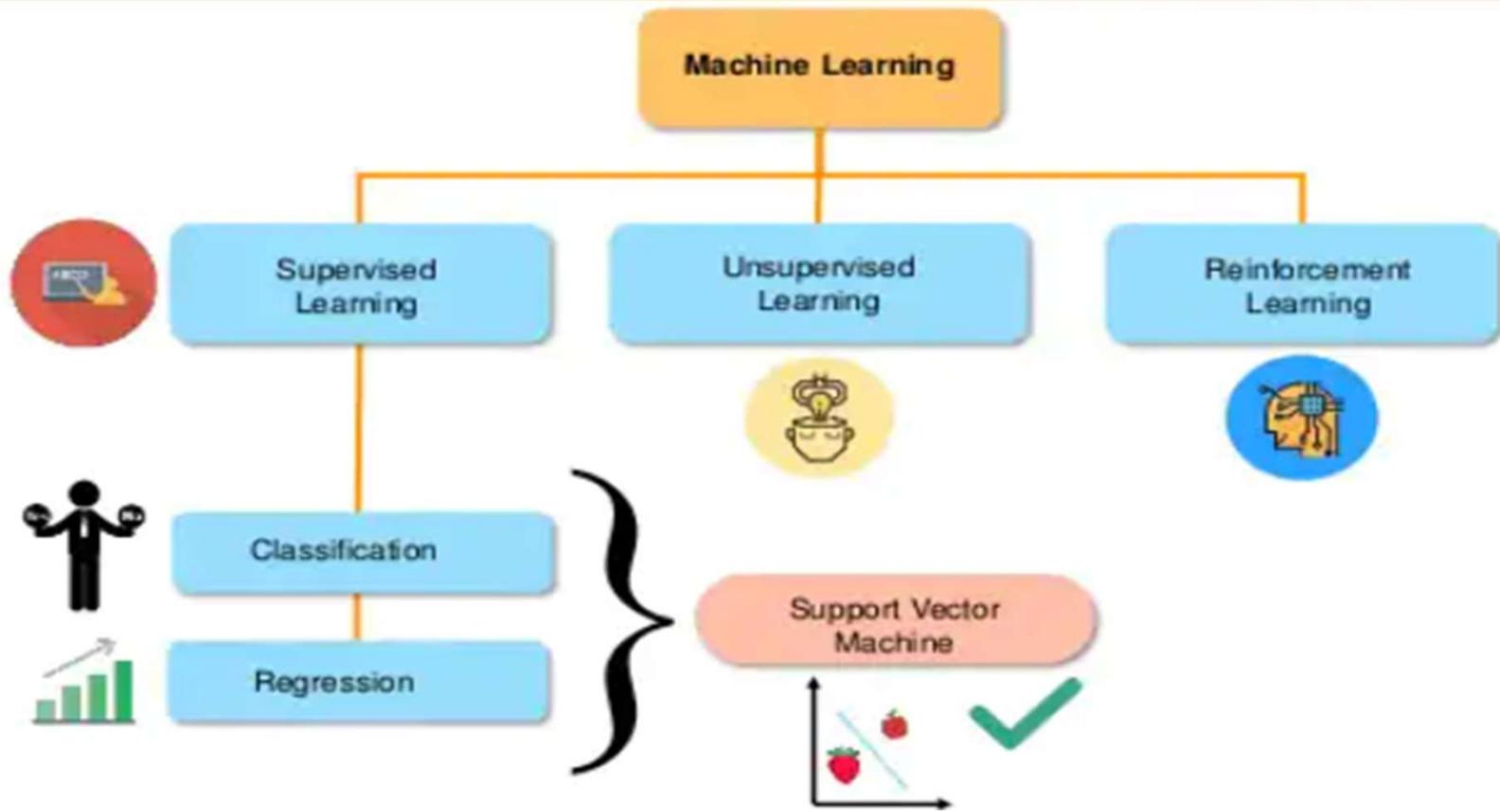




SUPPORT VECTOR MACHINE

What is Machine learning?



Why Support Vector Machine?

There he found a fruit which was similar to both

Dad, is that an apple or a strawberry?



Why Support Vector Machine?

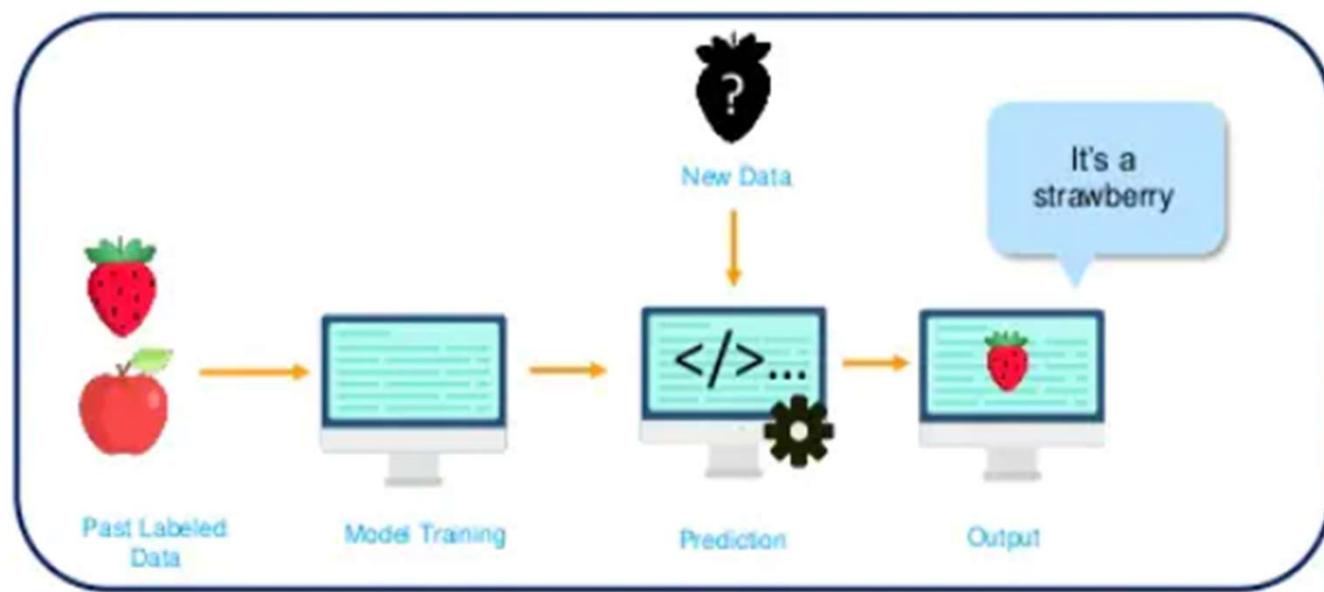
After a couple of seconds,
he could figure out that it
was a strawberry

It is a strawberry!



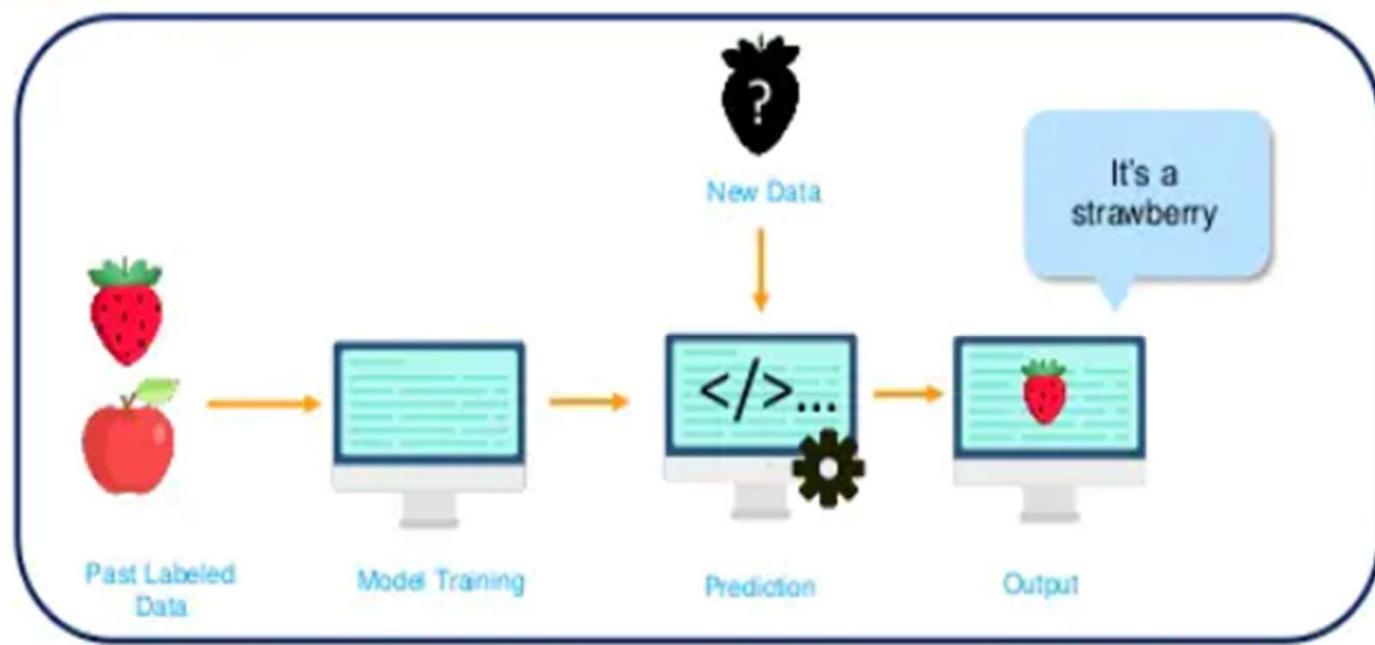
Why Support Vector Machine?

