Andrew Hyungsuk Song, **Ph.D.**

Postdoctoral research fellow

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Education

Harvard Medical School / Brigham and Women's Hospital — *Boston, MA*

Postdoctral research fellow — *Jan. 2022-*

- Mahmood lab (AI for Pathology Image Analysis)

Massachusetts Institute of Technology — *Cambridge, MA*

Ph.D. in Electrical Engineering and Computer Science — *Sept. 2016- Dec. 2021*

- Samsung Scholarship recipient
- Statistical signal processing for neural data: Leading multiple projects on developing statistical signal processing and inference algorithms, with emphasis on sparsity, for neural data. Co-advised by Emery N. Brown (MIT) and Demba Ba (Harvard)

Massachusetts Institute of Technology — *Cambridge, MA*

B.S. & M.Eng. in Electrical Engineering and Computer Science — *Sept. 2009- June 2016*

- Worked as an undergraduate researcher with diverse disciplines across EECS – RLE Communications and Network Group & CSAIL Anyscale Learning for All group
- Took two years of voluntary leave for military service in South Korea (2011∼2012)

Experience

Amazon - AWS Audio Machine Learning/Digital Signal Processing team — *Palo Alto, CA*

Applied Scientist Intern — *June 2019 - Aug. 2019*

- Worked on designing/implementing a neural network architecture to denoise noisy multi-channel audio data, inspired by classical beamforming application

Neuroscience Statistics Research Laboratory - MIT — *Cambridge, MA*

Graduate Researcher — *2016 - Present*

- Involved in multiple collaborations with neuroscientists to develop model and statistical inference frameworks for multiple modes of data – Spike (Point process), EEG, fMRI

CRISP Lab - Harvard University — *Cambridge, MA*

Graduate Researcher — *2016 - Present*

- Working on statistical inference framework, specifically sparse coding/dictionary learning, for application to broad class of data

Akamai — *Cambridge, MA*

Platform Infrastructure Software Engineer Intern — *June 2014 - Aug. 2014*

- Created an internal platform for employees to analyze and visualize the internet traffic data across the world

UN Peacekeeping force in Lebanon & South Korean Military — *Lebanon, South Korea*

Communication Specialist, English Interpreter, Sergeant — *2011 - 2012*

- Helped maintain peace and suppress terrorist attacks in unstable areas of Lebanon
- Worked as an interpreter between the United Nations HQ and the Korean army HQ

Service

Reviewer for **UAI, IEEE Transactions on Biomedical Engineering, IEEE Signal Processing Letters, IEEE EMBC, COSYNE**

Honors & Awards

2016 **Samsung scholarship**, 5-year fellowship for outstanding Korean researchers

Publications

(*) denotes equal contribution

Andrew H. Song, Drew F.K. Williamson, and Faisal Mahmood, **Investigating Morphologic Correlates of Driver Gene Mutation Heterogeneity via Deep Learning**, *Cancer Research*, 2022

Iain Carmichael*, **Andrew H. Song***, Richard Chen, Drew F.K. Williamson, Tiffany Chen, and Faisal Mahmood, **Incorporating intratumoral heterogeneity into weakly-supervised deep learning models via variance pooling**, *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI)*, 2022

Alexander Lin, **Andrew H. Song**, Berkin Bilgic, and Demba Ba, **Covariance-Free Sparse Bayesian Learning**, *IEEE Transactions on Signal Processing*, 2022

Alexander Lin, **Andrew H. Song**, Berkin Bilgic, and Demba Ba, **High-dimensional Sparse Bayesian Learning without Covariance Matrices**, *IEEE ICASSP*, 2022

Alexander Lin, **Andrew H. Song**, and Demba Ba, **Mixture Model Auto-encoders : Deep Clustering through Dictionary Learning**, *IEEE ICASSP*, 2022

Andrew H. Song*, Seong-eun Kim*, and Emery N. Brown, **Adaptive State-space Multitaper Spectral Estimation**, *IEEE Signal Processing Letters*, 2022

Andrew H. Song, Bahareh Tolooshams, and Demba Ba, **Gaussian Process Convolutional Dictionary Learning**, *IEEE Signal Processing Letters*, 2022

