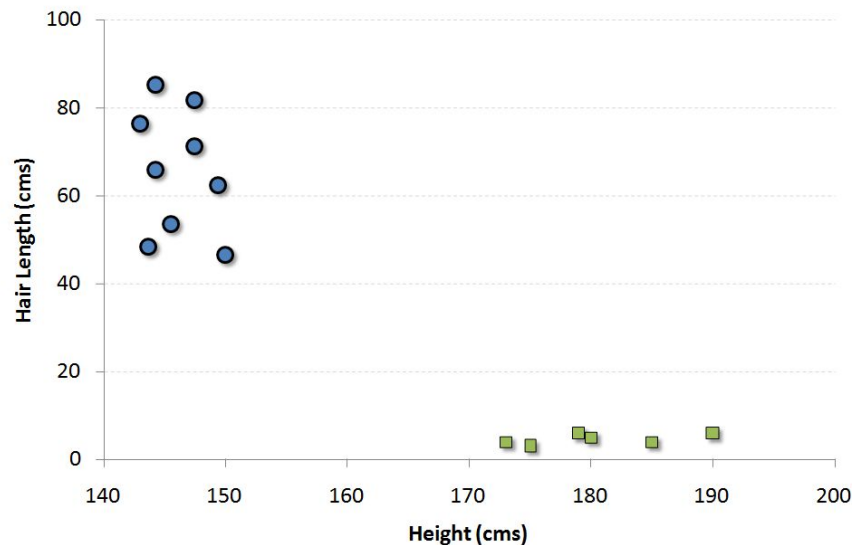


# Support Vector Machines

By [redacted]

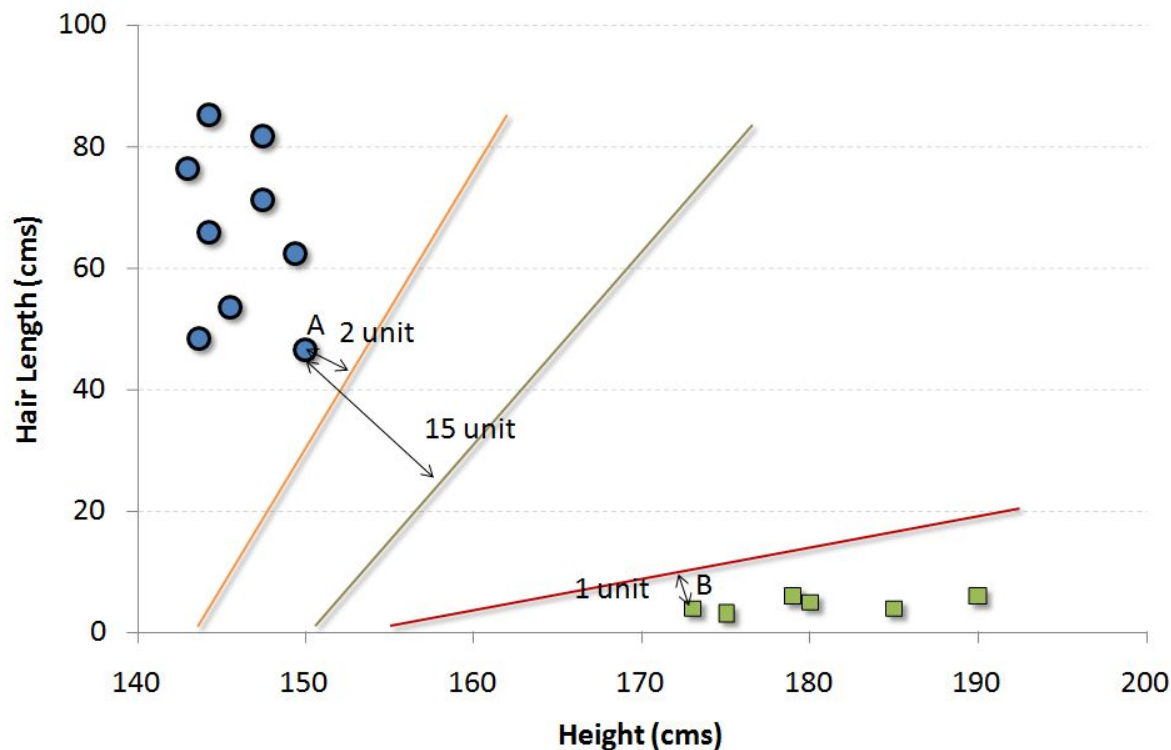
# what is a Support Vector Machine?

- supervised ML Algorithm
- mostly used for classification
- finds a hyperplane to separate datapoints in n-dimensional space
  - n is the number of features you have
- Support Vectors: another word for coordinates of each datapoint
- Support Vector Machine: a frontier that best separates data into groups



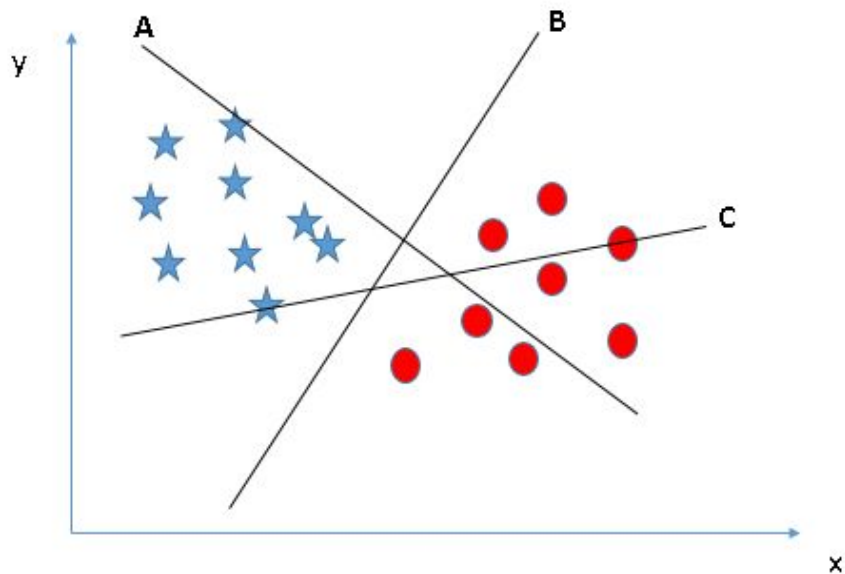
# what does it mean to “best separate”?

