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Youngeun Kim

Personal Website

- Machine Learning
- Computer Vision
- Neuromorphic Computing

Research Interests

My research focuses on building up *energy-efficient* machine intelligence. I develop learning algorithms that enable binary activation in neural networks, enabling efficient hardware-friendly AI systems without multipliers. Furthermore, I investigate multi-modal learning, a human-like feature, to enhance the system's ability to process and integrate information from various sources. I also explore various tasks, including continual learning, distributed learning and domain adaptation, to empower learning systems to handle real-world scenarios effectively.

Education

Ph.D. Candidate, Electrical Engineering, Yale University [Advisor: Prof. Priyadarshini Panda] **Sep. 2020 — May. 2024**
M.S., Electrical Engineering, Korea Advanced Institute of Science and Technology (KAIST) **Mar. 2018 — Feb. 2020**
B.S., Electrical Engineering, Sogang University **Mar. 2012 — Feb. 2018**

Experience

Machine Learning Research Scientist **Jun. 2024 — Current**
Meta Reality Labs
- CTRL-Labs: Neuromotor interface

Applied Scientist Intern **Jun. 2023 — Aug. 2023**
Amazon (AWS AI)
- Worked on Continual Learning with a Large-Scale Foundation Model
- [Publication] Kim, Y., et al. Open-World Dynamic Prompt and Continual Visual Representation Learning (2024 European Conference on Computer Vision - ECCV)

Research Intern **Jun. 2021 — Aug. 2021**
Samsung Advanced Institute of Technology (SAIT)
- Developed Hardware-aware Neural Network Training Algorithm
- [Publication] Kim, Y. et al. Gradient-based bit encoding optimization for noise-robust binary memristive crossbar. In 2022 Design, Automation & Test in Europe Conference & Exhibition (DATE) (pp. 1111-1114). IEEE.

Research Intern **Jan. 2020 — July. 2020**
SK-Tbrain
- Developed Source-free Domain Adaptation, Graph Neural Networks
- [Publication] Kim, Y. et al. Domain adaptation without source data. IEEE Transactions on Artificial Intelligence, 2(6), 508-518.

Research Intern **June. 2019 — Sep. 2019**
Kakao Corporation
- Developed Graph Neural Networks

Publications [Conference]

Yin, R., **Kim, Y.**, Wu, D., and Panda, P., *LoAS: Fully Temporal-Parallel Datatflow for Dual-Sparse Spiking Neural Networks*.IEEE/ACM International Symposium on Microarchitecture (MICRO) 2024.

Kim, Y., et al., *One-stage Prompt-based Continual Learning*. Accepted to European Conference on Computer Vision (ECCV) 2024.

Kim, Y., et al., *DPG: Dynamic Prompt Generation for Continual Open-World Visual Representation Learning*. Accepted to European Conference on Computer Vision (ECCV) 2024.

Li, Y., **Kim, Y.**, Lee, D. and Panda, P., *GenQ: Quantization in Low Data Regimes with Generative Synthetic Data*. Accepted to European Conference on Computer Vision (ECCV) 2024.

Li, Y., Geller, T., **Kim, Y.**, and Panda, P., *SEENN: Towards Temporal Spiking Early-Exit Neural Networks*. NeurIPS 2023 .

Moitra, A., Bhattacharjee, A., **Kim, Y.**, & Panda, P., *XPert: Peripheral Circuit & Neural Architecture Co-search for Area and Energy-efficient Xbar-based Computing.* ACM/IEEE Design Automation Conference (DAC) (2023).

Kim, Y., Li, Y. Park, H., Venkatesha, Y., Hambitzer, A., & Panda, P. , *Exploring Temporal Information Dynamics in Spiking Neural Networks.* AAAI Conference on Artificial Intelligence (AAAI) (2023).

Li, Y., Yin, R., Park, H., **Kim, Y.**, and Panda, P., *Wearable-based Human Activity Recognition with Spatio-Temporal Spiking Neural Networks*.NeurIPS 2022 Workshop.

Kim, Y., Li, Y. Park, H., Venkatesha, Y., Yin, R., and Panda, P., *Lottery Ticket Hypothesis for Spiking Neural Networks*. **Oral Presentation (2.7% of submitted papers)**, European Conference on Computer Vision (ECCV) 2022.

Kim, Y., Li, Y. Park, H., Venkatesha, Y., and Panda, P., *Neural Architecture Search for Spiking Neural Networks*. European Conference on Computer Vision (ECCV) 2022.

Li, Y., **Kim, Y.**, Park, H., and Panda, P., *Neuromorphic Data Augmentation for Training Spiking Neural Networks*. Accepted to European Conference on Computer Vision (ECCV) 2022.

Bhattacharjee, A.* , **Kim, Y.***, Moitra, A., and Panda, P. Examining the Robustness of Spiking Neural Networks on Non-ideal Memristive Crossbars. Accepted in ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED) (2022), **Best Paper**. (* equal contribution)

Kim, Y., Park, H., Moitra, A., Bhattacharjee, A. , Venkatesha, Y., and Panda, P. Rate Coding Or Direct Coding: Which One is Better for Accurate, Robust, and Energy-efficient Spiking Neural Networks?. Accepted in IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) (2022).

Kim, Y., Kim, H., Kim, S., Kim, S. J., & Panda, P. *Gradient-based Bit Encoding Optimization for Noise-Robust Binary Memristive Crossbar.* Accepted in Design, Automation and Test in Europe Conference (DATE) (2022).

