Xindi (Cindy) Wu

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Education

Princeton University *Princeton, NJ*
Phd student in Computer Science Department, School of Engineering and Applied Science *Aug. 2022 - Now*

Carnegie Mellon University *Pittsburgh, PA*
Master of Science in Computer Vision, School of Computer Science Robotics Institute *Aug. 2020 - Dec. 2021*
• Selected Courses: Computer Vision, Deep Reinforcement Learning for Robotics, Math foundation for Robotics, Visual Learning and Recognition, Geometry Based Computer Vision

Xi'an Jiaotong University *Xi'an, China*
Bachelor of Science in Computer Science, Honors Youth Program *Sept. 2016- July 2020*
• Selected Courses: Programming Language(C++), Data Structure and Algorithm, Compiling Fundamental, Computer Organization, Computer Graphics

Publications & Preprints

[1] Pix2Map: Cross-modal Retrieval for Inferring Street Maps from Images
X. Wu, K. Lau, F. Ferroni, A. Osep, D. Ramanan *Arxiv 2023*

[2] Ego4D: Around the World in 3,000 Hours of Egocentric Video
K. Grauman,..., **X. Wu**,..., Jitendra Malik *Conference on Computer Vision and Pattern Recognition (CVPR) 2022*

[3] Toward Learning Robust and Invariant Representations with Alignment Regularization and Data Augmentation
H. Wang, Z. Huang, **X. Wu** and EP. Xing *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2022*

[4] CryoETGAN: Cryo-electron Tomography Image Synthesis Using Unpaired Image Translation
X. Wu, C. Li, H. Wei, H. Deng, J. Zhang and M. Xu *Frontiers in Physiology Computational Physiology and Medicine, 2022*

[5] Squared l2 Norm as Consistency Loss for Leveraging Augmented Data to Learn Robust and Invariant Representations
H. Wang, Z. Huang, **X. Wu** and EP. Xing *Arxiv 2021*

[6] Marrying Motion Forecasting and Offline Model-Based Reinforcement Learning for Self-Driving Cars
S. Pande and **X. Wu** *Preprint, 2021*

[7] High Frequency Component Helps Explain the Generalization of Convolutional Neural Networks.
H. Wang, **X. Wu**, Z. Huang, EP. Xing *Conference on Computer Vision and Pattern Recognition (CVPR) 2020*

[8] Transferable Adversarial Attacks on Deep Reinforcement Learning
X. Pan, Y. Cao, **X. Wu**, E. Zelikman, C. Xiao, Y. Sui, R. Chakraborty, RS. Fearing *Workshop on Adversarial ML at CVPR, 2020*

[9] Reducing Exploitation of Data Idiosyncrasy Helps Robustify Trained Models
X. Wu, H. Wang, E. Zelikman, M. Xu and EP. Xing *Preprint, 2020*

[10] Regularized Adversarial Training (RAT) for Robust Cellular Electron Cryo Tomograms Classification
X. Wu, Y. Mao, H. Wang, X. Zeng, X. Gao, EP. Xing, M. Xu *IEEE Int. Conf. on Bioinformatics and Biomedicine (BIBM) 2019*

[11] Template-based and Template-free Approaches in Cellular Cryo-electron Tomography Structural Pattern Mining.
X. Wu, X. Zeng, Z. Zhu, X. Gao and M. Xu *Computational Biology, Codon Publications, Brisbane, Australia, 2019*

[12] Deep Self-Paced Learning for Semi-supervised Person Re-identification Using Multi-View Self-Paced Clustering
X. Xin, **X. Wu**, Y. Wang, J. Wang *IEEE 26^{th} Int. Conf. on Image Processing (ICIP), 2019*

[13] Multitask Learning With Enhanced Modules
Z. Zheng, Y. Wei, Z. Zhao, **X. Wu**, Z. Li and P. Ren *IEEE 23^{rd} Int. Conf. on Digital Signal Processing (DSP) 2018*

Industry Experience

Snap Inc. Perception Team *New York, NY*
Machine Learning Engineer *Feb. 2022 - July. 2022*
• Worked on the evaluation and index building pipeline for fashion products visual search. Link

Snap Inc. Perception Team *New York, NY*
Research Intern w/Dr. Alireza Zareian and Dr. Chen Wang *May 2021 - Aug. 2021*
• Developed a sample-efficient method to generate self-supervised vision and language representations incorporating ideas from CLIP, supporting a variety of downstream zero-shot tasks including classification, object detection, and segmentation.
• Achieved a 24% relative improvement on top-1 ImageNet accuracy over CLIP trained with the Conceptual Captions 3M dataset.

Research Experience

Robotics Institute - CMU Argo AI Center for Autonomous Vehicle Research *Pittsburgh, PA*
CMU Sponsered Capstone | Research Assistant w/ Prof. Deva Ramanan *Jan. 2021 - Dec. 2021*
• Proposed a contrastive cross-modal approach to dynamic street map construction from camera data. Trained the graph encoder and image encoder with a shared latent space building on recent advances in multimodal representation learning.
• Defined a new task and benchmark for map maintenance, evaluating both fidelity and generalization. Leveraged the Argoverse dataset to define a comprehensive and rigorous set of evaluation criteria. Demonstrated that this approach has the ability to generalize both to novel observations within a city as well as to unseen cities[1].

