Stefanos Pertigkiozoglou

pstefano@seas.upenn.edu | Google Scholar | Website |

Education

Ph.D. in Computer Science, University of Pennsylvania (GRASP Lab) (2019-Present)
Advisor: Kostas Daniilidis
Research Interests: Geometric Deep Learning, 3D Vision

MSc in Robotics, University of Pennsylvania (completed concurrently with PhD) (2019-2024)
GRASP Lab, GPA: 4.0/4.0

Integrated Bachelor's and Master's in Electrical and Computer Engineering (2012-2018)
National Technical University of Athens
GPA: 9.42/10, summa cum laude, Class rank: Top 2%
Undergrad Advisor: Petros Maragos
Thesis: Detecting Adversarial Examples in Convolutional Neural Networks

Research Interests

Computer Vision, Geometric Deep Learning, Equivariant representations, Point Cloud Processing, 3D Vision, Neural Rendering and Reconstruction, Physical Simulations

Publications

Improving Equivariant Model Training via Constraint Relaxation
S. Pertigkiozoglou*, E. Chatzipantazis*, T. Shubhendu, K. Daniilidis, *NeurIPS 2024* [pdf].
Introduced a novel method for improving the training of Equivariant Neural Networks. Specifically, we showcased how relaxing the equivariant constraint during training and projecting back to the space of equivariant models during inference can improve the overall optimization

BiEquiFormer: Bi-Equivariant Representations for Global Point Cloud Registration
S. Pertigkiozoglou*, E. Chatzipantazis*, K. Daniilidis, *NeurReps Workshop 2024* [pdf].
Proposed a novel point cloud registration method that utilizes bi-equivariant representations to achieve robust point cloud alignment, that is independent of the initial poses of the input point clouds.

$\mathrm{SE}(3)$**-Equivariant Attention Networks for Shape Reconstruction in Function Space**
E. Chatzipantazis*, **S. Pertigkiozoglou***, E. Dobriban, K. Daniilidis, *ICLR 2023* [pdf].
Proposed an SE(3)-Equivariant Transformer network for shape reconstruction given input point cloud scans. Showed how the equivariant constraint along with the use of local shape modeling enables the model, trained on single objects, to generalize to scene reconstruction.

Learning Augmentation distributions using transform risk minimization
E. Chatzipantazis*, **S. Pertigkiozoglou***, K. Daniilidis, E. Dobriban, *Transactions of Machine Learning Research 2023* [pdf].
Proposed Transformed Risk Minimization (TRM) as an extension of the standard risk minimization. TRM allows for simultaneously learning a model and a distribution of useful training and testing augmentations that improve the overall task performance.

Detecting Adversarial examples in convolutional neural networks
S. Pertigkiozoglou, P. Maragos, 2018 [pdf].
Investigated the adversarial robustness of Convolutional Neural Networks and proposed different techniques for detecting inputs that are perturbed by a set of adversarial attacks.

* Denotes equal contribution

Experience

Research Intern (Summer 2024)
InterDigital
- Developed a multi-scale motion model, achieving improvements over prior *Dynamic Gaussian Splatting* baselines.
- Submitted a relevant patent disclosure in collaboration with the engineering team.

Graduate Research Assistant (Sep. 2019-Present)
GRASP Lab, University of Pennsylvania
- Designed equivariant methods that enable models to learn representations of geometric objects and perform tasks such as shape reconstruction or point cloud registration consistently, independent of the arbitrary choice of reference frame.
- Proposed the *Transformed Risk Minimization* (TRM), a framework that can discover symmetries existing in the data and augmentation distributions useful during training and testing. (Worked done under the ARO-MURI project for robust concept learning)

Research Assistant (Sep. 2018- Aug. 2019)
CVSP Lab, National Technical University of Athens
- Designed methods for detecting adversarially perturbed inputs in neural networks.
- Investigated how properties such as the model's Lipschitz constant correlates to its adversarial robustness.

CVPR 2024 Workshop Invited Speaker
Equivariant Vision: From Theory to Practice
- Presented a tutorial on the basic methodologies and the essential tools available in *Geometric Deep Learning*. [slides][video]

Teaching Experience
- Teaching Assistant, CIS 580: Machine Perception (Head TA), Spring 2021
- Teaching Assistant, CIS 680: Advance Topics in Machine Perception, Fall 2020

Academic Reviewer: ICCV, CVPR, ICLR, Neurips, TMLR

Technical Reports, Projects

Shape Space and the Geodesics between Shapes (2023) [pdf]
Composed a technical report presenting the fundamental concepts of Shape Space theory and demonstrating the computation of geodesics within the shape space, enabling interpolation between shapes.

Adversarial Robustness in Model Ensembles (2021) [pdf]/[code]
Extended classical boosting algorithms to incorporate adversarial error, developing a framework that enhances neural network robustness against adversarial attacks through an ensemble of models.

Distributed Website Crawler (2020) [code]
Implemented a distributed website crawler. The distributed design allows for the individual crawler heads to be launched in independent EC2/AWS instances and aggregate information through a DynamoDB database.

Technical Skills

Proficient Use: Python, PyTorch, LaTeX, Git, Linux
Basic Use: C++, TensorFlow, Blender, Java

Honors and Awards

- **Gerondelis Foundation, Graduate School Grant**, 2023
- **Thomaideion Award** for the highest grades among all students in Electrical and Computer Engineering during the academic year 2012-2013
- **Chris Papakiriakopoulos Award** for academic excellence in Mathematics during the academic year 2012-2013