Support Vector Machine

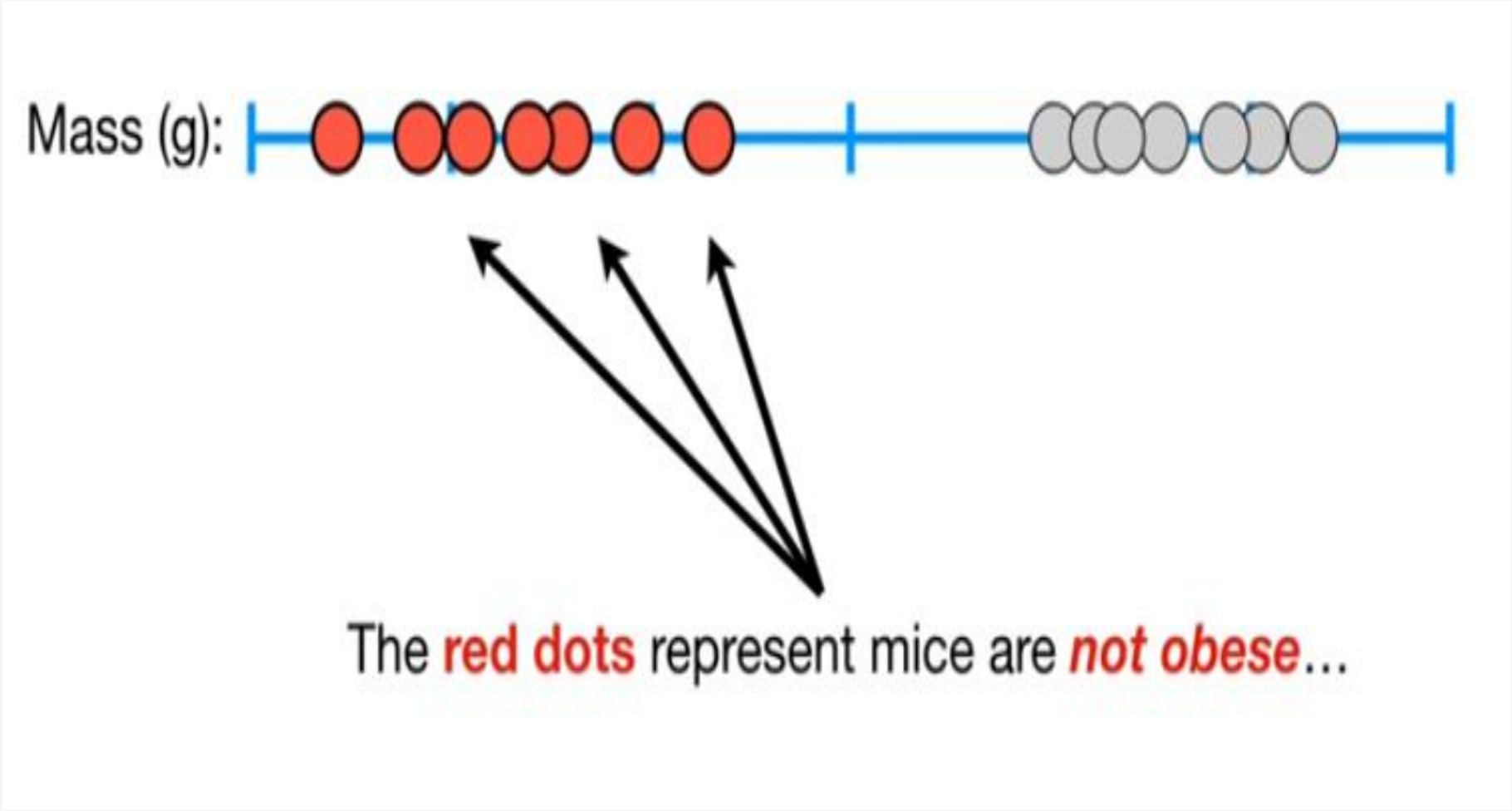
- SVM is a supervised learning model for classification and regression analysis. When it is used for Classification, it is called Support Vector Classifier.

