Machine Learning in Robotics

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Machine Learning is the statistical analysis of data used to solve problems. The purpose of this project is to use Machine Learning models to improve the efficiency and accuracy of a robotic arm. Machine Learning consists of three major learning algorithms: supervised, unsupervised, and reinforcement learning. The models used in this project are K-Means Clustering (unsupervised learning) and K-Nearest Neighbors (supervised learning). K-Means Clustering works by generating a k# of random clusters and assigning each training coordinate to its closest cluster. K-Nearest Neighbors works by generating random coordinates and then comparing the position of these coordinates to the position of the k# of nearest training coordinates. Based on these nearest coordinates, the random point is assigned a label. To implement these models a robotic arm was designed using Arduino electronics. This arm is capable of moving along the x and y axes. The arm is programmed using the Arduino programming language and can interface with an external Python program. The Python programs implement the K-Means Clustering and K-Nearest Neighbor models and send the model output to the Arduino. The models are fed some arbitrary coordinates, and using this data the model can eliminate unnecessary coordinates to arrive at the potential position of the object. The coordinate is then communicated to the Arduino and the robotic arm picks the object up at the coordinate. In conclusion, using Machine Learning the robotic arm was able to accurately and efficiently predict the position of the object from a collection of arbitrary data.

Awards Won: