

Deep learning has become the computer vision processing algorithm of choice. In this talk, I'll present several projects at the Naval Research Laboratory that have used deep learning in a robotics context. First, we developed a reactive controller for a robot that performs well both in structured indoor and unstructured outdoor environments. ControlNet maps visual input to motor commands, and allows rapid training (and requires minimal training data), thus permitting rapid deployment to novel environments. Second, we developed an anomaly detection system for a robot performing patrol: using deep learning, we construct a model of "normality" and then during patrol we compare the current image to the model to determine if an anomaly is present. Our initial system was unsupervised, while our current system is unsupervised via the use of GANs. Third, a joint project with other Navy research labs is examining using deep learning to identify ordinance for bomb disposal teams: we developed a pipeline that allows rapid identification of unique items in unknown environments. Finally, we are investigating neuromorphic architectures to improve throughput while minimizing power consumption.