- The algorithm involves finding a hyper-plane in a higher dimensional space which can be used to separate the two different class for binary classification. That is it provides a decision boundary for classifying data points

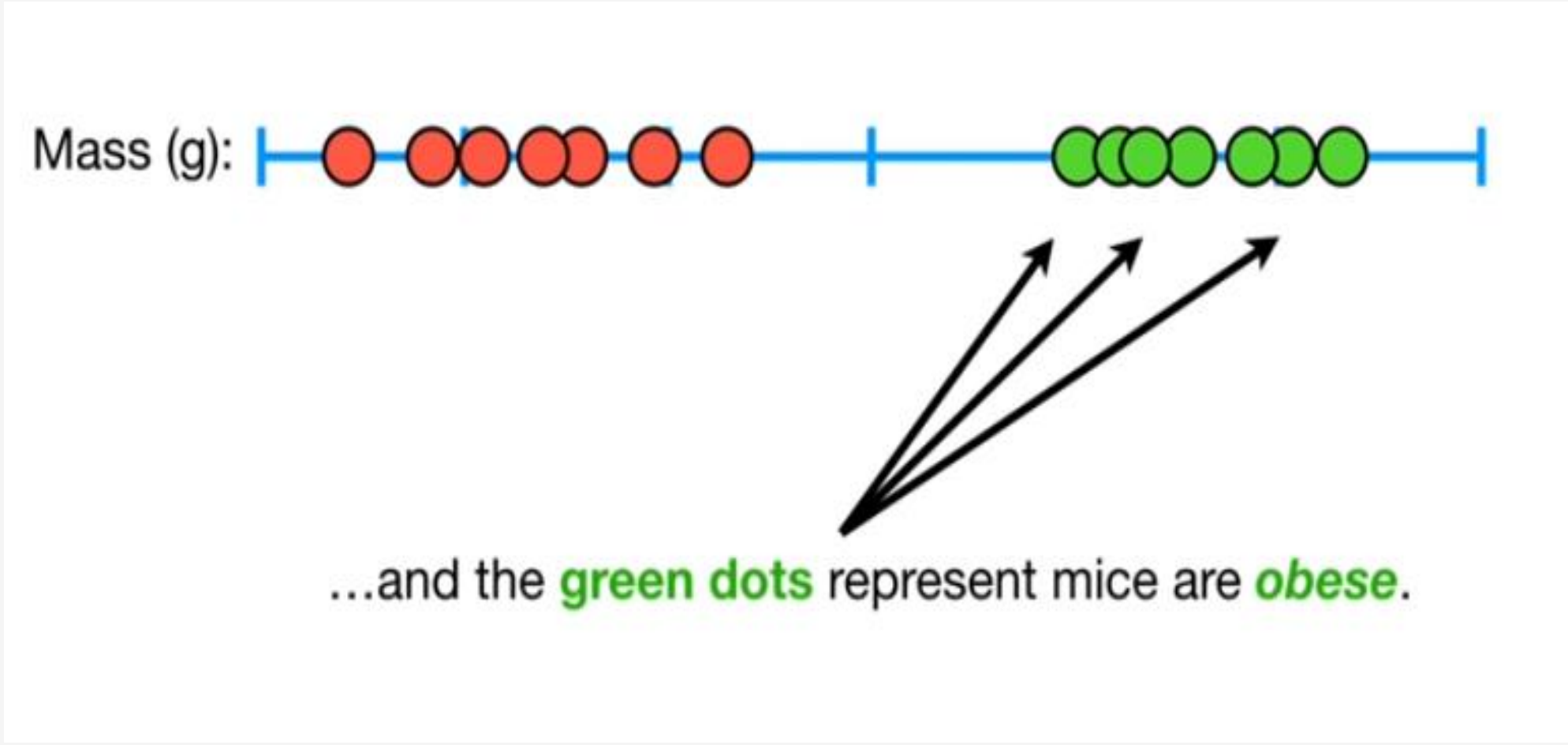
- The criteria for finding this hyperplane is based on the so-called “widest street approach” that has the largest margin: i.e. largest distance to the nearest training data points of any class

- https://www.youtube.com/watch?v=N1vOgolbjSc
- https://www.youtube.com/watch?v=efR1C6CvhmE