Why not build a model
which can predict an unknown
data??



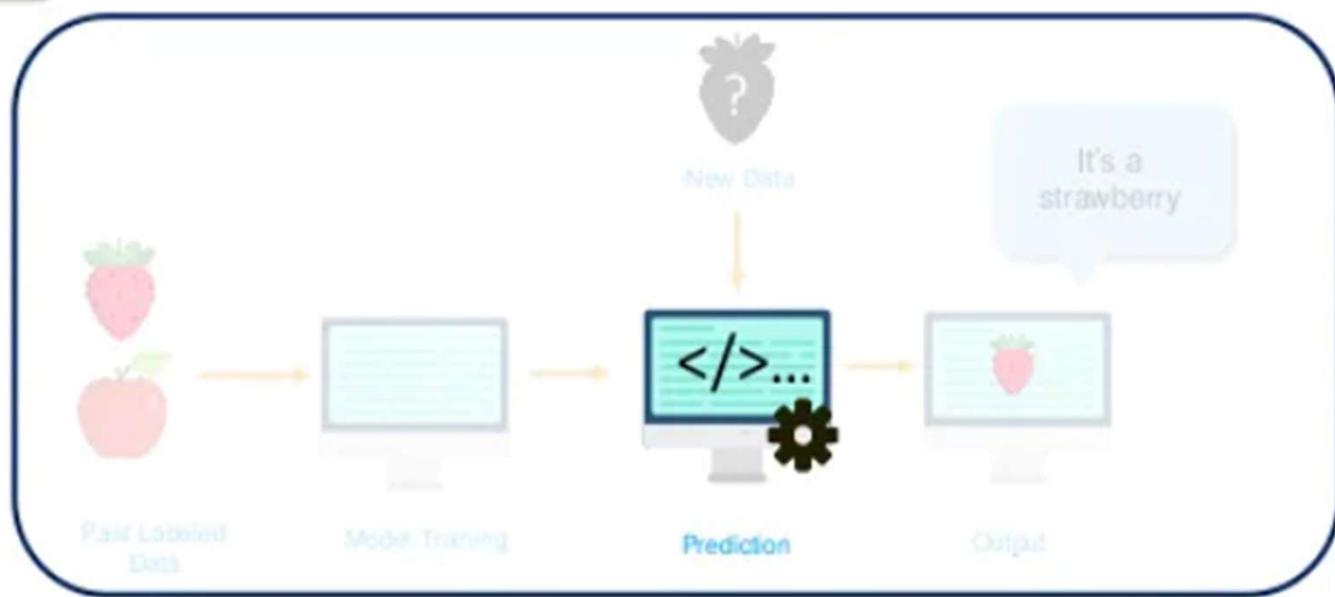
Why Support Vector Machine?

SVM is a supervised learning method that looks at data and sorts it into one of the two categories

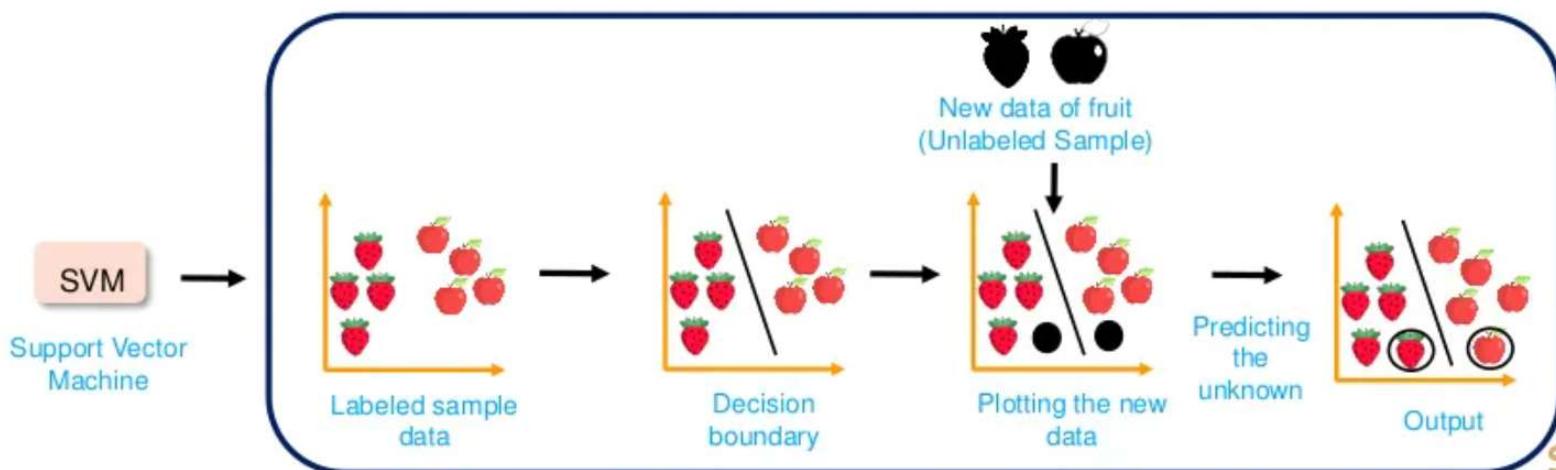
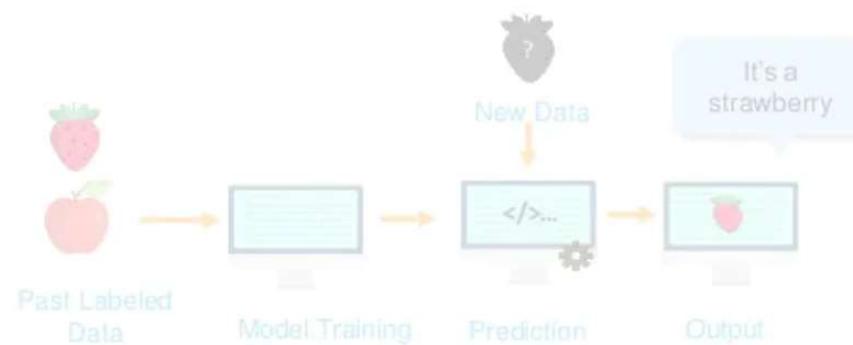


Why Support Vector Machine?

But how does prediction work?



Why Support Vector Machine?



What is Support Vector Machine?

The illustration shows a brown spiral-bound notebook. On the left page, there is a section titled "Example" with a small gold coin icon. Below the title, the text reads: "We are given a set of people with different". A bulleted list follows: "• Height and" and "• Weight". An orange hand is shown holding a blue pen and writing on the lined paper. On the right page, there is a section titled "Sample data set" with a small gold coin icon. Below the title, the word "Female" is written. A table with two columns, "Height" and "Weight", is shown:

Height	Weight
174	65
174	88
175	75
180	65
185	80

What is Support Vector Machine?

The illustration shows a brown spiral-bound notebook. On the left page, there is a section titled "Example" with a gold coin icon. Below it, text states: "We are given a set of people with different" followed by a bulleted list: "• Height and • Weight". A hand is shown writing in the notebook with a blue pen. On the right page, there is a section titled "Sample data set" with a gold coin icon. Below it, the word "Male" is written. A table with a blue header row is shown:

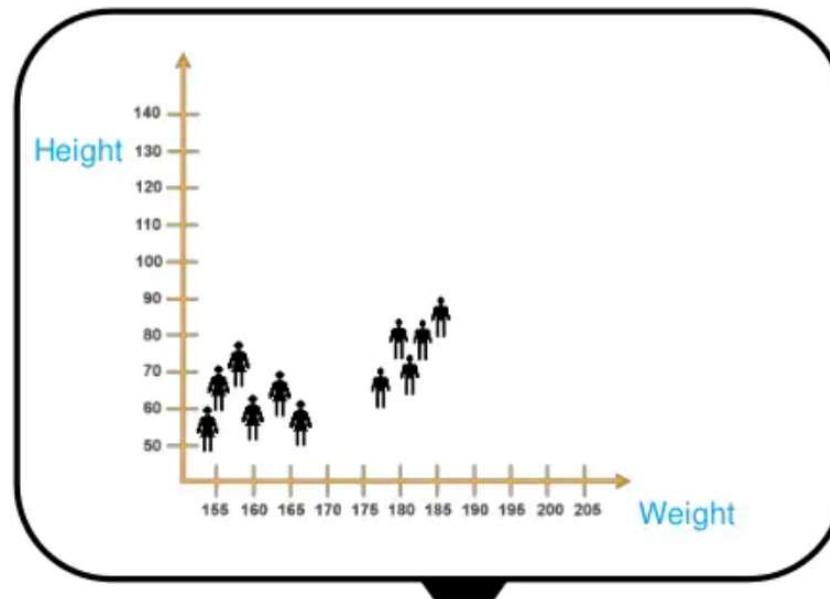
Height	Weight
179	90
180	80
183	80
187	85
182	72