Andrew H. Song, Demba Ba, and Emery N. Brown, **An efficient Gaussian process framework for analysis of oscillations in nonstationary time series**, *International Conference on Machine Learning (ICML) Time Series Workshop*, 2021

Andrew H. Song, Demba Ba, and Emery N. Brown, **PLSO: A generative framework for decomposing nonstationary timeseries into piecewise stationary oscillatory components**, *Uncertainty in Artificial Intelligence (UAI)*, 2021

Bahareh Tolooshams*, **Andrew H. Song***, Simona Temereanca, and Demba Ba, **Convolutional dictionary learning based auto-encoders for natural exponential-family distributions**, *International Conference on Machine Learning (ICML)*, 2020

Andrew H. Song, Francisco Flores, and Demba Ba, **Convolutional dictionary learning with grid refinement**, *IEEE Transactions on Signal Processing*, 2020

Bahareh Tolooshams, Ritwik Giri, **Andrew H. Song**, Umut Isik, and Arvindh Krishnaswamy, **Channel-attention dense u-net for multichannel speech enhancement**, *IEEE ICASSP*, 2020

Andrew H Song*, Leon Chlon*, Hugo Soulat, John Tauber, Sandya Subramanian, Demba Ba, and Michael J Prerau, **Multitaper Infinite Hidden Markov Model for EEG**, *IEEE EMBC*, 2019

Andrew H. Song, Francisco Flores, and Demba Ba, **Spike Sorting by Convolutional Dictionary Learning**, *Arxiv*

Andrew H. Song*, Sourish Chakravarty*, and Emery N. Brown, **A smoother state space multitaper spectrogram**, *IEEE EMBC*, 2018

Andrew H. Song, Aaron Kucyi, Vitaly Napadow, Emery N. Brown, Marco L. Loggia, and Oluwaseun Akeju, **Pharmacological Modulation of Noradrenergic Arousal Circuitry Disrupts Functional Connectivity of Locus Ceruleus in Humans**, *Journal of Neuroscience*, 2017

Oluwaseun Akeju, Allison E. Hamilos, **Andrew H. Song**, Kara J. Pavone, Patrick L. Purdon, and Emery N. Brown, **GABAA circuit mechanisms are associated with ether anesthesia-induced unconsciousness**, *Clinical Neurophysiology*, 2016

Oluwaseun Akeju, **Andrew H. Song**, Allison E. Hamilos, Kara J. Pavone, Francisco J. Flores, Emery N. Brown, and Patrick L. Purdon, **Electroencephalogram signatures of ketamine anesthesia-induced unconsciousness**, *Clinical Neurophysiology*, 2016

Andrew H. Song, Henna Huang, Vincent Chan, **Optical flow-switched transport layer protocol simulation and analysis**, *IEEE ICC*, 2016

Ignacio Arnaldo, Kalyan Veeramachaneni, **Andrew H. Song**, Una-May O'Reilly, **Bring your own learner: A cloud-based, data-parallel commons for machine learning**, *IEEE Computational Intelligence Magazine*, 2015

Abstracts

Andrew H. Song, Francisco J. Flores, Demba Ba, and Emery N. Brown, **A statistical framework for extracting time-varying oscillations from neural data**, *Computational and Systems Neuroscience (COSYNE)*, 2021

Andrew H. Song*,Bahareh Tolooshams*, Simona Temereanca, and Demba Ba, **Convolutional Dictionary Learning of Stimulus from Spiking Data**, *Computational and Systems Neuroscience (COSYNE)*, 2020

Andrew H. Song, Patrick L. Purdon, Emery N. Brown, Demba Ba, **Efficient robust spectral analysis of spike data**, *Society for Neuroscience*, 2019

Talks

2021	**Generative models for strutured neural time series**, SNU data science seminar	*S.Korea*
2021	**Generative models for neural time series with structured priors**, Harvard DtAK lab meeting	*USA*
2020	**Neural signal processing with domain constraints**, KAIST AI Symposium	*S.Korea*
2020	**Neural signal processing with domain constraints**, KAIST EE seminar	*S.Korea*
2020	**Neural signal processing with domain constraints**, SKKU M.IN.D lab seminar	*S.Korea*

Skills

Programming Python, MATLAB, Pytorch
Languages Korean, English
Citizenship US, Republic of Korea