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RESEARCH EXPERIENCE

My research interests include generalization/memorization of DNNs, AI security, and brain-computer interfaces (BCIs). My ultimate goal is to understand the basic rules of our brain through AI research, and, if I am lucky enough, capture a glimmer of hope to construct AGI.

Current
Apr 2019

Analysis of DNN's Prediction Landscape
BCI & ML Lab, HUST
- Study the influence of different optimization techniques (e.g., Batch Normalization, Dropout,...) on the linear regions of DNNs.
- Explore generalization and memorization of DNNs from the perspective of geometric analysis on prediction landscape.
- Through the analysis of DNN's prediction landscape, monitor test behaviors without any validation set.

Dec 2019
Sep 2018

Security in Brain-Computer Interfaces
BCI & ML Lab, HUST
- Construct adversarial noise on some popular CNN classifiers in EEG-based BCIs, and analyze its influence on the learned features.
- Construct adversarial noise on traditional approaches (e.g., Riemann-based pipeline, CCA, ...) used in EEG-based BCI spellers (e.g., P300 speller, SSVEP speller,...).
- Consider the causality of constructing adversarial noise for time series.

EDUCATION

Jun 2021
Sep 2018

M.Eng. - School of Artificial Intelligence & Automation, HUST
GPA: 90.3/100, **Rank**: 12/188
Supervisor: Prof. Dongrui Wu

Jun 2018
Sep 2014

B.Eng. - School of Optical & Electronic Information, HUST
GPA: 3.91/4.0, **Rank**: 5/318
Supervisor: Prof. Danhua Cao

PUBLICATIONS

DEEP LEARNING

- **X. Zhang** and D. Wu, "Rethink the Connections among Generalization, Memorization and the Spectral Bias of DNNs," in Proc. Advances in Neural Information Processing Systems (NeurIPS), 2020, *submitted*.
- **X. Zhang** and D. Wu, "Empirical Studies on the Properties of Linear Regions in Deep Neural Networks," in Proc. Int'l Conf. on Learning Representations (ICLR), Addis Ababa, Ethiopia, April 2020.

BCI & SECURITY

- **X. Zhang**, D. Wu, L. Ding, H. Luo, C-T Lin, T-P Jung and Ricardo Chavarriaga, "Tiny Noise Can Make an EEG-Based Brain-Computer Interface Speller Output Anything," National Science Review, 2020, *Major Revision*.

- Z. Liu*, **X. Zhang***, D. Wu, "Universal Adversarial Perturbations for CNN Classifiers in EEG-Based BCIs ," IEEE Trans. on Human-Machine Systems, 2019, *Major Revision*.
- **X. Zhang** and D. Wu, "On the Vulnerability of CNN Classifiers in EEG-Based BCIs," IEEE Trans. on Neural Systems and Rehabilitation Engineering, vol. 27, no. 5, pp. 814-825, 2019.
- X. Jiang, **X. Zhang**, D. Wu, "Active Learning for Black-Box Adversarial Attacks in EEG-Based Brain-Computer Interfaces ," IEEE Symposium Series on Computational Intelligence, Xiamen, China, December 2019.

HONORS

2020 Goodix Scholarship for Technology

2019 National Scholarship for Postgraduates

2019 1st Place - China Brain-Computer Interface Competition

2018 "Outstanding Graduate" of HUST

2018 "Honor College Student" of Qiming College of HUST

2015 2nd Place - The 7th Mathematics Competition of Chinese College Students

2015 National Encouragement Scholarship