We want to locate and track Vehicles in images of a video.

We will learn what features are the most useful for a supervised learning classifier that can help us detect whether something is a vehicle (or any object) or not.

For example: some characteristics in an image that might be useful to detect cars in an image are Color, Position within the image, shape, and Apparent Size and more!

We will learn about object Detection, and then learn how to classify them.

Detection:

Color and Gradient are good differentiators between objects. They are both features that we can use to help classify our image. In all applications, we will use a combination of features that lead to the best result.

So what features align with what characteristics in the objects we want to detect?

A Default images pixel values can give details on the color and shape of an object, while the histogram of pixel values gives us info on only the color. At the same time the gradients of pixel values gives us information about an objects shape.

Features:

Simplest Feature you can get from an image is the color. You can compare a known car image with the test region you want to check for that object. You can do this by subtracting pixel values or getting to correlation and threshold the values. This is called **Template Matching**.

The problem with template matching is that you need a Template. If you are thinking about tracking a vehicle from a video, its position relative to the camera changing as it speeds up and slows down would not match the template, meaning it won’t work well for us. (Same Orientation, size, and color)

We need to find a transformation that are robust to changes in appearance. An example of one transform is the **histogram of color values** in an image. It will match things in a region that share the same color distribution. By normalizing the distribution, we can also account for a variation in the objects size. It will also match the object if it is in slightly different aspects orientations can still be matched. Note that this is only matching based on color, which can still match unwanted regions.

Now let’s thing about other color spaces. If we thing about HSV images. In some images, cars are usually saturated in color while the background is pale. Maybe Saturation values can help identify cars invariant of colors. Of course this isn’t always the case, but it’s good to try as much as you can.