Maximum Margin Classifier in 1-dimension

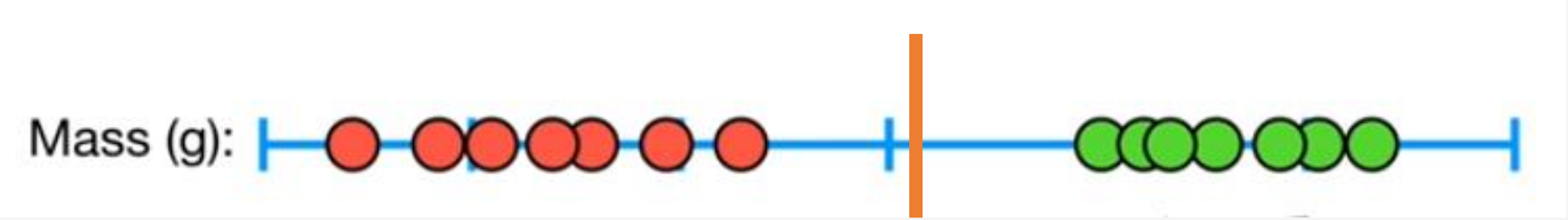


Maximum Margin Classifier in 1-dimension

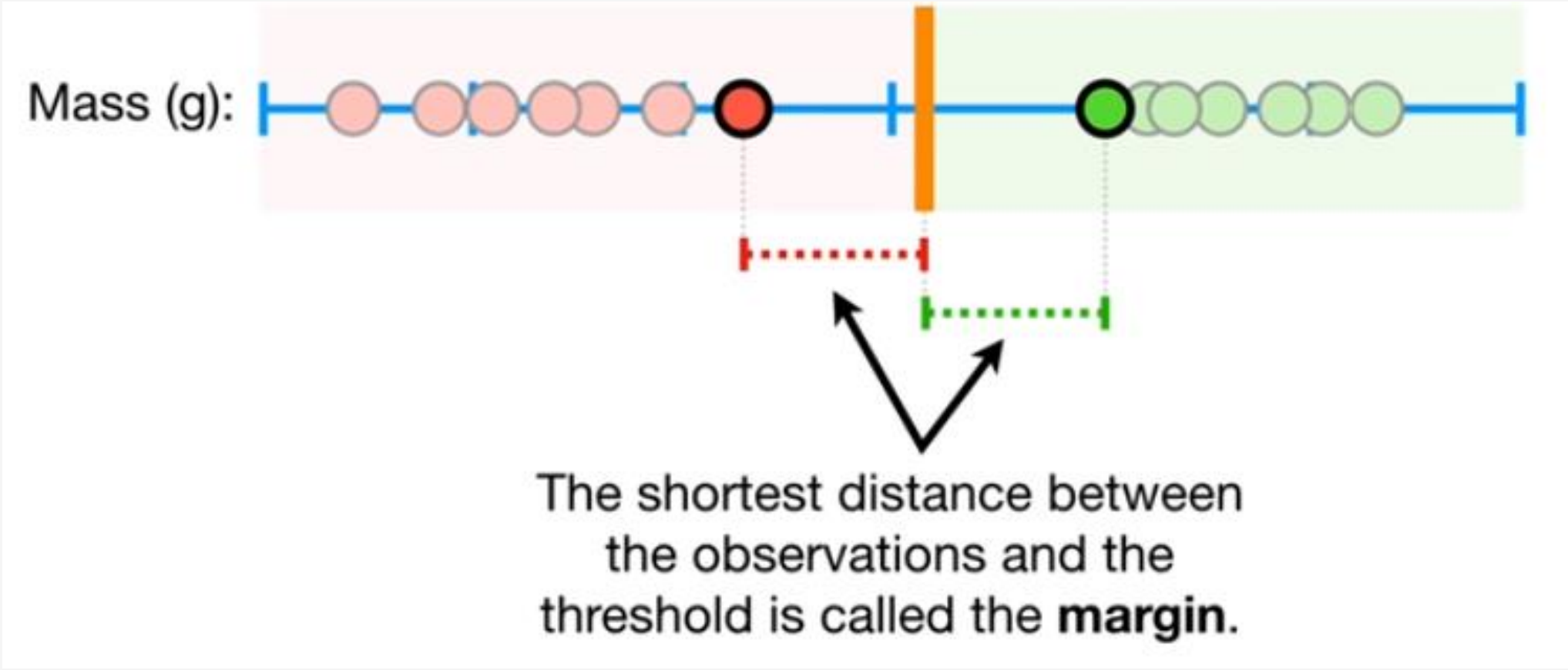