Sample data set

Male

Height	Weight
179	90
180	80
183	80
187	85
182	72

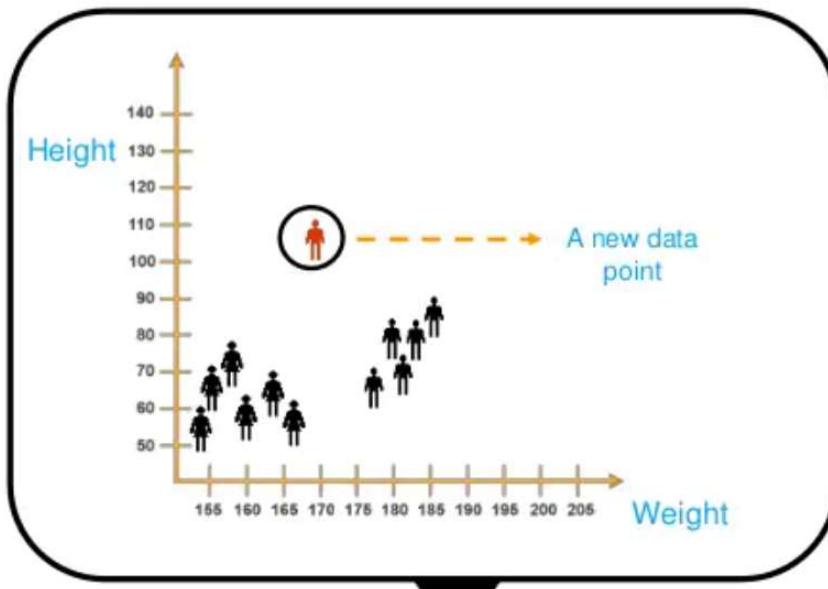
What is Support Vector Machine?



Let's add a new data point and figure out if it's a male or a female?



What is Support Vector Machine?



Let's add a new data point and figure out if it's a male or a female?



What is Support Vector Machine?

Sure.. For this task, we need to split our data first



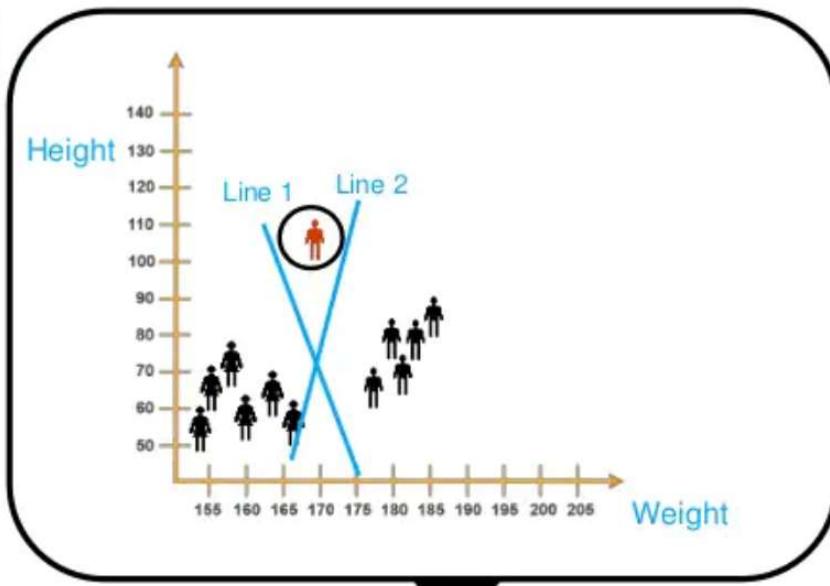
What is Support Vector Machine?

We can split our data by choosing any of these lines



What is Support Vector Machine?

But to predict the gender of a new data point we should split the data in the best possible way



What is Support Vector Machine?

Then I would say, this line best splits the data

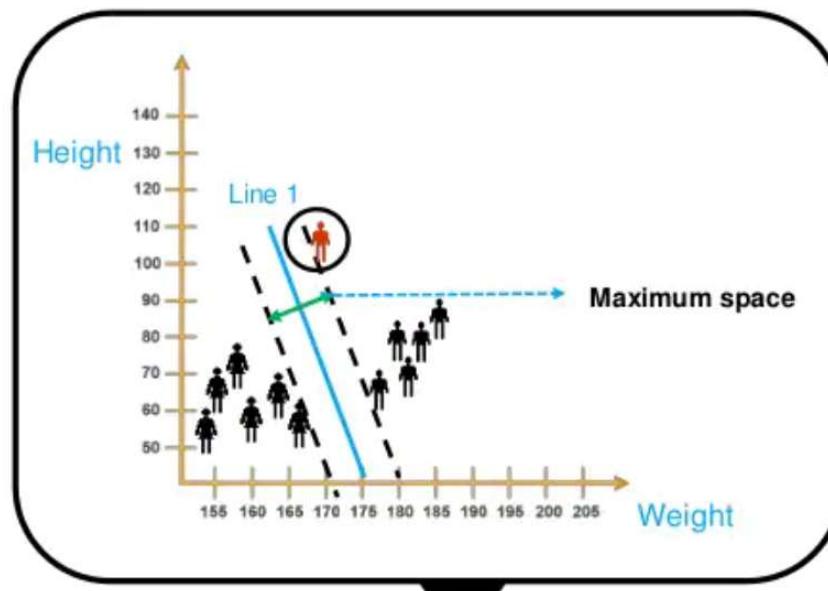


Why do you say it's the best split??



What is Support Vector Machine?

This line has the maximum space that separates the two classes

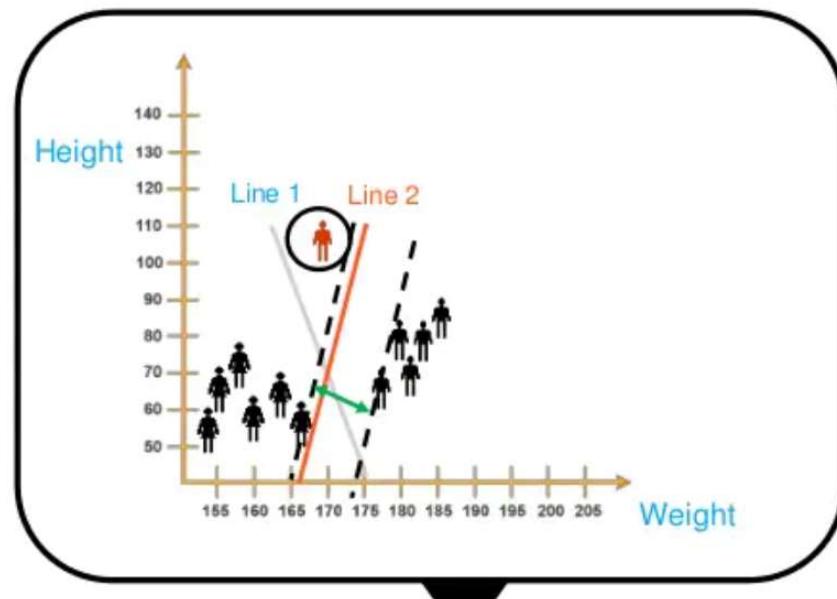


Why do you say
it's the best
split??



What is Support Vector Machine?

While the other line doesn't have the maximum space that separates the two classes

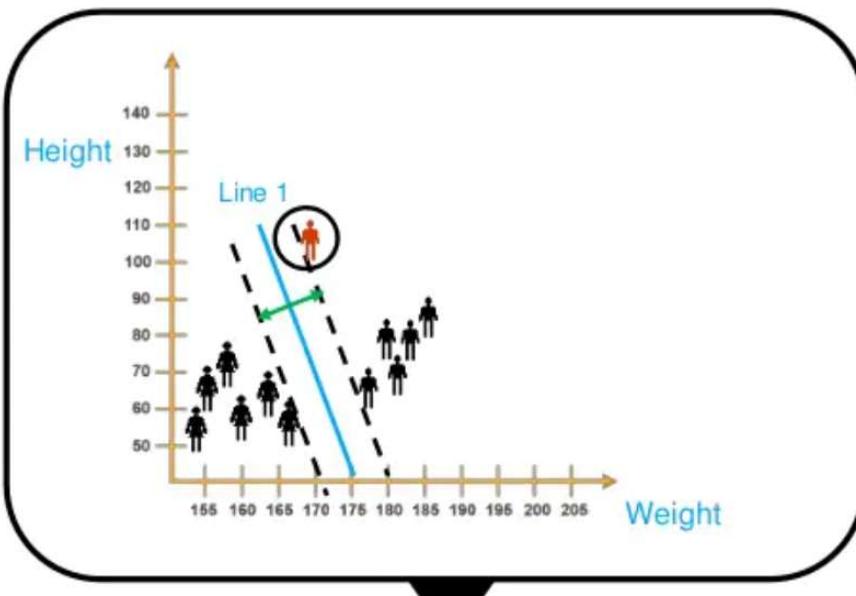


Why do you say it's the best split??



What is Support Vector Machine?

