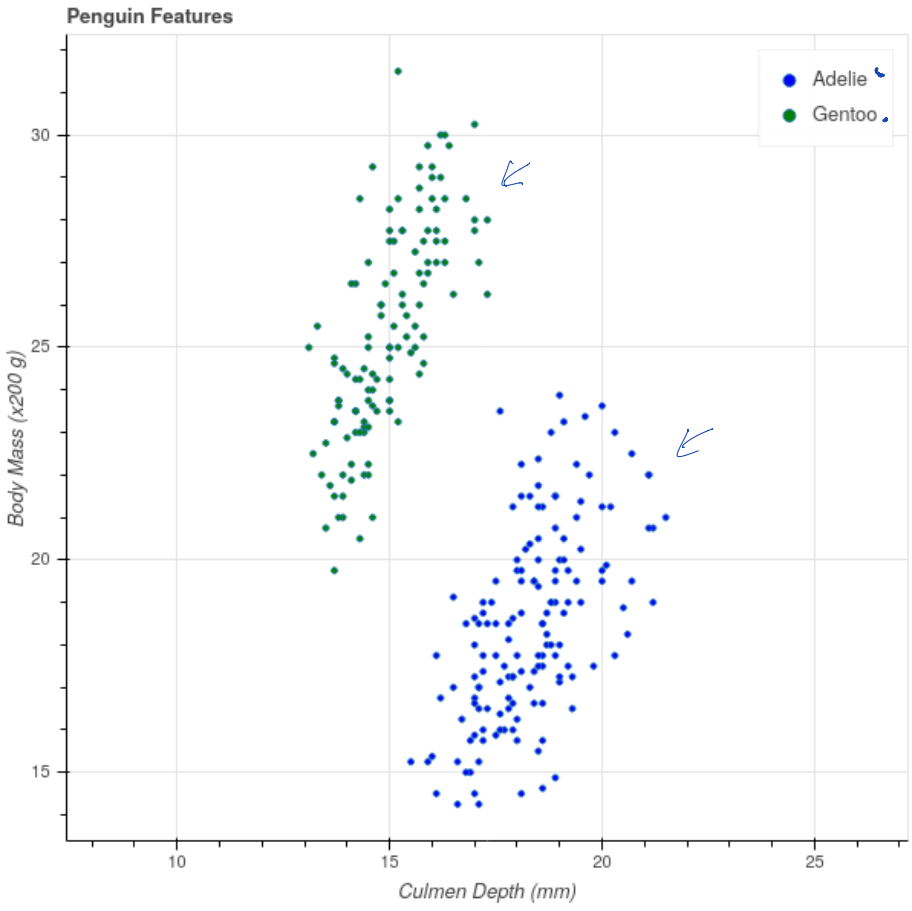
Support Vector Machines

Introduction

- Support Vector Machines are a classification algorithm based on geometry.
- I have no idea why they are called "machines." They are also called "Optimal Margin Classifiers" and that is a better name.
- They have the advantage that, once "fit" to the data, they are fast to evaluate.

The Basic Idea

Let's look at the following data from the Palmer Penguins dataset. (See https://github.com/allisonhorst/palmerpenguins)



This plot shows "Culmen Depth" (or Bill depth) vs Body Mass for two different species of penguins.

Classifying line

- Notice that the two groups of penguins are separated by a line.
- Actually many lines.

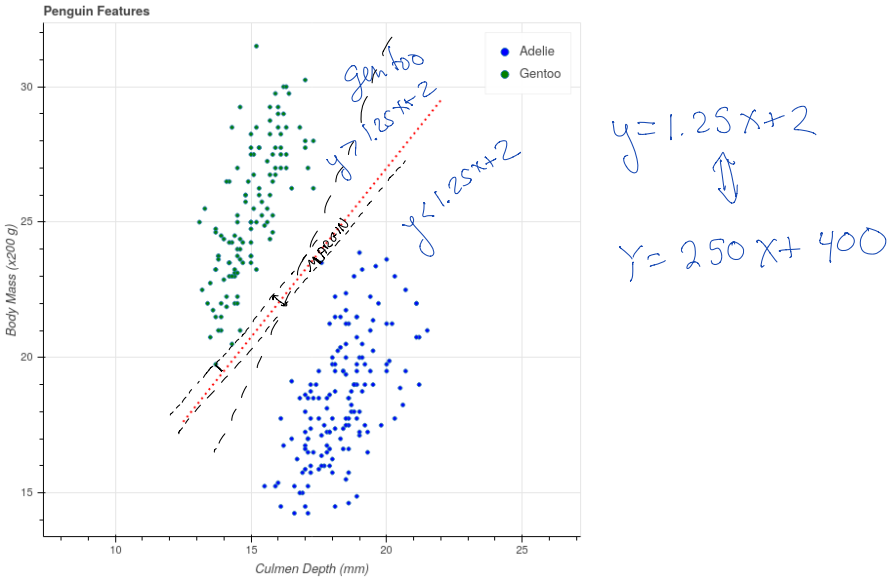


Figure 1: Margin

If

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Penguin Mass > 250(Penguin Bill Depth)+400
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then it's a Gentoo, otherwise an Adelie.

Optimal Margin

The *margin* associated with such a separating line is the gap between the closest points in the two sets measured perpendicular to the line.

"Support Vector Machine" or "Optimal Margin Classifier" problem: **Find the line separating the two sets with the largest possible margin.**