jul. 2016.

- [5] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Super-resolution in sound field recording and reproduction based on sparse representation. In *5th Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan*, Honolulu, Nov. 2016.
- [6] Shoichi Koyama. Sound field recording and reproduction using small number of microphones and loudspeakers. In *University of Southampton, Institute of Sound and Vibration Research (ISVR), seminar talk*, Jul. 2017.
- [7] Shoichi Koyama, Naoki Murata, and Hiroshi Saruwatari. Effect of multipole dictionary in sparse sound field decomposition for super-resolution in recording and reproduction. In *Proceedings of International Congress on Sound and Vibration (ICSV)*, London, Jul. 2017.

Professional memberships

Institute of Electrical and Electronic Engineers (IEEE), *Member*

Audio Engineering Society (AES), *Member*

Acoustical Society of Japan (ASJ), *Member*

Institute of Electronics, Information and Communication Engineers (IEICE), *Member*

Technical skills

Programming: Matlab, C, C++, Python, PHP, HTML, CSS

Languages

Japanese: Native speaker

English: Proficient

French: Basic