That is why this line best splits the data

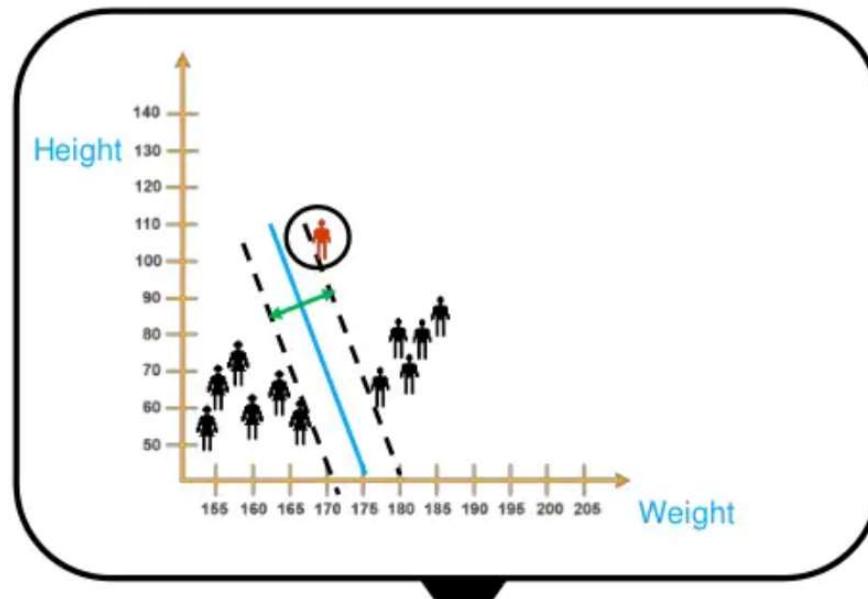


Well yes.. This is the best split!



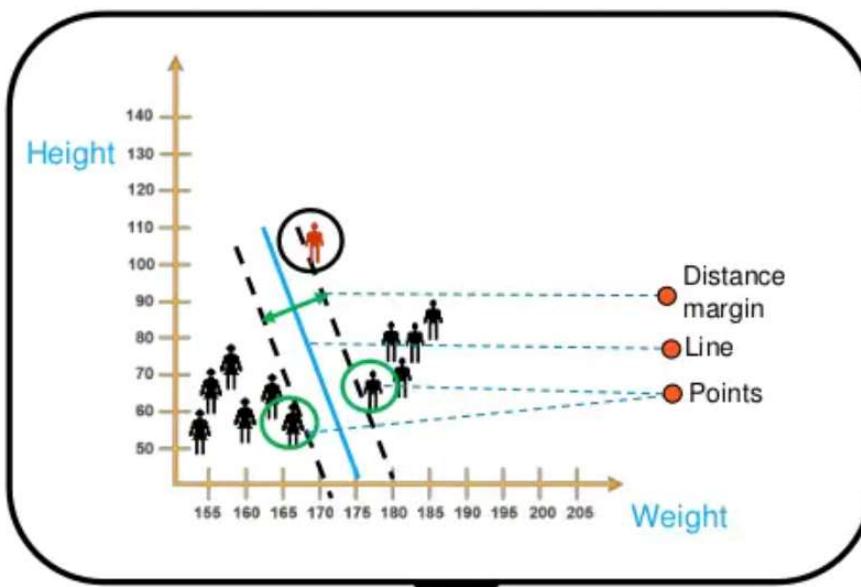
What is Support Vector Machine?

Now, Let me add some technical terms to this



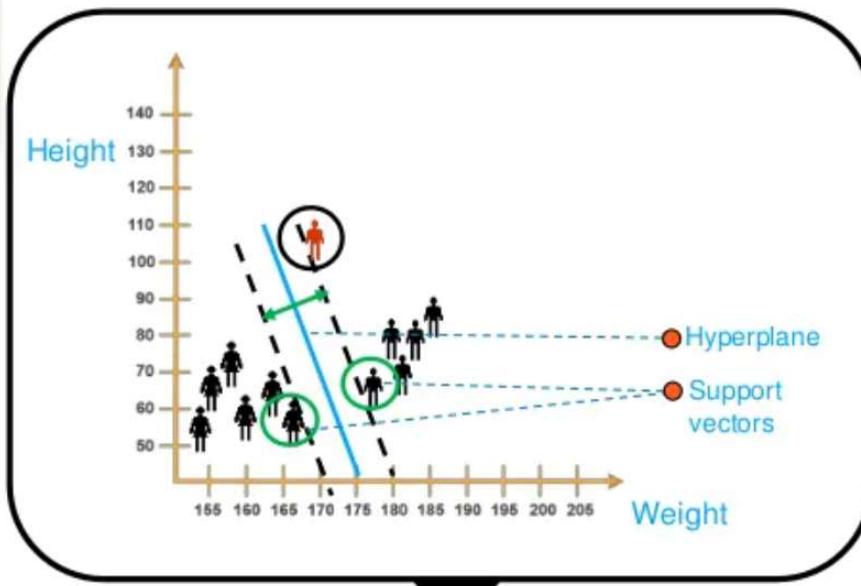
What is Support Vector Machine?

We can also say that the distance between the points and the line should be far as possible



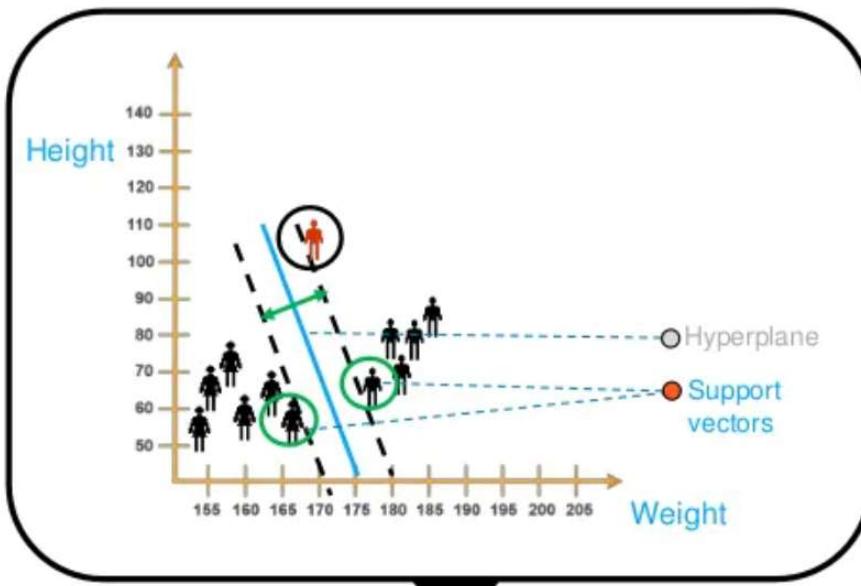
What is Support Vector Machine?

In technical terms we can say,
the distance between the
support vector and the
hyperplane should be far as
possible



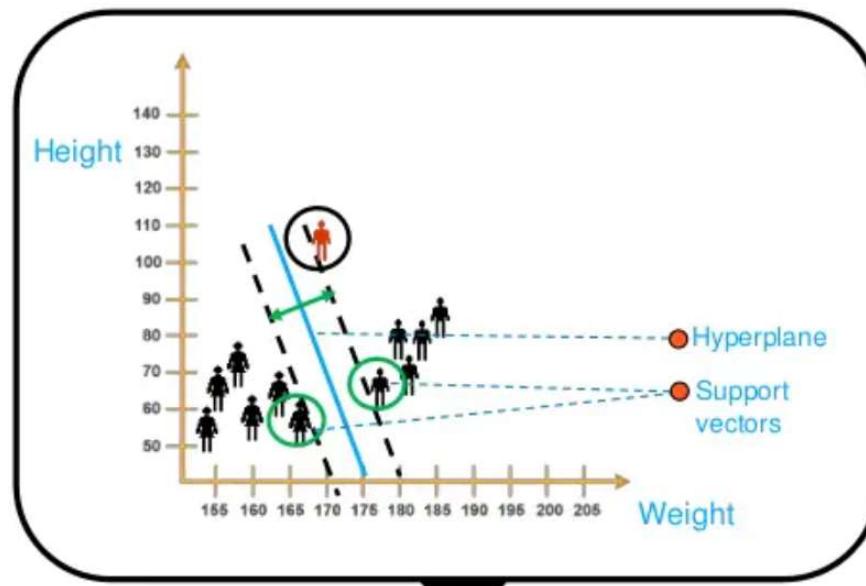
What is Support Vector Machine?

Where support vectors are the extreme points in the datasets



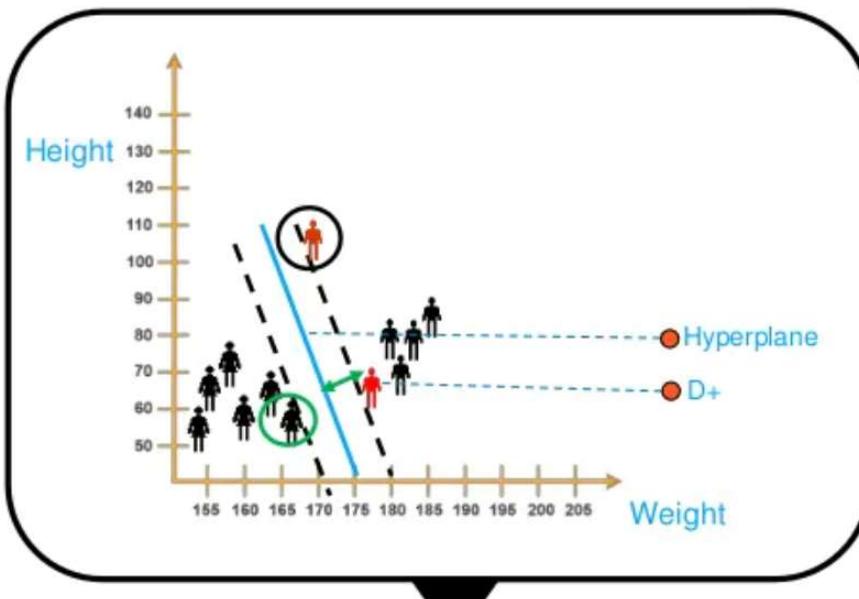
What is Support Vector Machine?

