Xupeng **Chen**

Electrical Engineering · New York University

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Education

School of Life Science, Tsinghua University *Beijing, China*

BSc in Life Science *Sept. 2014 - June. 2019*

- Minor in Statistics
- XueTang program, cultivating top students to become leading researchers in science
- Courses Taken: Calculus, Linear Algebra, Probability and Statistics, Mathematical Modelling, Biostatistics, Bioinformatics, Pattern Recognition, Artificial Neural Networks, Image Processing.

Tandon School of Engineering, New York University *Brooklyn, New York*

Ph.D. Student in Electrical Engineering *Sept. 2019 -*

- Video Lab, Supervisor: Prof. Yao Wang
- Courses Taken: Image and Video Processing, Advanced Machine Learning, Natural Language Processing, Robot Perception, Computer Vision, High-Performance ML, Probability and Stochastics, Digital Signal Processing, System Optimization, Medical Imaging

Publications

1. Chen, X., Wang, R., Khalilian-Gourtani, A., Yu, L., Dugan, P., Friedman, D., Doyle, W., Devinsky, O., Wang, Y. and Flinker, A. **"A Neural Speech Decoding Framework Leveraging Deep Learning and Speech Synthesis."** *Nature Machine Intelligence (2024)* (To appear soon, under galley proof). doi: 10.1101/2023.09.16.558028

2. Wang, R., Chen, X., Khalilian-Gourtani, A., Yu, L., Dugan, P., Friedman, D., Doyle, W., Devinsky, O., Wang, Y. and Flinker, A. **"Distributed feedforward and feedback cortical processing supports human speech production."** *Proceedings of the National Academy of Sciences (PNAS)* 120, no. 42 (2023): e2300255120. doi:10.1073/pnas.2300255120

3. Wang, R., Chen, X., Khalilian-Gourtani, A., Chen, Z., Yu, L., Flinker, A. and Wang, Y. **"Stimulus speech decoding from human cortex with generative adversarial network transfer learning."** *2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI)* pp. 390-394. IEEE, 2020. doi: 10.1109/ISBI45749.2020.9098589

4. Lin, Z., Wei, D., Jang, W.D., Zhou, S., Chen, X., Wang, X., Schalek, R., Berger, D., Matejek, B., Kamentsky, L. and Peleg, A. **"Two stream active query suggestion for active learning in connectomics."** *Computer Vision–ECCV 2020: 16th European Conference (ECCV)* Glasgow, UK, August 23–28, 2020, Proceedings, Part XVIII 16, pp. 103-120. Springer International Publishing, 2020. doi: 10.1007/978-3-030-58523-5_7

5. Khalilian-Gourtani, A., Wang, R., Chen, X., Yu, L., Dugan, P., Friedman, D., Doyle, W., Devinsky, O., Wang, Y. and Flinker, A. **"A corollary discharge circuit in human speech."** *bioRxiv* (2022): 2022-09. (Under Review). doi: 10.1101/2022.09.12.507590

6. Chen, J., Chen, X., Wang, R., Le, C., Khalilian-Gourtani, A., Jensen, E., Dugan, P., Doyle, W., Devinsky, O., Friedman, D., Flinker, A and Wang, Y. **"Subject-Agnostic Transformer-Based Neural Speech Decoding from Surface and Depth Electrode Signals."** *bioRxiv* (2024): 2024-03. (Under Review). doi: 10.1101/2024.03.11.584533

Research Experience

Neural Speech joint representation with self-supervised learning framework *Video Lab, New York University*

Supervisor: **Yao Wang and Adeen Flinker** *2023-*

- Use a disentangled self-supervised learning framework to learn semantic and instance information from ECoG
- Learned latent representation helps improve the downstream speech decoding task

Neural Speech Synthesizing from sEEG signal on overt and imagined speech *Video Lab, New York University*

Supervisor: **Yao Wang and Adeen Flinker** *2023-*

- Use a HuBERT speech synthesizer for speech re-synthesis
- Overt and imagined speech decoding from sEEG signals guided by HuBERT extracted features
- Contribution analysis of ECoG electrodes

Neural Speech Synthesizing leveraging a novel speech synthesizer from ECoG *Video Lab, New York University*

Supervisor: **Yao Wang and Adeen Flinker** *2020-2023*

- Use a new differentiable speech synthesizer for speech re-synthesis
- Low-density and Hybrid-density participants neural speech decoding
- Contribution analysis of ECoG electrodes

Stimulus Speech Decoding from Human Cortex using ECoG signal *Video Lab, New York University*

Supervisor: **Yao Wang and Adeen Flinker** *2019*

- Use wavenet vocoder for spectrogram to speech conversion
- GAN-aided WaveNet model pretraining to generate latent guidance for ECoG to spectrogram decoding

exSeek: Robust exRNA Analysis Tool for Noninvasive Biomarker *Lu Lab, Tsinghua University*

Supervisor: **Zhi Lu** *2017-2018*

- Developed a complete pipeline for exRNA analysis. Included mapping, counts, matrix processing, robust feature selection, and evaluation
- Used statistical and machine learning model for imputation, normalization, batch removal, and feature selection
- Packaged all functions into software. Validated on published and lab dataset

eMaize: Machine learning method for quantitative traits prediction *Lu Lab, Tsinghua University*

Supervisor: **Zhi Lu** *2017-2018*

- Developed a new linear mixed model to predict traits of 36,000 hybrid samples using SNP data to find heterosis in maize
- Developed a non-parameter model to solve small sample training problems

Efficient Instance Annotation for Connectomics *Visual Computing Group and Lichtman Lab, Harvard University*

Supervisor: **Hanspeter Pfister and Jeff Lichtman** *2018 Summer*

- Constructed a powerful 3D U-net for synapse detection in CREMI dataset. Ranked 1^{st} place in CREMI contest
- Constructed 3D U-net and 3D-CNN for synaptic connections between neurons and intracellular structures like mitochondria. Construct an active-learning annotation framework for proofreading
- Applied models to predict JWR dataset with 1 million synapses.

Activities&Awards

2020 **Teaching Assistant for Medical Imaging** Lecturer: Prof. Jonathan Mamou *New York University*

2018 **Teaching Assistant for Bioinformatics Basic Course** Lecturer: Prof. Zhi Lu *Tsinghua University*

2015-2018 **Scholarship** XueTang scholarship *Tsinghua University*

2017 **Second prize** The First National College Students' Brain Computation and Application Competition *International*

2017 **First Prize** eMaize Challenge: Machine learning in breeding *National*

2018 **Meritorious Winner** Mathematical Contest in Modeling (MCM) *International*

2016-2018 **Xuetang Research Funding** $10,000 for Research in Lu lab *Tsinghua University*

2016-2018 **Initiative Scientific Research Program** $8,000 for Research in Biomedical Image analysis *Tsinghua University*

2015 **Golden Prize** Social practice award for investigation on e-cycling *Tsinghua University*

Skills

- Proficient in Python, MATLAB, R, Bash, LaTeX
- Familiar with Machine Learning, Deep Learning (Tensorflow, Keras, Pytorch), and Computer Vision tools.
- Familiar with Linux, MacOS, Windows