Peng Zan

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EDUCATION

Ph.D., Electrical and Computer Engineering — 12/2019
University of Maryland, College Park, MD — GPA 3.6

M.Sc., Electrical and Computer Engineering — 08/2019
University of Maryland, College Park, MD — GPA 3.8

B.Sc., Electrical Engineering — 07/2014
Xi'an Jiaotong University, Xi'an, China — GPA 90/100

Exchange, Electronic Engineering — 05/2013
Chinese University of Hong Kong, Hong Kong, China — GPA 3.7

WORK EXPERIENCE

Sr. Software Engineer - AI Framework — 08/2021-present
Black Sesame Technologies, San Jose — CA

Principal Scientist — 02/2021-06/2021
Origin Wireless AI, Greenbelt — MD

Principal Data Scientist — 02/2020-02/2021
Origin Wireless AI, Greenbelt — MD

DSP Research Intern — 05/2019-08/2019
Starkey Hearing Technologies, Eden Prairie — MN

Graduate Research Assistant — 08/2015-05/2019
University of Maryland, College Park — MD

Graduate Teaching Assistant — 08/2014-05/2015
University of Maryland, College Park — MD

EXPERTISE

Mathematical Optimization for Signal Processing, AI Compiler & Quantization Framework

SKILLS

Programming: Python (expert), C/C++, R
Software Tools: Matlab (expert), SPSS, Tensorflow, Pytorch, Git/Github, Linux/Unix, LaTeX
Software Engineering: Algorithms and Data Structure, Neural Network Quantization, System Automation
Data Science: Statistics, Machine Learning, Deep Learning

PROJECTS

ADAS Chip Quantization & Compiler Optimization[P1][P2] — 08/2021 - present
AI Framework R&D — AI Framework Team, Black Sesame Technologies, Inc.

- Identified factors affecting quantization accuracy and improved quantization accuracy by about 20%.
- Designed and optimized neural network quantization processes on autonomous driving chip using mathematical modeling and optimization theory, boosting mass production of next-generation chip [P1][P2].
- Designed graph partition and memory allocation algorithms to improve SoC performance.

WiFi Sensing and Internet of Things (IoT)[P3]-[P7] — 02/2020 - 06/2021
WiFi-Sensing for Home Security and Indoor Activity Monitoring — Algorithm Team, Origin Wireless AI

- Researched and developed real-time algorithm for indoor motion and breathing localization using WiFi sensing based on *statistical electromagnetic field models*.
- Designed and optimized indoor activity monitoring algorithms for HEX Home, our home security and activity monitoring system (CES 2021 Innovation Award), based on *a sequential decision model*.
- Collaborated with companies such as Verizon, Alarm.com and Belkin to turn research into commercialized products.

WiFi-Sensing Production Automation — Hardware Team, Origin Wireless AI

- Designed and automated manufacture workflow for WiFi-sensing products by Python.
- Boosted production rate from one per hour to 10-12 per hour.
- Supported Verizon Communications Inc. with quality products and visualization tools built by Python.

Real-Time Tracking with IMU Sensors on Mobile Devices — Algorithm Team, Origin Wireless AI

- Developed a real-time tracking system with sub-meter accuracy based on a *Bayesian dynamic model on graph*.
- Developed Android and iOS App for Origin Tracking product - work without WiFi.

Joint Approach of Auditory Attention Decoding and Speech Enhancement [C1] — 05/2019 - 08/2019
Signal Processing Research, Starkey — Internship research

- Designed and conducted electroencephalography (EEG) experiment to simulate a cocktail party scenario.
- Collected auditory responses while subjects switch attention from one speaker to another.
- Developed an *EEG guided Beamforming model* for joint approach of attention decoding and speech enhancement.

Mutual Information Analysis of Auditory Brain Responses and Effects of Aging [J1][J2] 01/2018 - 05/2019
Computational Sensorimotor Systems Lab, UMD — Thesis research

- Developed a novel approach based on information theory to decode phase-locked response from M/EEG recording.
- Revealed speech over-representation in the aging midbrain [J2] and cortical [J1] marker of behaviors.
- Algorithm programmed in Matlab, source-space analysis done in Python and statistics conducted in R.

Machine Learning Applications in Auditory Research [J3][J4] — 06/2017 - 12/2017
Computational Sensorimotor Systems Lab, UMD — Independent research

- Implemented KNN and CNN for schizophrenia detection based on auditory steady-state response features (code).

- Designed and compared neural decoders based on maximum likelihood estimation, linear regression and neural network to study adaptive efficient coding of correlated acoustic properties in auditory cortex of ferret [J3].
- Developed object and edge detection approach to extract pupillometry information from video recordings to study implicit memory for complex sounds in auditory cortex of ferret [J4].

JOURNAL PUBLICATIONS

[J1] **Peng Zan**, Alessandro Presacco, Samira Anderson, and Jonathan Z. Simon. Exaggerated cortical representation of speech in older listeners: mutual information analysis. *Journal of Neurophysiology, 124(4):1152-1164*, Oct. 7, 2020.

[J2] **Peng Zan**, Alessandro Presacco, Samira Anderson, and Jonathan Z. Simon. Mutual information analysis of neural representations of speech in noise in the aging midbrain. *Journal of Neurophysiology Innovative Methodology, 122(6): 2372-2387*, Dec. 4, 2019.

[J3] Kai Lu, Wanyi Liu, Kelsey Dutta, **Peng Zan**, Jonathan B Fritz, and Shihab A. Shamma. Adaptive efficient coding of correlated acoustic properties. *The Journel of Neuroscience, 39(44):8664-8678*, Oct. 30, 2019.

[J4] Kai Lu, Wanyi Liu, **Peng Zan**, Stephen V. David, Jonathan B Fritz, and Shihab A. Shamma. Implicit memory for complex sounds in higher auditory cortex of the ferret. *The Journel of Neuroscience, 38(46):9955-9966*, Nov. 14, 2018.

[J5] Junmin Liu, Yongchang Hui, and **Peng Zan**. Locally linear detail injection for pansharpening. *IEEE Access, 5:9728-9738*, June 7, 2017.

[J6] Dai Wang, Xiaohong Guan, Jiang Wu, Pan Li, **Peng Zan**, and Hui Xu. Integrated energy exchange scheduling for microgrids with electric vehicles. *IEEE Transaction on Smart Grid, 7(4):17621774*, July 10, 2016.

[J7] Xiaoming Du, Stephanie Hare, Ann Summerfelt, Bhim Adhikari, Laura Garcia, Wyatt Marshall, **Peng Zan**, Mark Kvarta, Eric Goldwaser, Heather Bruce, Si Gao, Hemalatha Sampath, Peter Kochunov, Jonathan Z. Simon, Elliot Hong. Cortical Connectomic Mediations on Gamma Band Synchronization in Schizophrenia. *Translational Psychiatry, Nature Publishing Group*, Jan. 19, 2023.

CONFERENCE PAPERS & POSTERS

[C1] Wenqiang Pu, **Peng Zan**, Jinjun Xiao, Tao Zhang, Zhi-Quan Luo. Evaluation of joint auditory attention decoding and adaptive binaural beamforming approach for hearing devices with attention switching. *2020 IEEE International Conference on Acoustics, Speech, and Signal Processing*, May 08, 2020.

[C2] **Peng Zan**, Alessandro Presacco, Samira Anderson, and Jonathan Z. Simon. Mutual information analysis of neural representations of speech in noise in the aging midbrain. *ARO 2019.*, Feb. 2019.

[C3] **Peng Zan**, Alessandro Presacco, Samira Anderson, and Jonathan Z. Simon. Cortical over-representation of speech in older listeners correlates with a reduction in both behavioral inhibition and speech intelligibility. *ARO*, Feb. 2019.

[C4] **Peng Zan**, Alessandro Presacco, Samira Anderson, and Jonathan Z. Simon. Mutual information analysis of neural representations of speech in noise in the aging midbrain. *Auditory SPLASH*, Sep. 8, 2018.

[C5] **Peng Zan**, Alessandro Presacco, Samira Anderson, and Jonathan Z. Simon. Mutual information analysis of neural representations of speech in noise in the aging midbrain. *EAR*, June 15, 2018.

PATENTS

[P1] **Peng Zan**. System and method for neural network structure-level quantization optimization. Application No. 18209932, filed to USPTO, June 14, 2023.

[P2] **Peng Zan**. System and method for mathematical modeling of hardware quantization process. Application No. 18081515, filed to USPTO, Dec 14, 2022.

[P3] Chenshu Wu, Beibei Wang, **Peng Zan**, Sai Deepika Regani, Xiaolu Zeng, Hung-Quoc Lai, Kj Ray Liu, Oscar Au. Method, apparatus, and system for wireless micro motion monitoring. *US20210311166A1*, 10/7/2021.

[P4] Beibei Wang, Muhammed Zahid Ozturk, Chenshu Wu, Xiaolu Zeng, Sai Deepika Regani, Yuqian Hu, K. J. Ray Liu, Oscar Chi-Lim Au, Yi Han, Hung-Quoc Duc Lai, David N. Claffey, Chun-I Chen, Dan Bugos and **Peng Zan**. Method, apparatus, and system for sound sensing and wireless sensing. Japan Patent Application No. 2022-095307, filed June 13, 2022.

[P5] Beibei Wang, Muhammed Zahid Ozturk, Chenshu Wu, Xiaolu Zeng, Sai Deepika Regani, Yuqian Hu, K. J. Ray Liu, Oscar Chi-Lim Au, Yi Han, Hung-Quoc Duc Lai, David N. Claffey, Chun-I Chen, Dan Bugos and **Peng Zan**. Method, apparatus, and system for sound sensing and wireless sensing. EP Patent Application No. 22178761.7, filed June 13, 2022.

[P6] Yuqian Hu, Beibei Wang, Sai Deepika Regani, **Peng Zan**, Chenshu Wu, Dan Bugos, Xiaolu Zeng, Hung-Quoc Duc Lai, K. J. Ray Liu, Oscar Chi-Lim Au. Method, apparatus, and system for wireless sensing based on linkwise motion statistics. U.S. Patent Application No. 17/838,244, filed June 12, 2022.

[P7] Chenshu Wu, Beibei Wang, Oscar Chi-Lim Au, K.J. Ray Liu, Chao-Lun Mai, Dan Bugos, Hung-Quoc Duc Lai, Spencer Maid, Yuqian Hu, Sai Deepika Regani, Muhammed Zahid Ozturk, Xiaolu Zeng, Fengyu Wang, Jeng-Feng Lee and **Peng Zan**. Method, apparatus, and system for wireless monitoring to ensure security. EP Patent Application No. 21200823.9, filed October 4, 2021.

PEER REVIEWS

[R1] IEEE Access 07/2019
[R2] IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing 01/2020, 03/2020
[R3] Neuroscience Letters 04/2021, 07/2021
[R4] IEEE Signal Processing Letters 05/2021, 06/2021, 08/2021

SELECTED AWARDS & HONORS

Starkey Recognition Award Starkey, 08/2019
NSF-Funded COMBINE Fellowship (Computational Biological Network Program) UMD, 09/2017
Jimmy H. C. Lin Graduate Scholarship for Entrepreneurship UMD, 09/2014
ECE Ph.D. Fellowship Award UMD, 09/2014
National Scholarship, Ministry of Education of the P.R.C. XJTU, 11/2011