And a hyperplane has the maximum distance to the support vectors of any class



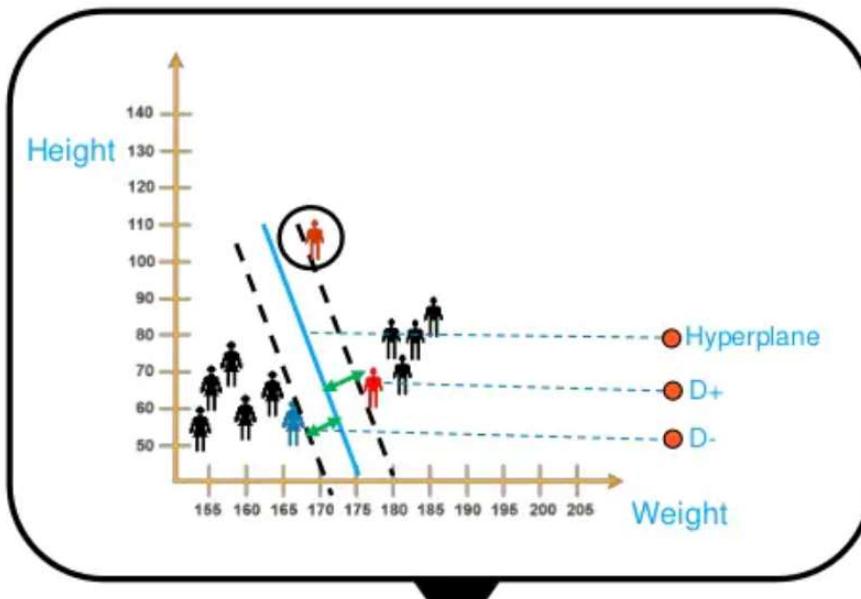
What is Support Vector Machine?

Here, D_+ is the shortest distance to the closest positive point



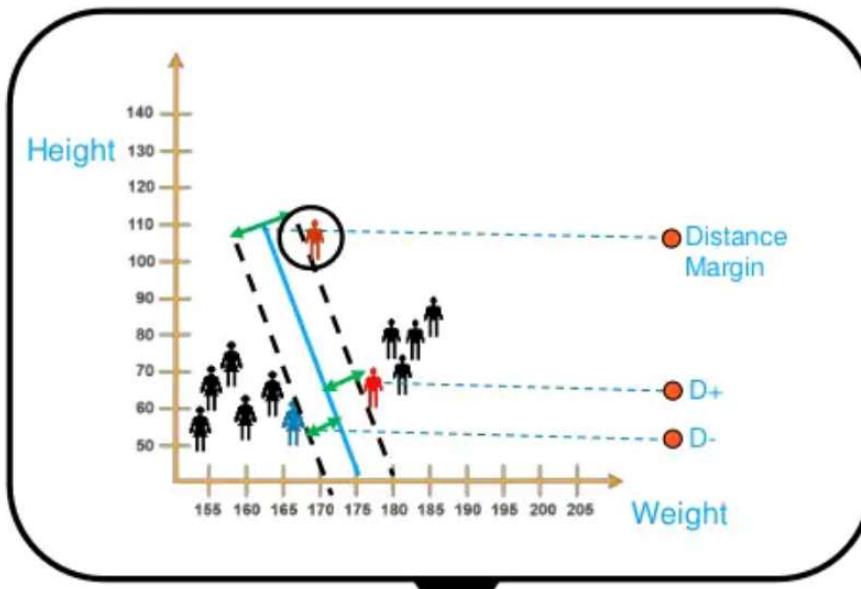
What is Support Vector Machine?

And D- is the shortest distance to the closest negative point



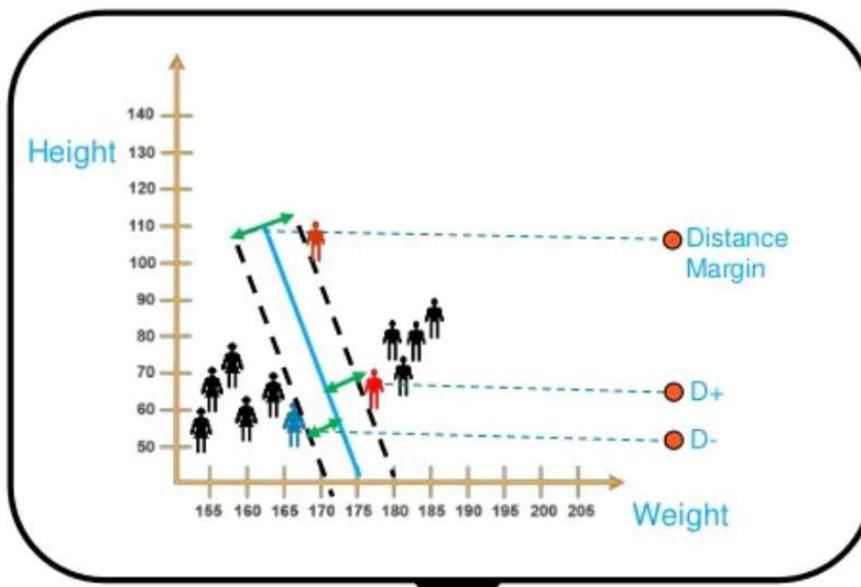
What is Support Vector Machine?

Sum of D+ and D- is called the distance margin



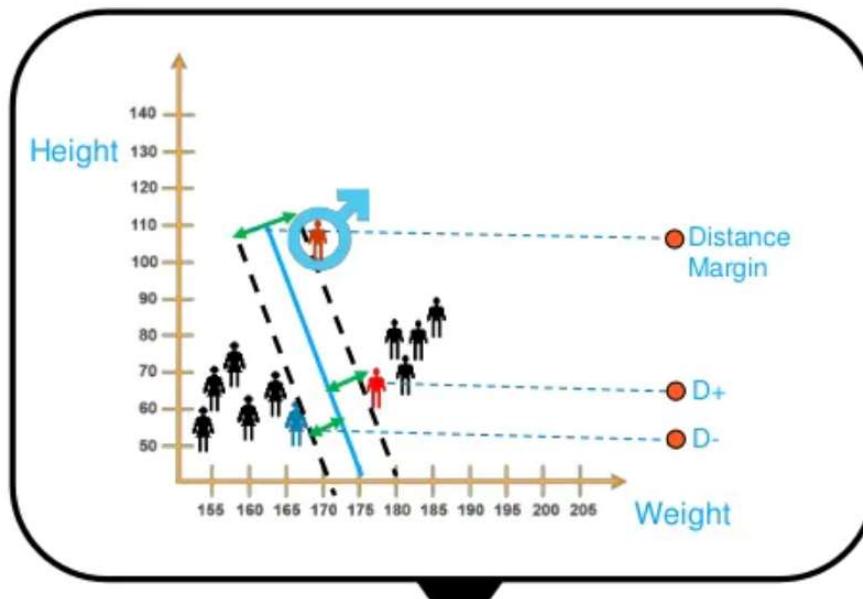
What is Support Vector Machine?

From the distance margin, we get an optimal hyperplane

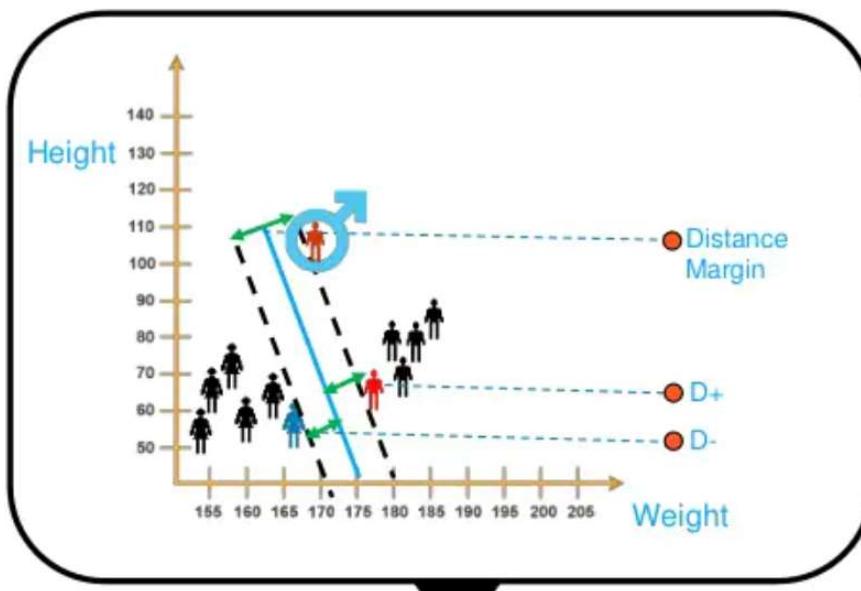


What is Support Vector Machine?

Based on the hyperplane,
we can say the new data point
belongs to male gender



What is Support Vector Machine?

