

Robotics ML Toolbox for MoveIt Studio

The Robotics ML Toolbox is an adaptable machine learning pipeline for training robotic arms for perception and segmentation. It is a set of tools for training ML networks and fine-tuning foundation models throughout the lifetime of your application. This easy-to-use toolbox integrates smoothly with the MoveIt Studio SDK runtime and Developer Platform frontend and offers object grasping, affordance generation, bin picking and door opening capabilities out of the box. Best yet, your models can be trained lifelong with our MLOps tools.

Background: Why MoveIt Studio?

Before discussing machine learning further, here's a reminder of the many advantages of building on the [MoveIt Studio Platform](#):

- Dramatically shorten the time to create and deploy your application.
We're seeing an average of 9 months taken off the deployment time.
- Commercial grade reliability, infrastructure, and support out of the box
- Benefit from our 10+ years of experience building advanced robot arm applications



Why do I need the Robotics ML Toolbox?

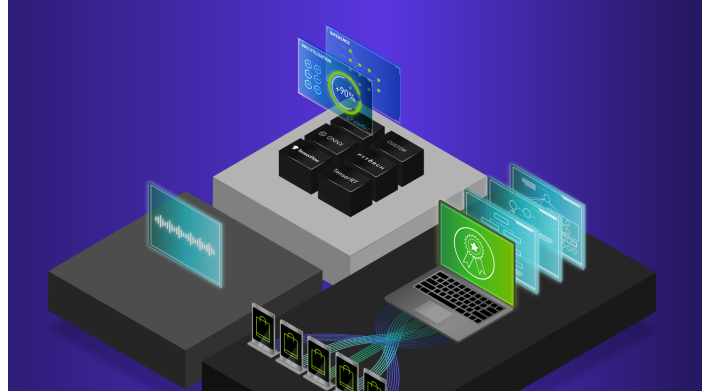
- Add sophisticated computer vision capabilities to your robot instantly
- Give your robot an ML-based understanding of its environment
- Generate smart grasps and approaches based on AI
- Iterate rapidly on your ML models to get to market quicker
- Easily add your own ML models and tools to build your unique robot application



Example segmentation images from MoveIt Studio

What is MLOps and why is it important?

ML models can adapt to any problem in any environment with unprecedented accuracy. Their main requirement is sufficient training data. But problem conditions change, especially in unstructured environments: you might deploy your system at a new facility, with different types of objects, or a different workcell. To keep their accuracy, ML models need to be adjusted to the new situation with new data. This continuous specialization and maintenance process is generally known as ML operations or MLOps.



How do I train a model to accurately perceive objects of interest in a changing, unstructured environment?

Some of the operations involved are: selecting ML models, capturing application data, taking in newly labeled data, sampling and augmenting the data, training the models with different hyperparameters, monitoring training jobs, visualizing results, measuring model performance, choosing and deploying the best models, capturing and labeling data from failure cases and re-training the models with them.



There are many foundation models, software components, and providers of different ML operations to do all the above, but it takes a lot of time, effort, and expertise in robotics and ML to put everything together and make it scalable. We fixed that.

Movelt Studio includes foundation and pre-trained ML models for object perception, and its Robotics ML Toolbox provides a deep integration of all the necessary MLOps components to keep model accuracy always at its highest for any application, no matter how

exotic the domain. With its user interface, you can manage ML operations from a single entry point, with less where-to-go-for-what cognitive load, enabling you to move faster and more precisely.

How do I get started?

Robotics ML Toolbox

- All the tools needed to train and retrain ML models specific to your application.
- You get access to all the source code.
- You are in control of the fine-tuning of our pre-trained models to your needs.
- Requires Movelt Studio base license.

Basic Dataset Training Package

- We will train and tune the model for up to 10 objects of interest.
- You initially provide ~40 images of each object so we can run preliminary training.
- You will own the resulting dataset and model.
- We will train your team to extend the dataset.

