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, LaTeX, 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 - Present*

- **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 test-time prompt tuning strategy. Implemented the method in PyTorch and sped up the pipeline using distributed data-parallel (DDP) with automatic mixed precision (AMP).
  - 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.*