HAO LIANG

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EDUCATION

Carnegie Mellon University *May 2020*
Master of Science in Electrical and Computer Engineering QPA: 3.83/4.0

University of Electronic Science and Technology of China *June 2018*
Bachelor of Engineering in Opto-electronic Information GPA: 3.77/4.0, RANK: 2/35

EXPERIENCE

Research Associate at Cylab, CMU
Supervisor: Prof. Giulia Fanti and Prof. Vyas Sekar *MAY 2020 – Present*

· **Topic**: Research on Generating Attacks to Network Functions
· Wrapped up network functions to end-to-end blackbox functions, took network packets as inputs and returned their amplifications.
· Proposed *AmpGAN*, a machine learning approach to synthesize high amplification inputs to network functions. Boosted the performance comparing to AmpMAP, Bayesian Optimization, Simulated Annealing and Genetic Algorithm.

Research Assistant at OPAL, CMU
Supervisor: Prof. Gauri Joshi *July 2019 – May 2020*

· **Topic1**: Research on Communication-Efficient Distributed Machine Learning Algorithm Design
· Proposed an algorithmic approach named *Overlap-Local-SGD* (and its momentum variant) to overlap the communication and computation so as to speedup the distributed tranining procedure.
· Reduced the communication-to-computation ratio from 34.6% to 1.5%, while mainting the loss-versus-iterations convergence as fully synchronous SGD. Proved its convergence under non-convex objective functions.
· **Topic2**: Research on Tackling the Objective Inconsistency Problem in Federated Learning
· Proposed a new theoretical framework for heterogeneous federated optimization.
· Proposed *FedNova*, a novel federated normalized averaging algorithm which converges faster and achieves 6-9% higher test accuracy than FedAVG on synthetic dataset, non-IID CIFAR-10 dataset. Proved its convergence under new proposed framework.

Research Assistant at MLSP, CMU
Supervisor: Prof. Bhiksha Raj *Sep 2019 – Sep 2020*

· **Topic**: Research on Generating Faces From Voices
· Proposed *Controlled Autoencoder*, a novel encoder structure to allow conditional inputs to the generator. Proposed a GAN-based overall structure subsequently, realize generate face from voices.
· Reached 22% higher scores on human subjective, 0.12 higher feature similarity and 10% higher face retrieval ratio than current state-of-the-art approach.

Teaching Assistant of 11-785: Introduction to deep learning
Instructor: Prof. Bhiksha Raj *Dec 2019 – May 2020*

· Task: Led lectures, re-designed homework assignments, led 4 semester-long student research projects.

ACADEMIC PROJECTS

Attention-Based End-to-End Speech-to-Text Transcription Nov 2019
Deep Learning, CMU

- Designed an end-to-end speech to text transcription system using pyramidal Bi-LSTM network encoder and an attention-based decoder to transcribe speech utterances to characters.
- Applied gradually decayed teacher forcing and beam search to enhance robust learning and decoding, yielding less than 15 Levenshtein distance.

Image Classification   Oct 2019
Deep Learning, CMU

- Implemented transfer learning to train image classifier by training MobileNetV2 on 30,000 images from Google Landmark Recognition Challenge dataset and attained 95% accuracy.

Frame Level Classification of Speech   Sep 2019
Deep Learning, CMU

- Implemented feedforward neural networks(Python, PyTorch) and applied it to a speech recognition task.

Multi-Thread Proxy Server with Cache   April 2019
Foundations of Computer System, CMU

- Developed a proxy with sockets and threads which can passing requests and responses between web clients and servers.

Linux Shell Design   March 2019
Foundations of Computer System, CMU

- Developed an interactive command-line interpreter(Linux Shell) which supports process manipulating, job control and some built-in commands.

PUBLICATIONS

Published

- **Liang H**., Yu L., Xu G., Raj B., Singh R. (2020) Controlled AutoEncoders to Generate Faces from Voices. Advances in Visual Computing. ISVC 2020. Lecture Notes in Computer Science, vol 12509. Springer, Cham.
- Wang Jianyu, **Hao Liang**, and Gauri Joshi. "Overlap local-SGD: An algorithmic approach to hide communication delays in distributed SGD." In ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2020), pp. 8871-8875. IEEE, 2020.
- Wang Jianyu, Qinghua Liu, **Hao Liang**, Gauri Joshi, and H. Vincent Poor. "Tackling the Objective Inconsistency Problem in Heterogeneous Federated Optimization." Accepted by Thirty-fourth Conference on Neural Information Processing Systems (NeurIPS 2020).
- **Liang, Hao.** "Study on the Properties of ZnO-TFT Prepared by Magnetron Sputtering." Solid State Phenomena. Vol. 278. Trans Tech Publications Ltd, 2018.

Submitting

- "AmpGAN: Automated Synthesis of Amplifying inputs with Generative Adversarial Networks."

HONORS & AWARDS

- Honorable Mention, MCM/ICM, COMAP   2017
- 3rd Class, the People's Scholarship for Excellent College Students   2016
- Campus Star of Science and technology Innovations of UESTC   2016
- 3rd Class Prize, National English Contest of China   2016
- 2nd Class, the People's Scholarship for Excellent College Students   2015
- 2nd class, National Mathematics Contest of China   2013

RELATED COURSES

Introduction to Deep Learning(11785), Introduction to Machine Learning (10601), Convex Optimization(10725), Special Topics in Computer Systems: Foundations of Cloud and Machine Learning Infrastructure(18847F), Foundations of Computer System(15213), Java Programming(17681), Data Structure(17683), Signals and Systems, Functions of Complex Variables