PENG Zhenghao

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EDUCATION

The Chinese University of Hong Kong
August 2019 - Present

- PhD student under the supervision of Prof. Zhou Bolei at Multimedia Lab, Department of Information Engineering.

Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Sciences
June 2018 - Sept. 2018

- Research intern at Multimedia Research Center, under the supervision of Prof. Qiao Yu.

University of California, Berkeley
July 2017 - Aug. 2017

- Summer session.

Shanghai Jiao Tong University
Sept. 2015 - July 2019

- B.E. in Naval Architecture and Ocean Engineering.
- Member of Zhiyuan Honors Program.
- Research assistant at Advanced Computer Architecture Laboratory with Prof. Jiang Li.

PUBLICATIONS

[1] Hao Sun, Jiankai Sun, **Peng, Zhenghao**, Dahua Lin, and Bolei Zhou. Learning with identity and uniqueness through social constraint. In *NeurIPS 2019 Deep RL Workshop*, 2019

[2] **Peng, Zhenghao**, Xuyang Chen, Chengwen Xu, Naifeng Jing, Xiaoyao Liang, Cewu Lu, and Li Jiang. Axnet: Approximate computing using an end-to-end trainable neural network. In *Proceedings of the 2018 International Conference on Computer-Aided Design. ICCAD'18*. IEEE/ACM, 2018   [arXiv, pdf]

[3] Zhuoran Song, Dongyu Ru, Ru Wang, Hongru Huang, **Peng, Zhenghao**, Jing Ke, Xiaoyao Liang, and Li Jiang. Approximate random dropout. In *Design, Automation & Test in Europe Conference & Exhibition, 2019. DATE'19*. IEEE, 2019   (Camera-ready version is not not available currently at arXiv.) [arXiv, pdf]

RESEARCH EXPERIENCES

Multi-agent Reinforcement Learning Traffic Simulation
February 2019 - July 2019
Research Intern at SenseTime

- Optimized Multi-agent Reinforcement Learning (MARL) traffic simulation environment and achieved 5× speedup in simulation.
- Applied MARL framework RLLib to train 16 autonomous driving vehicles in fuse and split scenes, pushed success rate to 99% (previously 80%) and accelerated training for 8× (previously a week, now a night).

Weakly-supervised Video Action Detection via Convex Clustering
June 2018 - Sept. 2018
Supervised by Prof. Qiao Yu *Research Intern at SIAT*

- Leveraged an external representativeness database to strengthen UntrimmedNet, the weakly supervised video action recognition framework.
- Applied reinforcement learning as action instances detector in untrimmed videos based on the reward signals from the snippet-level action classifier.

Approximate Random Dropout
Apr. 2018 - Sept. 2018
Supervised by Prof. Jiang Li

- Replaced the random dropout in neural network training with predefined dropout patterns, thus enabled the prediction of dropped neurons and the skip of the redundant zero-multiplication. The work collaborates the randomness in software with the efficiency in hardware.
- Reduced the training time by 20%-77% (19%-60%) when dropout rate is 0.3-0.7 on MLP (LSTM) with marginal accuracy drop.
- Provided mathematical proof for the equivalence of this approach and the random dropout, reorganized [3] and proofread the original paper.

Wire Routing on IC by Multi-agent Reinforcement Learning

Feb. 2018 - June 2018

Supervised by Prof. Jiang Li

- Formulated wire routing problem to a competitive-cooperative multi-agent reinforcement learning problem, the possible solution for NP-hard problems.
- Applied PPO, TRPO, DDPG, ACKTR and A2C algorithms to train the agents.
- Implemented 3D wire routing reinforcement learning environment allowing multi-agent cooperation, competition, and communication, based on Gym library and open-source.

Neural Network Based Approximate Computing Framework

Sept. 2017 - May 2018

Supervised by Prof. Jiang Li

- Fused the conventional approximate computing architecture as an end-to-end structure. Applied the Hadamard product at the output of predictor and the activation of approximator to learn jointly.
- Reduced 74% training time; Improved the invocation by 50.6%, averagely. In JPEG benchmark, 60% parameters reduced and achieved $32\times$ speedup.
- Formulated the question, proposed idea, wrote codes, conducted experiments, and finished the paper [2].

Handwritten Arithmetic Expression Recognition

May 2017 - June 2017

Side Project

- Built an End-to-End system providing recognition and calculation service of handwritten arithmetic expression via WeChat (an IM application).
- Utilized conventional CV techniques like Sobel filter, gaussian blur, erosion and dilation to segment digits and operators. Used convolutional neural network to recognize.
- Expanded MNIST dataset with 10000+ operators images for neural network training.