Facebook AI Research & Carnegie Mellon University, Robotics Institute *Pittsburgh, PA*
Research Assistant w/ Prof. Kris Kitani *Sept. 2020 - Dec. 2020*
- Developed de-identification tool based on object tracking to efficiently de-identify arbitrary objects including faces, license plates, etc., in egocentric video at near real time, allowing 3x faster de-identification than other methods (e.g. Adobe Premiere Pro)[2].

Megvii Research (Face++) *Beijing, China*
Computer Vision Research Intern w/ Banghuai Li *June 2020 - Sept. 2020*
- Researched & designed few shot learning models built on Detectron2 with metric learning based methods for object detection.
- Implemented mixup data augmentation and contrastive loss to improve the post-Region Proposal Network relation graph.

Carnegie Mellon University, Language Technology Institute Pittsburgh, PA
Research Intern w/ Haohan Wang *Apr. 2019 - June 2020*
- Demonstrated a relationship between the frequency spectrum of image data and generalization behavior of CNNs[7].
- Designed a regularization scheme that penalizes large differences between adjacent components within kernels. Link

Carnegie Mellon University, Computational Biology Department *Pittsburgh, PA*
Research Assistant w/ Prof. Min Xu *Mar. 2019 - June 2020*
- Proposed Regularized Adversarial Training to push the decision boundary away from training data while maximizing accuracy on unperturbed examples to improved the robustness of subtomogram SoTA classification models [10].
- Designed a model to achieve unsupervised image-to-image translation for Cryo-ET images which is stable to train and capable of generating plausibly diverse image samples[4].

Xi'an Jiaotong University, Institute of Artificial Intelligence and Robotics *Xi'an, China*
Research Assistant w/ Prof. Jinjun Wang & Prof. Pengju Ren *Dec. 2017 - Feb.2019*
- Introduced a self-paced regularizer to select reliable samples for fine-tuning each CNNs and implemented self-paced clustering.
- Improved mAP & Rank-1 by 4.44% & 2.2% on person re-identification using ResNet50; 6.04% & 4.6% on DenseNet121 [12].
- Designed an inverse adversarial learning regime which take classifiers to supervise each generator extract discriminate features and take discriminators for regularizing generators to learn complementary features.

Projects

Transferable Adversarial Attacks on Deep Reinforcement Learning [8] Jan. 2020 - March 2020
- Implemented the attacks to minimize the rewards of substitute target policies against DRL.
- Outperforms the existing attacks when the system dynamics or the action space changes in both HalfCheetah and Walker2d.

Robustifying Trained Models by Reducing Exploitation of Data Idiosyncrasy Link March 2019 - May 2019
- Developed a mathematical framework to put bounds on previously-identified trade-off between robustness & accuracy.
- Implemented three lightweight methods to increase model robustness to verify the framework's implications.

Multitask Learning With Enhanced Modules [13] *Jan. 2018 - May 2018*
- Used 5.23x fewer generations to achieve 99% accuracy on a source-to-target MNIST classification task compared with DeepMind's PathNet. Increased the accuracy of CIFAR- SVHN transfer task by x1.9. Achieved 70.75% accuracy on miniImageNet

Smooth Kernels Improve Adversarial Robustness Link *Aug. 2019 - Oct. 2019*
- Designed a regularization scheme that penalizes large differences between adjacent components within kernels
- Achieved numerically the best adversarially robustness across most settings, suggesting the effective of smooth regularization

Talks and Poster Presentations

- "VisionxHDmap: Learning to generate vector maps from observations", **Smith Hall poster session**. Pittsburgh, Oct. 2021.
- "Regularized Adversarial Training (RAT) for Robust Cellular Electron Cryo Tomograms Classification", our work at **BIBM 2019** (accepted as oral). San Diego, Nov. 2019.

Professional Service and Volunteering

- **Reviewer** - CVPR 2023, CVPR 2022, ECCV 2022, Neurips Interpolate workshop 2022, BMVC 2020, IJCAI 2020
- **Committee Member** - Diversity, Equity and Inclusion Committee in Robotics Institute, CMU
- **Conference Chair** - SIGBOVIK 2021
- **Volunteer** - vGHC(Grace Hopper Celebration of Women in Computing) 2021 Volunteer
- **Panelist** - Robotics Institute MS Student Panel, 2021, Robotics Institute Summer Scholars (RISS) program 2021
- **Co-Host** - Weekly RI Meets! 2021
- **Mentor** - CMU Society of Women Engineeers (SWE) mentoring program 2021

Extracurricular

- Aero Model Association, Xi'an Jiaotong University *Sept. 2016 - May 2017*
- Student Union of Nanyang College, Xi'an Jiaotong University *Sept. 2016 - May 2017*
- Strong Woman strong girl, Carnegie Mellon University *Sept. 2021 - Dec. 2021*
- Society of Women Engineers, Carnegie Mellon University *Sept. 2021 - Dec. 2021*

Skills

Languages: Python, C/C++/C#, Matlab, R, SQL, Bash, HTML/CSS
Development Tools: Spark, Hadoop, RabbitMQ, Celery; Docker;
Deep Learning Tools: PyTorch, TensorFlow, Keras, Caffe; OpenCV; MuJoCo, OpenAI Gym