Maximum Margin Classifier in 1-dimension

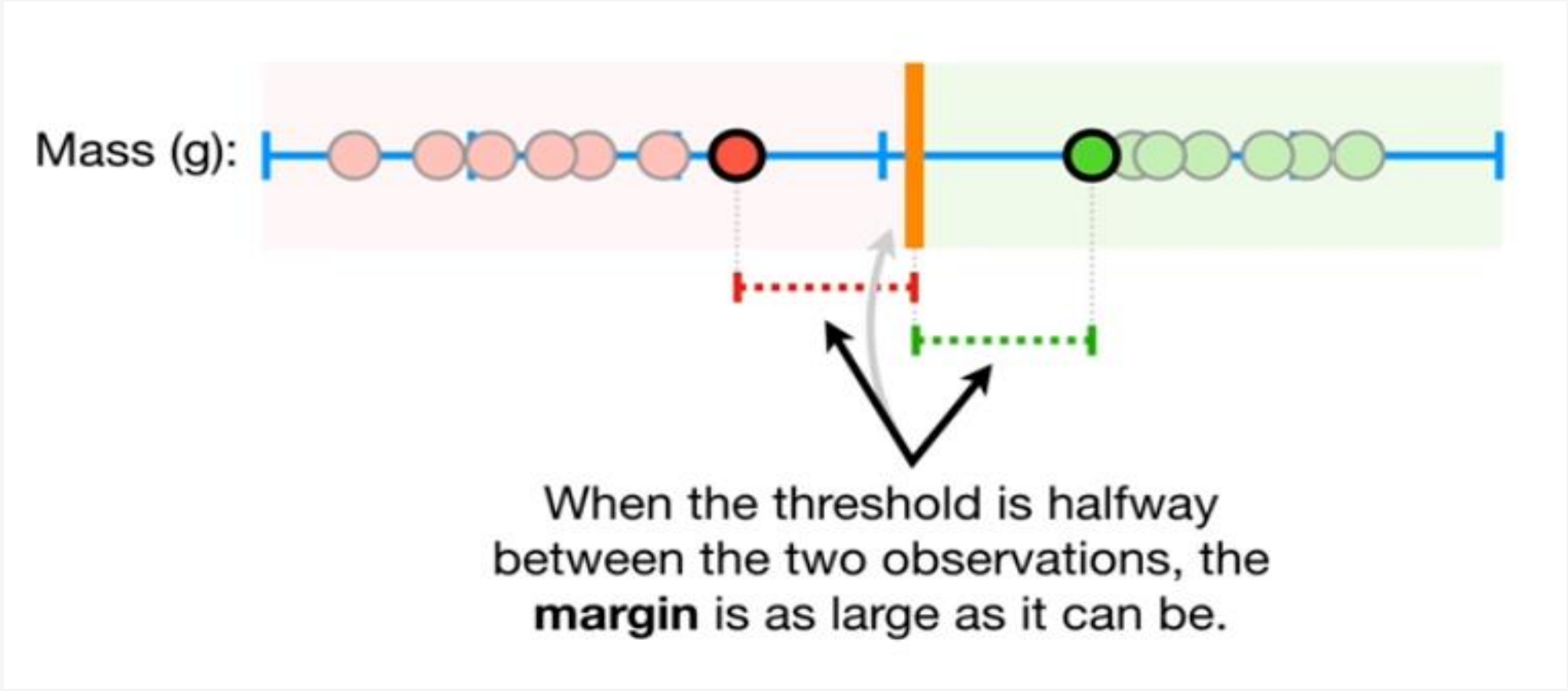
How to choose the threshold to decide whether the Mice is obese



