

# Robot Learning Project Proposal

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## Big Idea of the Project:

Have you ever wanted to watch soccer, but couldn't find any good matches to watch? We've never had that problem, but imagine it must be a pain for those who have. To solve this problem, we plan to train our robot to recognize and move to a soccer ball while avoiding other obstacles or non-soccer ball balls. If time allows, we may continue this project by training the robot to recognize a 'goal' of some sort, and attempt to push the ball towards the goal. In reality, our goals when attempting this project are to learn more about machine learning and image recognition.

## Background Research

Robot soccer matches are already a common occurrence - [this](#) article covers a supervised approach to identify a soccer ball using OpenCV and a Linear Binary Pattern (LBP) Classifier. After creating a data set with positive and negative samples, they use a cascade classifier to classify the training set. They then tune the identifier to accommodate different situations.

Soccer (football!) matches are especially interesting to run machine learning on given just how crowded they are with all the colors and the varying sizes based on distance of the ball yet several algorithms can detect it. Because our scene will be much simpler it probably will be easier but at the same time having a lower resolution than many football

images may prove to be a problem if it is the distinct pattern and not just the shape/color of the ball that it uses to recognize it as.

## MVP and/or Stretch Goal

In terms of the system that you will have running on the robot, what is your MVP?  
What is your stretch goal?

Our MVP is to have several objects lined up in front of the neato and have the neato use its camera to recognize the soccer ball. It will then drive forward and tap the soccer ball. Our stretch goal is to have the neato identify a soccer ball and the goal. Once it does that, it will plan a path so that when it drives into the ball, it will go towards the goal.

## Learning Orientation

Top down approach for object recognition (soccer ball) and path planning (moving to soccer ball).

## Data Collection Plan

We are making the assumption there are datasets of just soccerball images and associated labels given the number of blog posts on this topic. If not we can webscrape Google Images term "soccer ball" and other balls then label them appropriately.

## Types of Learning Algorithms

What sorts of learning algorithms will you apply? You could choose these based on what you think will work the best or what you want to learn about the most.

We will try to train one of the OpenCV image classifiers

## Non-Learning Baseline Algorithm Comparison

We can compare it to a Hough Circle transform for rough identification of circular objects. Once we can identify the ball with this algorithm, we can probably carry out the rest of the actions.

## Team Goals

Ben - Learn how machine learning is used in path planning (what it entails, what an effective/ineffective data set looks like, etc)

Nate - Learn more about machine learning over a large dataset, and machine learning in regards to pathfinding.

Max - Learn more about how machine learning works, and can be used towards path planning and

Em Jay - Learn how to properly use machine learning and become more comfortable with openCV.