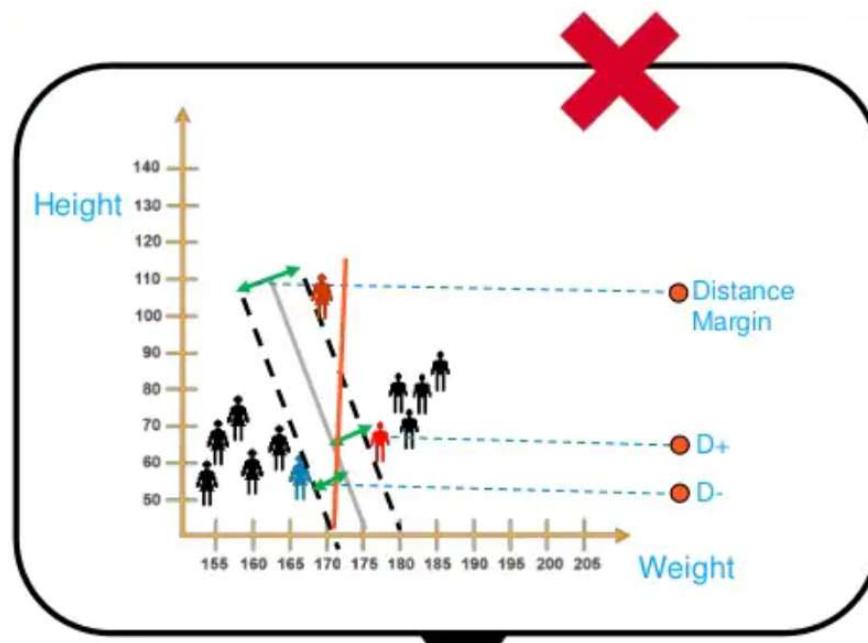


But what happens if a hyperplane is not optimal?



What is Support Vector Machine?

If we select a hyperplane having low margin then there is high chance of misclassification

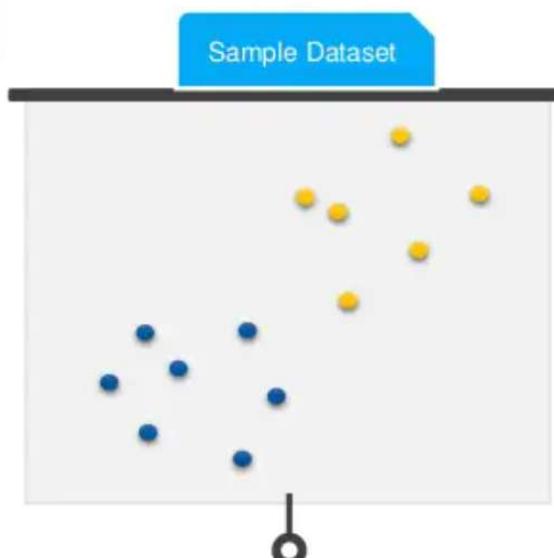


But what happens if a hyperplane is not optimal?



Understanding Support Vector Machine

What if my data was not like this

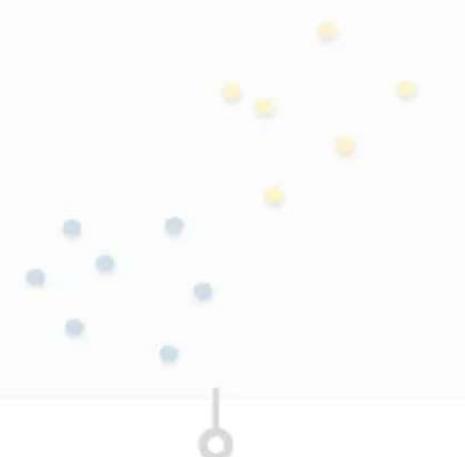


Understanding Support Vector Machine

But like this?



Sample Dataset



Sample Dataset



Understanding Support Vector Machine

Here, we cannot use a hyperplane



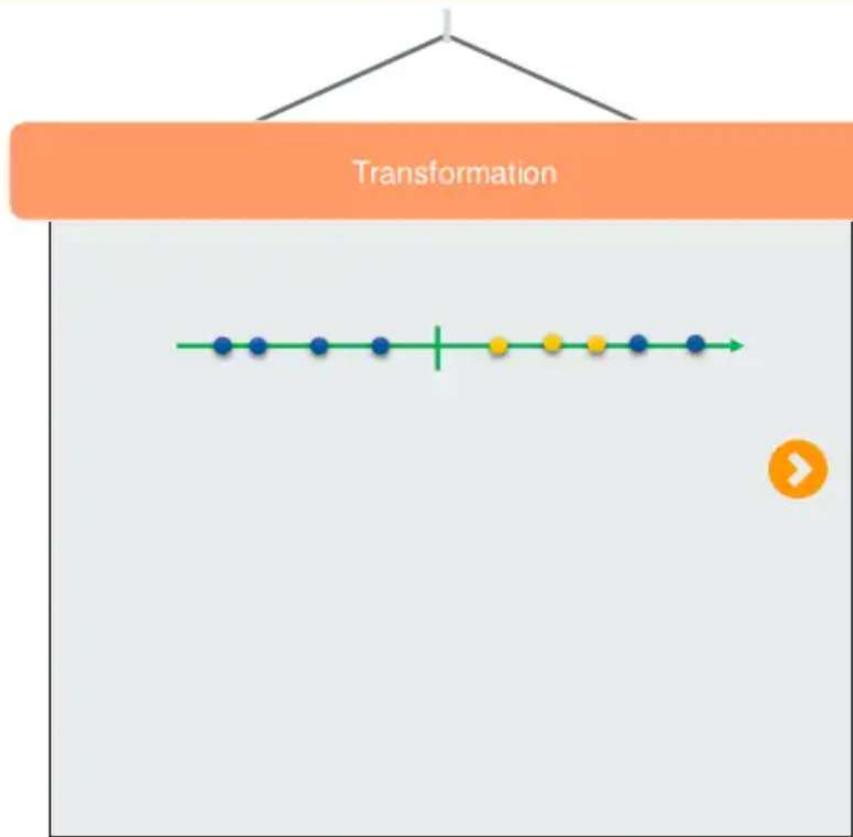
Transformation



si

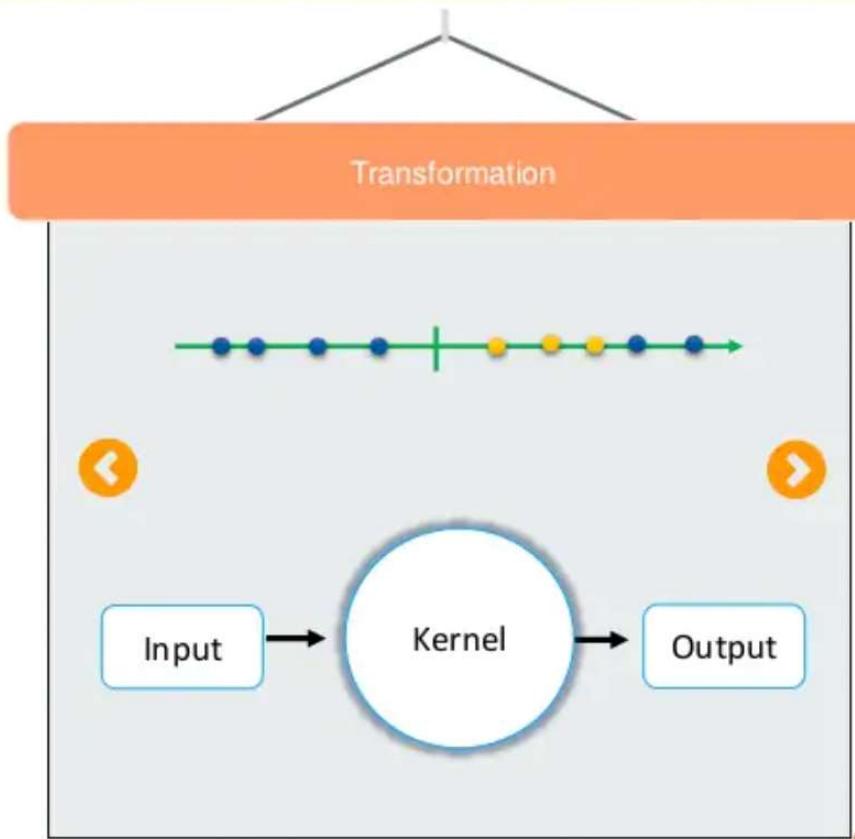
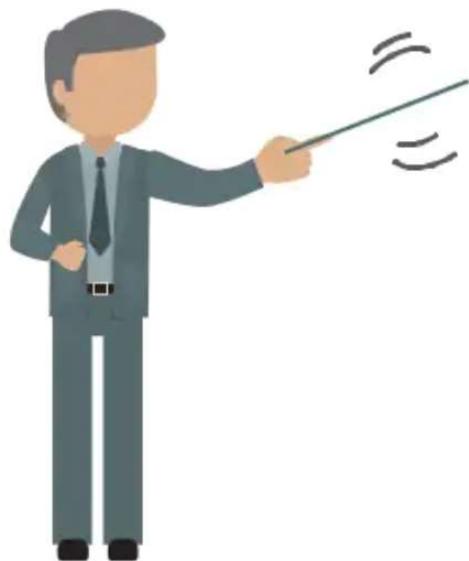
Understanding Support Vector Machine