Maximum Margin Classifier in 1-dimension

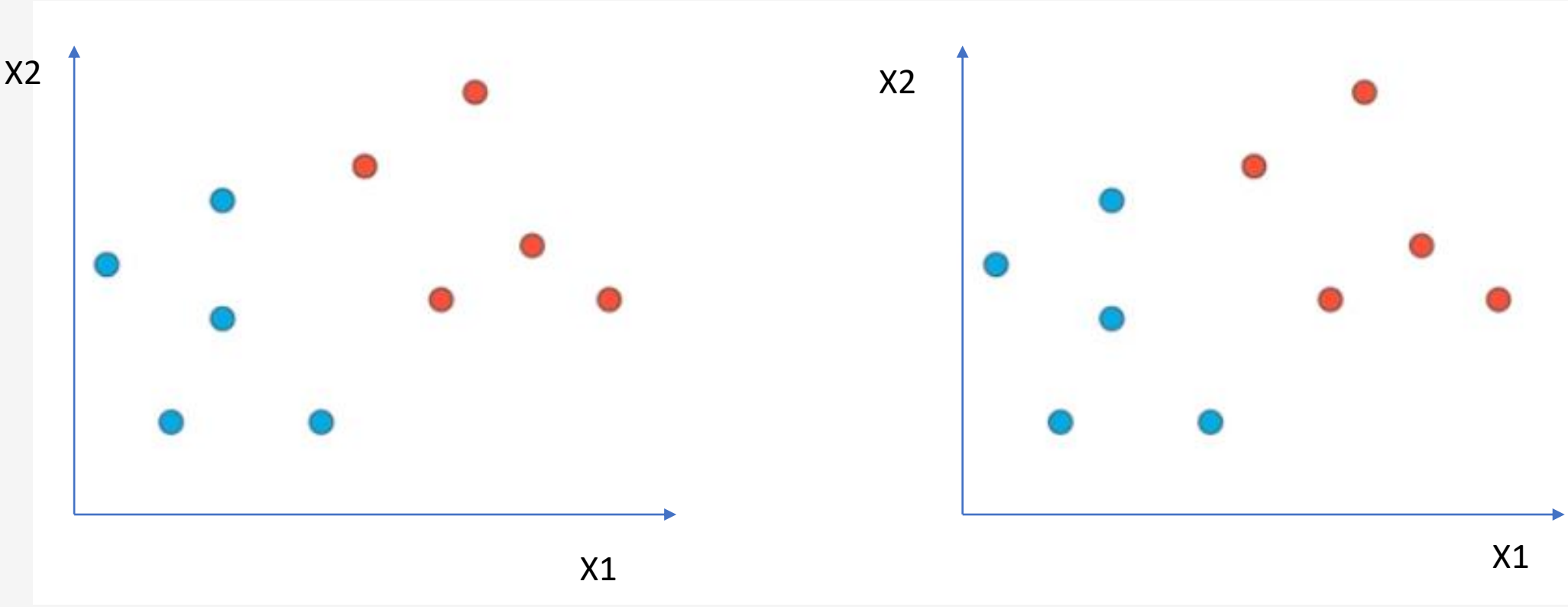


Maximum Margin Classifier in 1-dimension



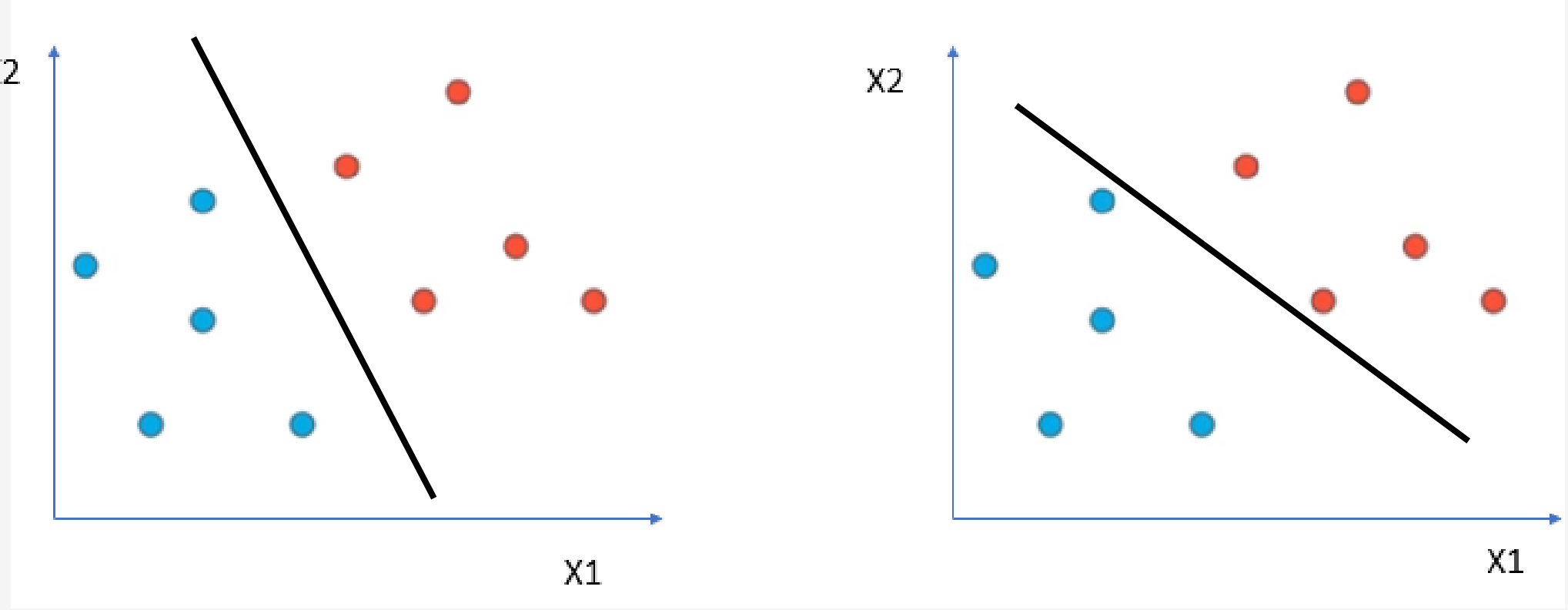
Maximum Margin Classifier in 2-dimension

