# 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

## 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
During my summer internship, I worked on a research project aiming at improving Dynamic Gaussian Splatting by introducing a novel multi-scale motion model.

**Graduate Research Assistant** (Sep. 2019-Present)
GRASP Lab, University of Pennsylvania
My research interests lie in the intersection of Computer Vision and Geometric Deep Learning.

- 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.
- As part of the multidisciplinary ARO-MURI project for robust concept learning, we proposed the Transformed Risk Minimization (TRM) that can discover symmetries existing in the data and augmentation distributions that are useful during both training and testing.

**Research Assistant** (Sep. 2018- Aug. 2019)
CVSP Lab, National Technical University of Athens
As a part of my thesis, I designed methods for detecting adversarially perturbed inputs to neural networks, and I investigated how properties such as the Lipschitz constant of a model correlate to its adversarial robustness.

**Teaching Experience**

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

**Invited speaker for a tutorial talk in the CVPR 2024 workshop: "Equivariant Vision: From Theory to Practice" [slides][video]**

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

## Technical Reports, Projects

**Shape Space and the Geodesics between Shapes** (2023) [pdf]
A presentation of fundamental concepts of the Shape Space theory and the computation of geodesic in shape space that allows for interpolation between shapes.

**Adversarial Robustness in Model Ensembles** (2021) [pdf]/[code]
In this work we investigated the adversarial robustness of ensembles of models. Then we proposed a generalization of the classical boosting methods as a way of reducing the adversarial error of such ensembles.

**Designing a Distributed Website Crawler** (2020) [code]
Implementation of a distributed website crawler. The distributed crawler heads are designed so that they can be individually deployed in EC2/AWS instances.

## 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