So, it's necessary to move away from a 1-D view of the data to a 2-D view



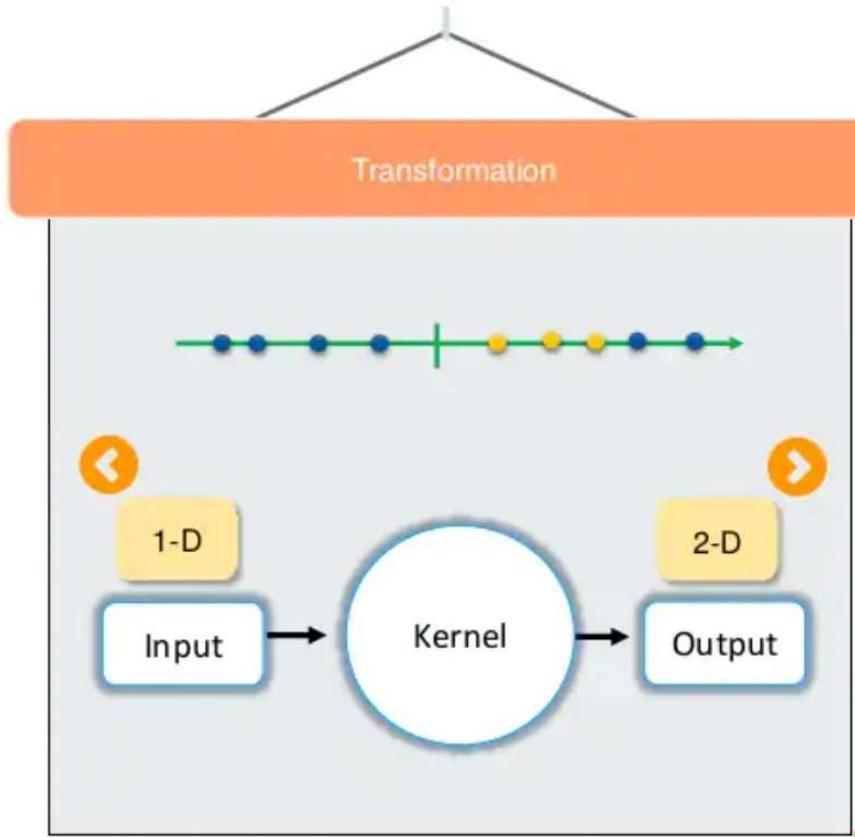
Understanding Support Vector Machine

For the transformation, we use a Kernel Function



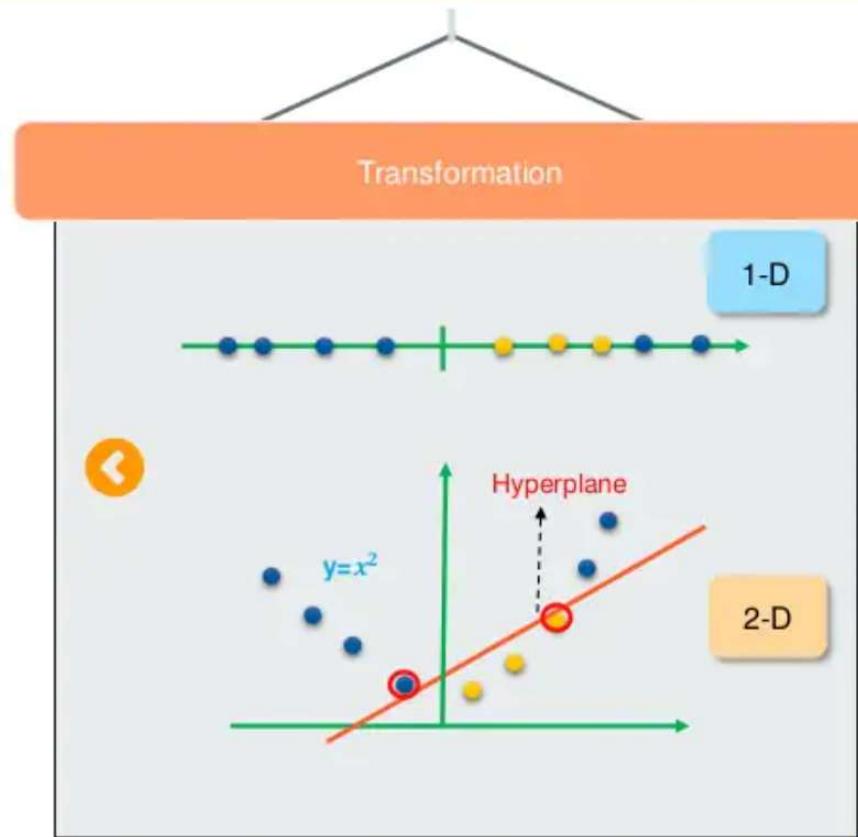
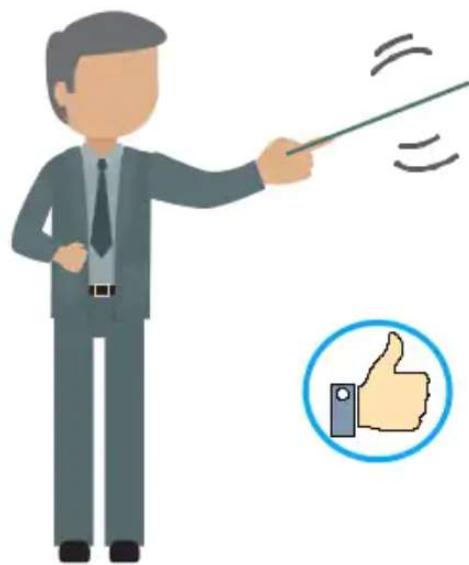
Understanding Support Vector Machine

Which will take the 1-D input and transfer it to 2-D Output



Understanding Support Vector Machine

Now, we got the result !!

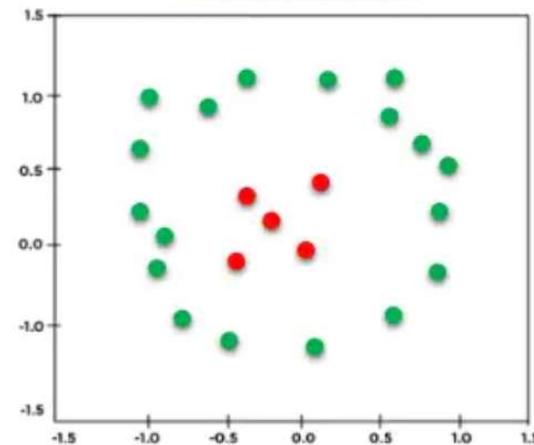


Understanding Support Vector Machine

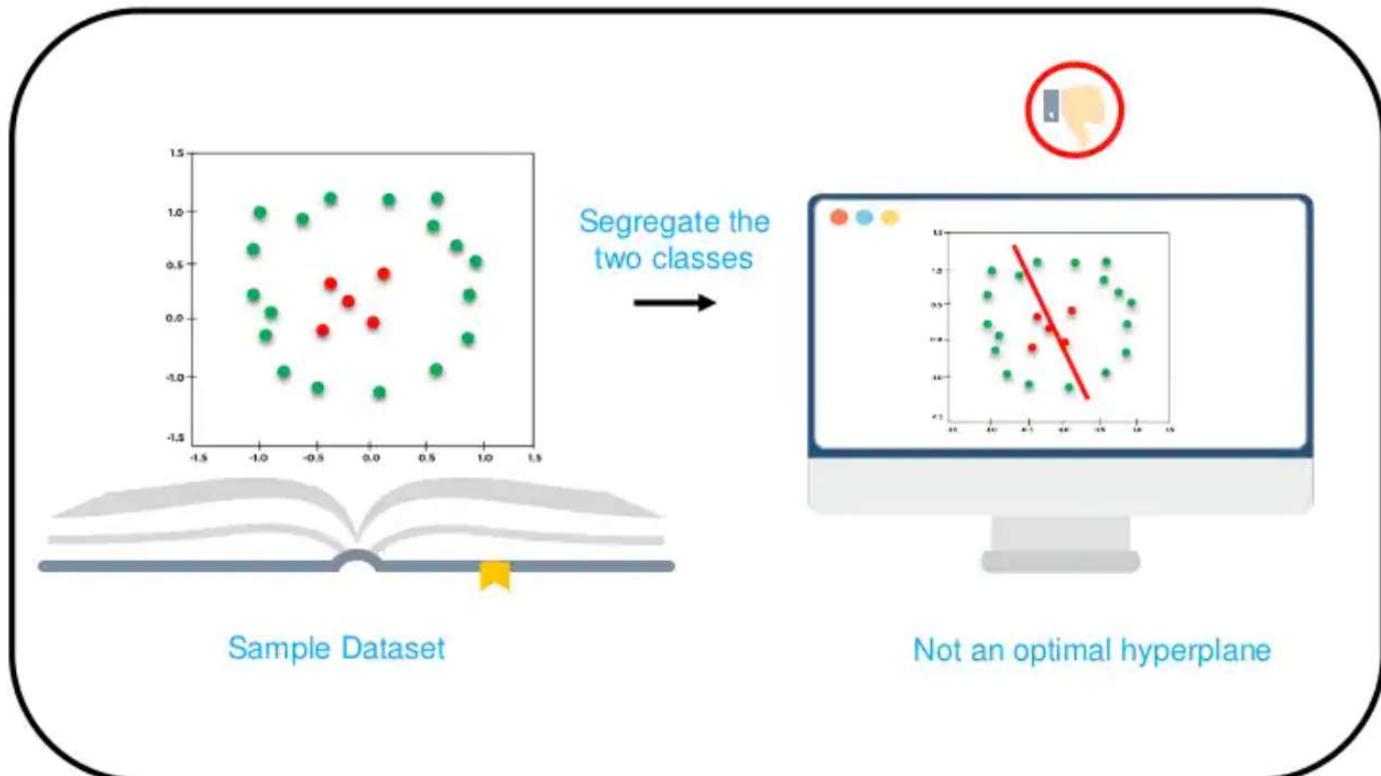
How to perform SVM
for this type of dataset?