Draw a line that can separate the blue and red dots. The line will serves as the decision boundary.



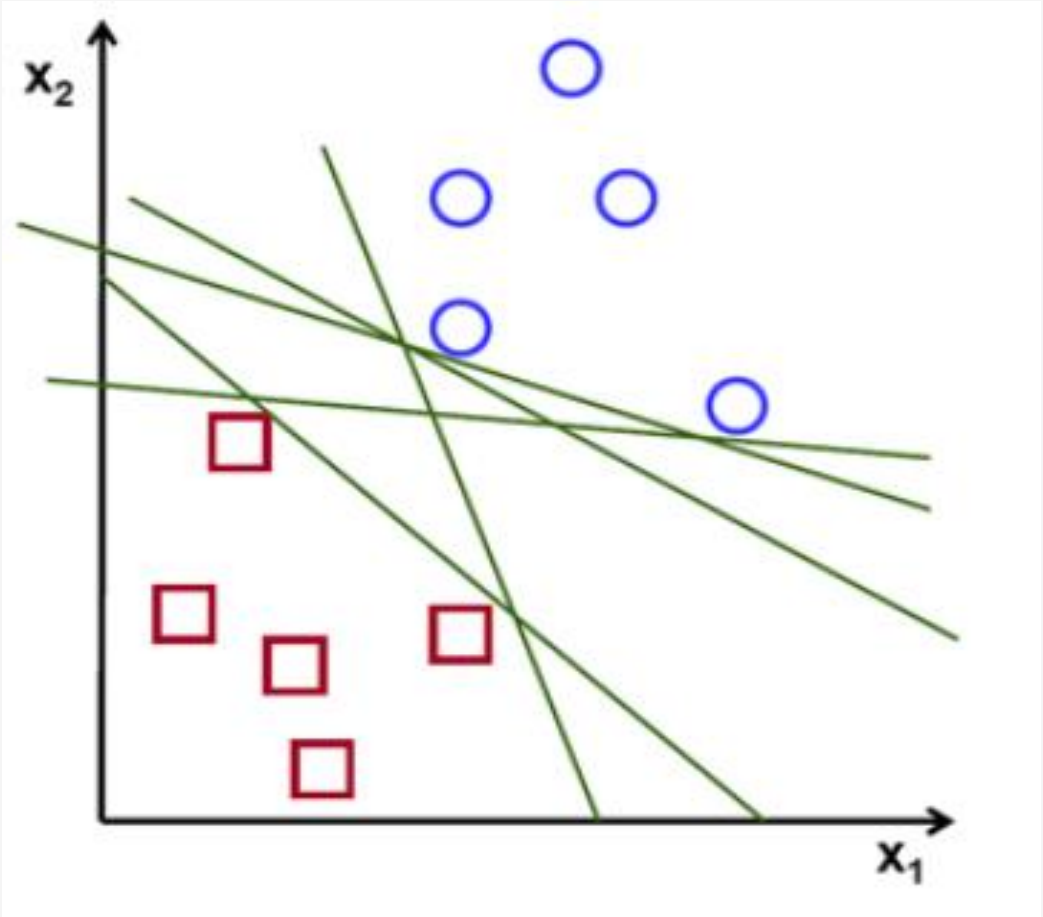
Maximum Margin Classifier in 2-dimension