- these all separate the datapoints into their respective categories
- what makes one better than another?



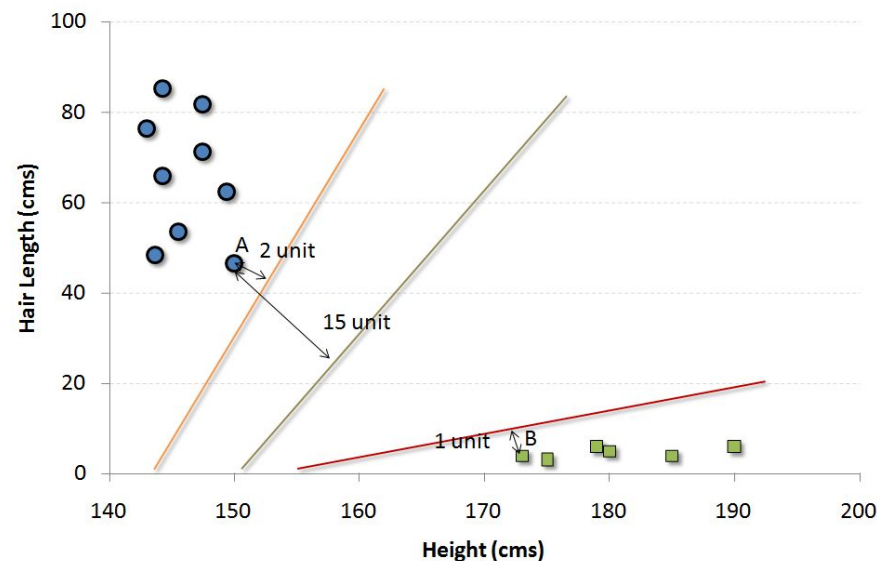
# rules for creating good frontiers

- top priority is accuracy:  
dividing the datapoints into their respective categories
- best line here is line B



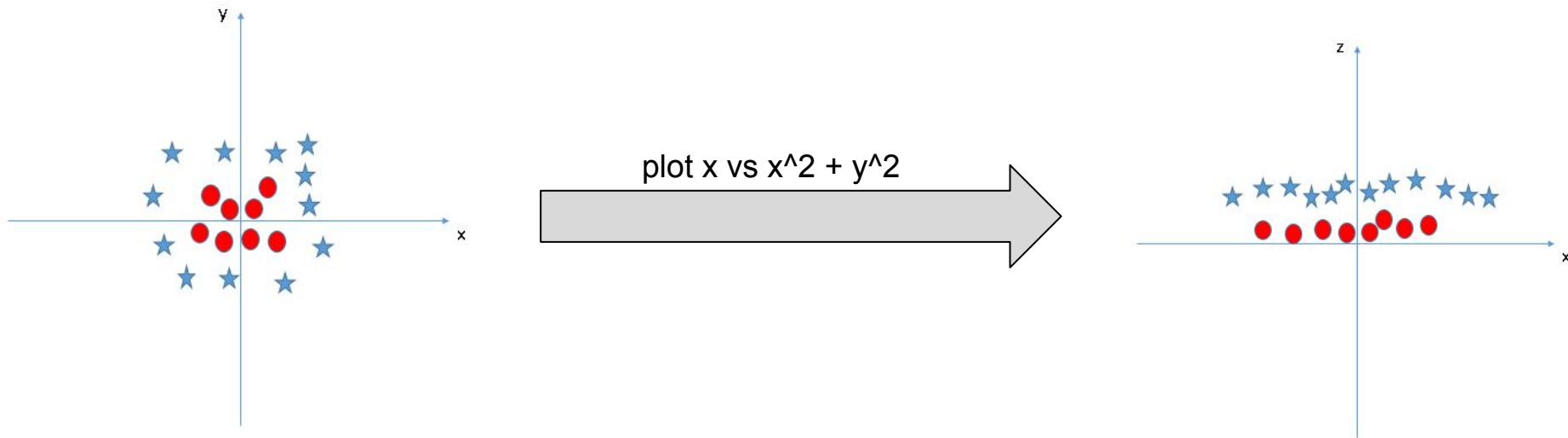
# rules for creating good frontiers

- the second priority is maximizing margin: the distance between any given point and the frontier
- the reduces the chance we will misclassify data
- in this graph, the green line is the best choice to divide the data



# the kernel trick

- what if we don't have an easy linear division between the categories?
- SVMs use something called the kernel trick to embed the data into a higher dimension, allowing it to exhibit more linear separation



# hyperplanes, outliers, etc.

- the notion of a ‘hyperplane’ is just a higher dimensional frontier to separate the datapoints
  - this allows for more possibilities than simple lines, as shown previously
  - SVMs contain algorithms to automatically do the kernel trick for you, so you don’t have to worry about it
- SVMs also have some tolerance for outliers, so that more simple solutions can be found to datasets with a few bad outliers
- all of these parameters can be manipulated in most implementations of SVMs

