Robot Learning Workshop

October 14-15, 2019

Kostas Daniilidis

Computer & Information Science.

GRASP Lab

University of Pennsylvania

Learning Geometry-Aware Representations: 3D Object and Human Pose Inference

Traditional convolutional networks exhibit unprecedented robustness to intraclass nuisances when trained on big data. However, such data have to be augmented to cover geometric Transformations. Several approaches have shown recently that data augmentation can be avoided if networks are structured such that feature representations are transformed the same way as the input, a desirable property called equivariance. We show in this talk that global equivariance can be achieved for the case of 2D scaling, rotation, and translation as well as 3D rotations. We show state of the art results using an order of magnitude lower capacity than competing approaches. Moreover, we show how such geometric embeddings can recover the 3D pose of objects without key points or using ground-truth pose on regression. We finish by showing how graph convolutions enable the recovery of human pose and shape without any 2D annotations.