

Manli Shu

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Education

University of Maryland, College Park

Expected: 05/2024

Ph.D. student in Computer Science, Department of Computer Science

GPA: 4.0

University of Science and Technology of China

09/2015 – 07/2019

B.Eng. in Information Security, School of Information Science & Technology

GPA: 3.8

Technical Skills

- **Coding/Programming:** Python (PyTorch, TensorFlow, Caffe, SciPy), Go (gRPC), SQL, C/C++.
- **Software and Tools:** Git, Docker, GCP, OpenCV, Open3D, L^AT_EX, MySQL
- **A.I./Machine Learning:** Deep Learning, Representation Learning, Self-supervised Learning, Adversarial Optimization, Multi-modal Learning, 3D Object Detection, Semantic Segmentation.

Work Experience

Salesforce, Research Intern

06/2022 - 11/2022

- **3D Point Cloud Object Detection:** enhancing transformers with 3D inductive biases.
 - Investigated the limitations in the designs of existing transformers for point clouds.
 - Designed a novel attention mechanism to improve the precision of 3D object detection.
 - Improved previous state-of-the-art transformer-based 3D detection model on the ScanNetV2 indoor 3D detection benchmark by over 2.0% in mean average precision.

Nvidia, Research Intern

01/2022 - 05/2022

- **Vision-Language Models:** improving zero-shot generalization with prompt tuning.
 - Established a new way of prompt tuning without downstream data or annotations.
 - Developed a self-supervised optimization objective for prompt tuning on a single test sample.
 - Refined the test-time optimization pipeline by introducing a prediction calibration step.
 - Increased the out-of-distribution accuracy of a pre-trained vision-language model by 5.6%.

Research Experience

UMD Center for Machine Learning, Graduate Research Assistant

08/2019 - Present

- **Representation Learning:** unifying contrastive learning and meta-learning.
 - Analyzed and modeled the connection between contrastive learning and meta-learning.
 - Prototyped a self-supervised pre-training framework using meta-learners and demonstrated that it can produce models with better transferability on 8 downstream datasets.
 - Applied meta-learning techniques to state-of-the-art self-supervised representation learning methods and improved model performance by over 2.0% under different settings.
- **Out-of-distribution Robustness:** an adversarial approach for domain generalization.
 - Proposed adversarial batch normalization for simulation of novel feature distributions.
 - Visualized the novel feature distribution in image space, validating the effect of the method.
 - Evaluated the method on image classification and semantic segmentation and achieved consistent improvement on over ten domains with a maximum of 9.0% performance boost.

Selected Publications

- [1] M. Shu, W. Nie, D. Huang, Z. Yu, T. Goldstein, A. Anandkumar, C. Xiao. Test-Time Prompt Tuning for Zero-Shot Generalization in Vision-Language Models. In *Conference on Neural Information Processing Systems (NeurIPS)*, 2022.
- [2] R. Levin, M. Shu, E. Borgnia, F. Huang, M. Goldblum, T. Goldstein. Where do models go wrong? Parameter-space saliency maps for explainability. In *Conference on Neural Information Processing Systems (NeurIPS)*, 2022.
- [3] R. Ni, M. Shu, H. Souri, M. Goldblum, T. Goldstein. The Close Relationship between Contrastive Learning and Meta Learning. In *International Conferences on Learning Representations (ICLR)*, 2022.
- [4] M. Shu, Z. Wu, M. Goldblum, T. Goldstein. Encoding Robustness to Image Style via Adversarial Feature Perturbations. In *Conference on Neural Information Processing Systems (NeurIPS)*, 2021.
- [5] Y. Shen, L. Zheng, M. Shu, W. Li, T. Goldstein, M. Lin. Gradient-Free Adversarial Training against Image Corruption for Learning-based Steering. In *Conference on Neural Information Processing Systems (NeurIPS)*, 2021.
- [6] M. Shu, Y. Shen, M. Lin, T. Goldstein. Adversarial Differentiable Data Augmentation for Autonomous Systems In *International Conferences on Robotics and Automation (ICRA)*, 2021.