Kim, Y., Venkatesha, Y., & Panda, P. , *PrivateSNN: Privacy-Preserving Spiking Neural Networks.* AAAI Conference on Artificial Intelligence (AAAI) (2022).

Choi, S., Lee, S., **Kim, Y.**, Kim, T., & Kim, C. *Hi-cmd: Hierarchical cross-modality disentanglement for visible-infrared person re-identification.* IEEE/CVF conference on computer vision and pattern recognition (CVPR) (2020).

Kim, Y., Kim, S., Kim, T., & Kim, C. *Cnn-based semantic segmentation using level set loss.* IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (2020).

Kim, Y., Choi, S., Lee, H., Kim, T., & Kim, C. *RPM-Net: Robust Pixel-Level Matching Networks for Self-Supervised Video Object Segmentation.* IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (2020).

Yang, S., Kim, Y., **Kim, Y.**, & Kim, C. *Combinational class activation maps for weakly supervised object localization* IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) (2020).

Lee, H., Choi, S., **Kim, Y.**, & Kim, C. *Bilinear Siamese Networks with Background Suppression for Visual Object Tracking.* British Machine Vision Conference (BMVC) (2019).

Publications [Journal]

Kim, Y. *et al.*, *Rethinking Skip Connections in Spiking Neural Networks with Time-To-First-Spike Coding*. Frontiers in Neuroscience (2024).

Kim, Y. *et al.*, *Do We Really Need a Large Number of Visual Prompts?*. Neural Networks-Elsevier (2024).

Kim, Y., Li, Y., Moitra, A., Yin, R., and Panda, P., *Do We Really Need a Large Number of Visual Prompts?*. Neural Networks-Elsevier (2024).

Moitra, A., Bhattacharjee, A., **Kim, Y.** & Panda, P., *RobustEdge: Low Power Adversarial Detection for Cloud-Edge Systems* IEEE Transactions on Emerging Topics in Computational Intelligence (2023).

Li, Y., Yin, R., **Kim, Y.** & Panda, P., *Efficient Human Activity Recognition with Spatio-Temporal Spiking Neural Networks* Frontiers in Neuroscience (2023).

Kim, Y., Li, Y., Moitra, A., Yin, R. & Panda, P., *Sharing Leaky-Integrate-and-Fire Neurons for Memory-Efficient Spiking Neural Networks* Frontiers in Neuroscience (2023).

Li, Y., **Kim, Y.**, Park, H., & Panda, P. , *Uncovering the Representation of Spiking Neural Networks Trained with Surrogate Gradient.* Transactions on Machine Learning Research (2023).

Han, K., **Kim, Y.**, Han, D., Lee, H., & Hong, S. "TL-ADA: Transferable Loss-based Active Domain Adaptation." Neural Networks - Elsevier (2023).

Kim, Y., Chough, J., & Panda, P. "Beyond Classification: Directly Training Spiking Neural Networks for Semantic Segmentation." Neuromorphic Computing and Engineering (2022).

Yin, R., Moitra, A., Bhattacharjee, A., **Kim, Y.**, and Panda, P., *SATA: Sparsity-Aware Training Accelerator for Spiking Neural Networks*. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (2022).

Christensen, D.V., et al. "2022 roadmap on neuromorphic computing and engineering." Neuromorphic Computing and Engineering (2022).

Kim, Y., & Panda, P. , *Revisiting batch normalization for training low-latency deep spiking neural networks from scratch* Frontiers in

Neuroscience (2021).

Kim, Y. & Panda, P., *Visual explanations from spiking neural networks using interspike intervals.* Nature Scientific Reports 11(2021).

Kim, Y. & Panda, P., *Optimizing Deeper Spiking Neural Networks for Dynamic Vision Sensing.* Neural Networks-Elsevier(2021).

Venkatesha, Y., **Kim, Y.**, Tassiulas, L., & Panda, P., *Federated Learning with Spiking Neural Networks.* IEEE Transactions on Signal Processing(2021).

Kim, Y., Cho, D., Han, K., Panda, P., & Hong, S, *Domain adaptation without source data.* IEEE Transactions on Artificial Intelligence(2021).

Bhattacharjee, A., Bhatnagar, L., **Kim, Y.**, & Panda, P., *NEAT: Non-linearity Aware Training for Accurate, Energy-Efficient and Robust Implementation of Neural Networks on 1T-1R Crossbars.* IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems(2021).

Kim, Y., & Hong, S, *Adaptive Graph Adversarial Networks for Partial Domain Adaptation.* IEEE Transactions on Circuits and Systems for Video Technology(2021).

Kim, Y., Cho, D., & Hong, S, *Towards Privacy-Preserving Domain Adaptation.* IEEE Signal Processing Letters (2020).

Talks

Searching for Feedback Connection Architectures using NAS in Spiking Neural Networks
Center for Brain-Inspired Computing (C-BRIC, SRC), Aug 18, 2022
Towards Deep, Interpretable, and Robust Spiking Neural Networks: Algorithmic Approaches
Center for Brain-Inspired Computing (C-BRIC, SRC), Feb 25, 2021

Teaching Experience

- EENG 348, Digital Systems, 2022

Academic Activities

Reviewer
- Program Committee (PC) Member for the Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI), 2023, 2024
- European Conference on Computer Vision (ECCV), 2022, 2024
- International Conference on Computer Vision (ICCV), 2023
- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2022, 2023, 2024
- Frontiers in Neuroscience
- IEEE Transactions on Pattern Analysis and Machine Intelligence(TPAMI)
- IEEE Transactions on Artificial Intelligence (T-AI)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)