

Vision Processing and Machine Learning Course Outline

Prerequisite- Introduction to Programming course or another Java course

In this course, students learn the basics of Open CV using Python and Vision Processing. They will learn how to combine it with Tensorflow Object Detection and create their own data set to be used for machine learning.

Lesson	Learning Objectives	Time
Getting Started with Open CV	a) Learn about Open CV Installation and Getting Started with Images	1 hour
Getting Started with Images	a) Getting started with images b) Image manipulation c) Image annotation d) Image enhancement	5 hours
Accessing the Camera and Video Writing	a) Accessing the camera b) Video Writing	3 hours
Image Filtering and Features	a) Image filtering b) Image Features and Alignment	2 hours
Conditionals	a) Panorama and HDR	2 hours
Object Tracking	a) Object tracking and Face Detection b) TensorFlow Object Detection c) Pose Estimation and using OpenPose	2 hours
Introduction to Machine Learning	a) Machine Learning in a nutshell	1 hour
Managing a Machine Learning Workflow	a) Creating videos for image recognition b) Uploading videos c) Adding Labels to frames d) Producing Datasets e) Training Models f) Continuing on Training Models g) Understanding Model Metrics	5-10 hours
Optimizing Videos for Increased TensorFlow Model Detection	a) Why is TensorFlow called TensorFlow b) How many frames of our object is enough to ensure a good model? c) How do I know if my model is trained well d) Changing Parameters e) Overlapping bounding boxes	5 hours

Implementing in Robot Code	a) Implementing data set into <i>FIRST</i> Tech Challenge Code	5 hours
Introduction to AprilTags	a) Vision processor and portal initialization b) AprilTag ID Codes, Metadata and Reference Frame c) Camera Calibration d) AprilTag Pose and Library e) Vision Portal CPY, Bandwidth, and Cameral Controls f) Vision Portal Multiportal	10-15 hours
Robot Navigation with Field Coordinates and	a) Using vision processing and field coordinates to improve navigation in the field and robot autonomy b) Using vision process to align and score objects on a field	20 hours