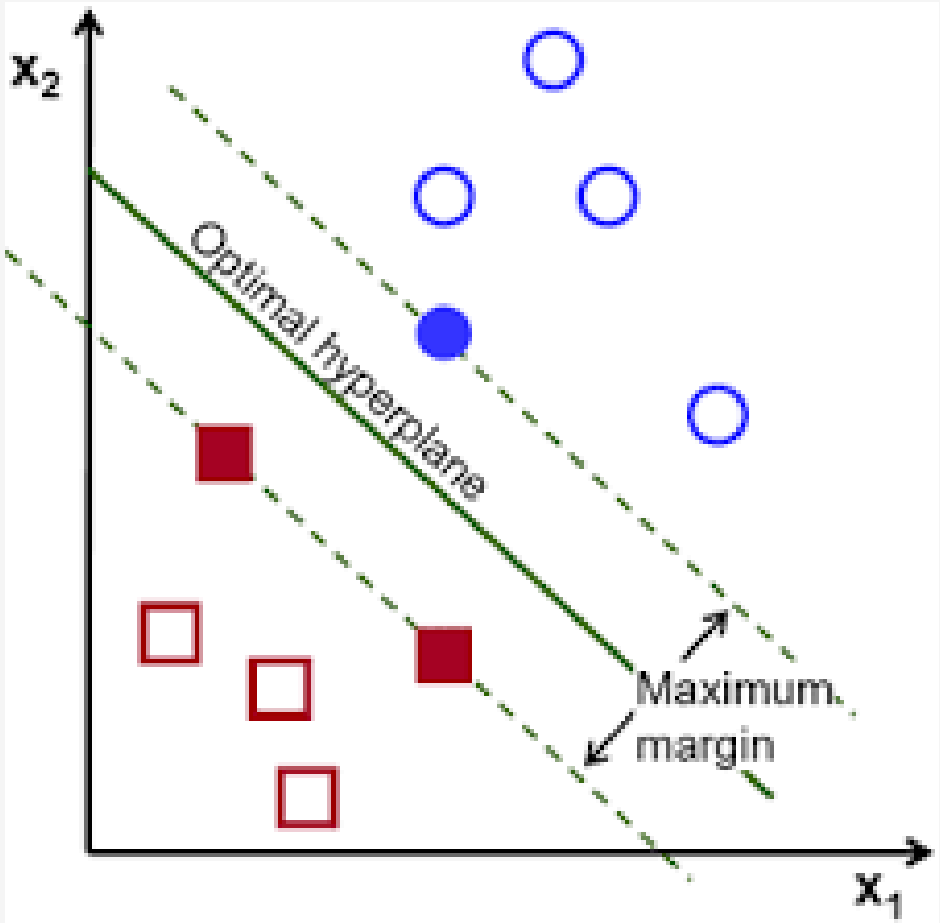
Which line will be a better line?



Maximum Margin Classifier in 2-dimension

Which of the green line separate the blue circle from the red square data points?





Support Vector Machine Terminology

So SVM is to try to find the hyperplane that maximize the margin between the plane and its nearest data points which are called the support vectors.

Watch https://www.youtube.com/watch?v=N1vOgolbjSc

- Hyperplane
- Maximum Margin Classifier
- Margin, Soft Margin
- Support Vectors
- C – parameters
- Kernel tricks

Learning by doing

Some useful references

- https://towardsdatascience.com/support-vector-machine-introduction-to-machine-learning-algorithms-934a444fca47
- https://www.youtube.com/watch?v=N1vOgolbjSc
- https://www.youtube.com/watch?v=efR1C6CvhmE
- Bias and Variance:
- https://www.youtube.com/watch?v=EuBBz3bI-aA&feature=youtu.be