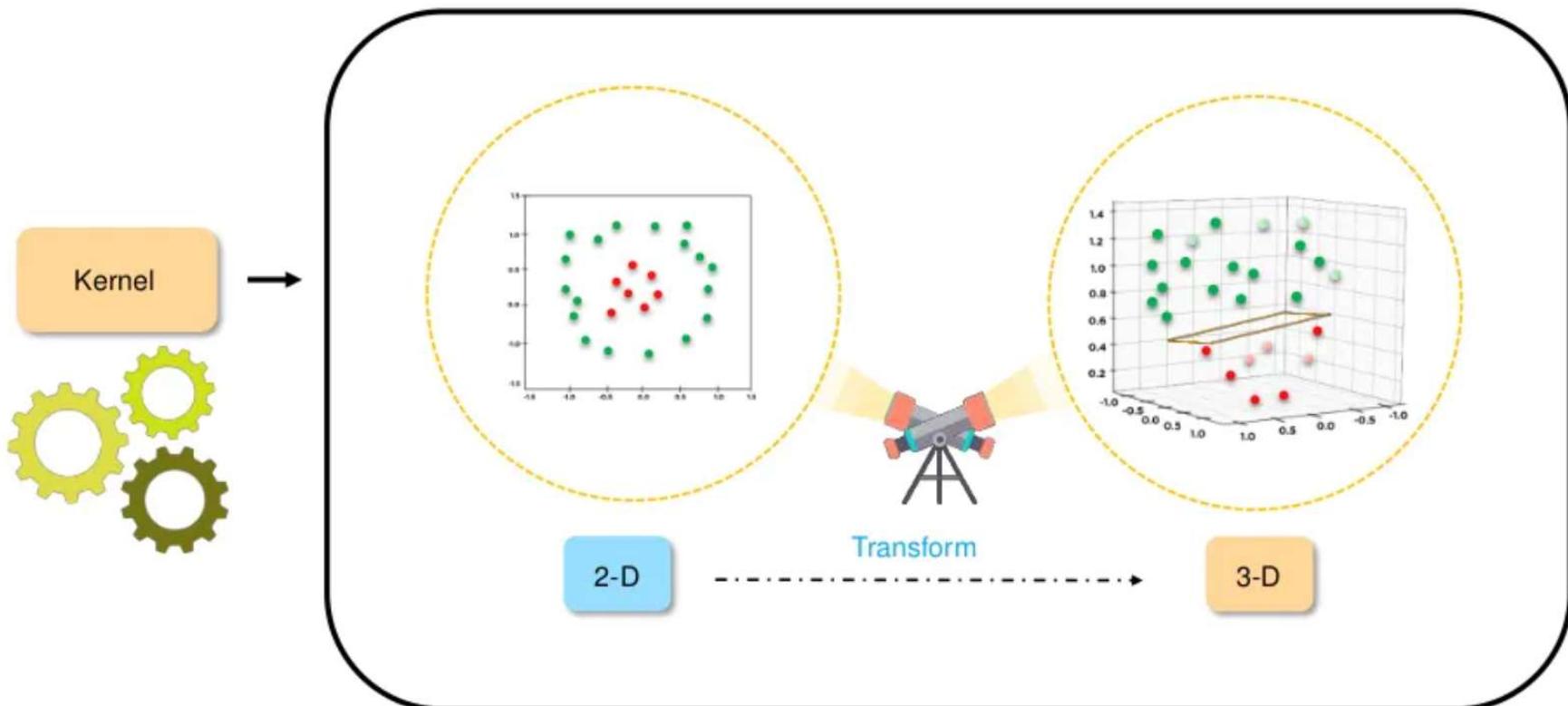
Sample Dataset



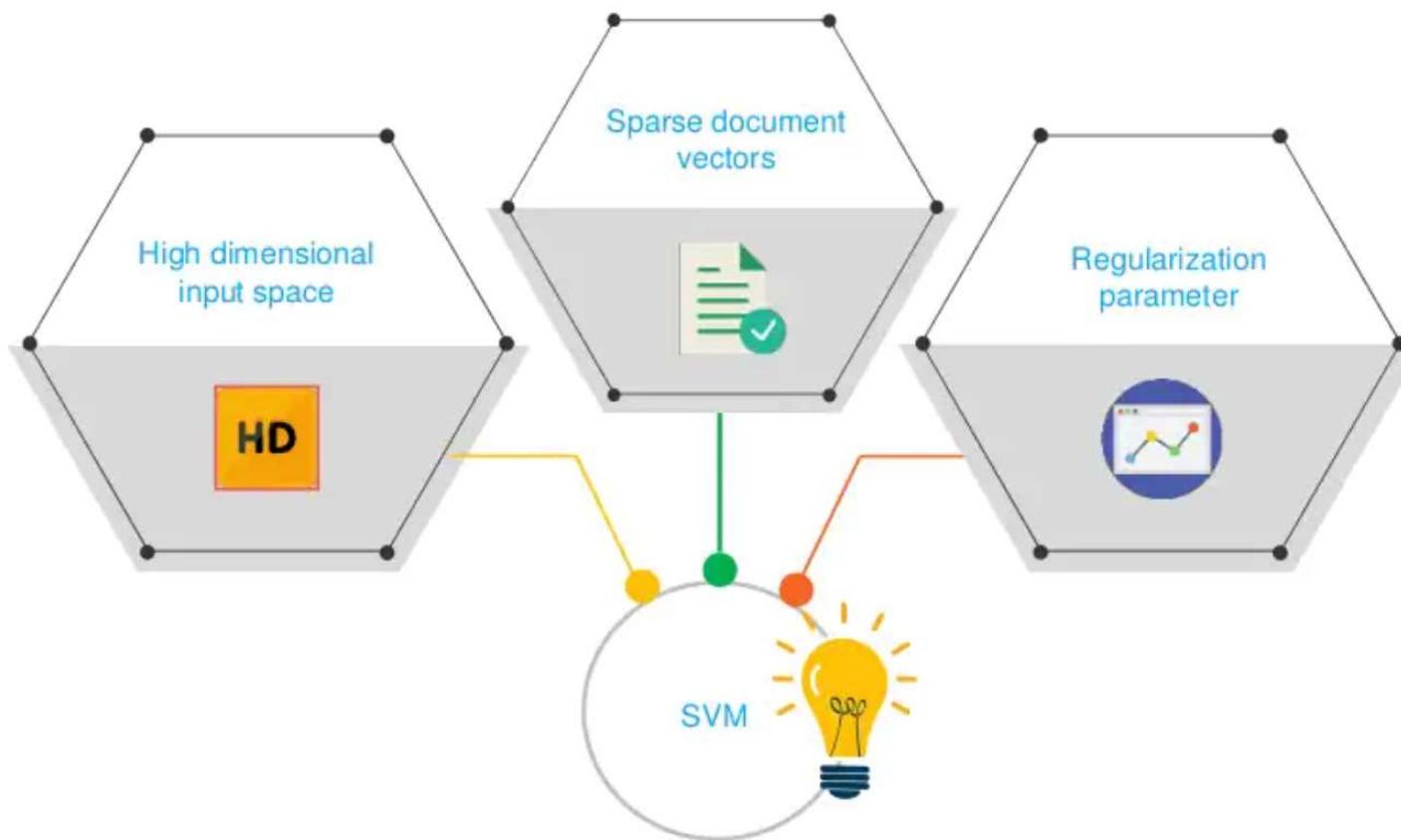
Understanding Support Vector Machine



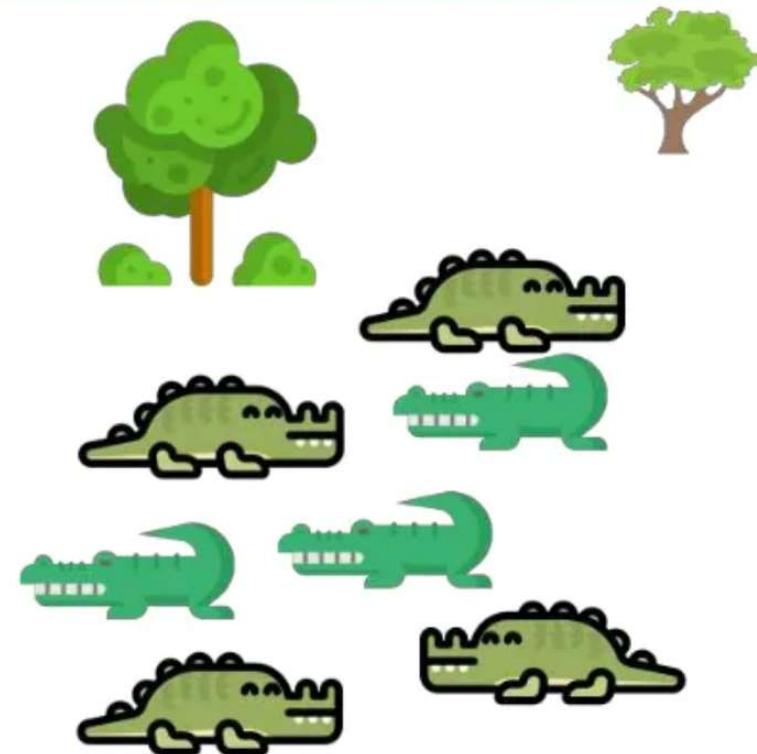
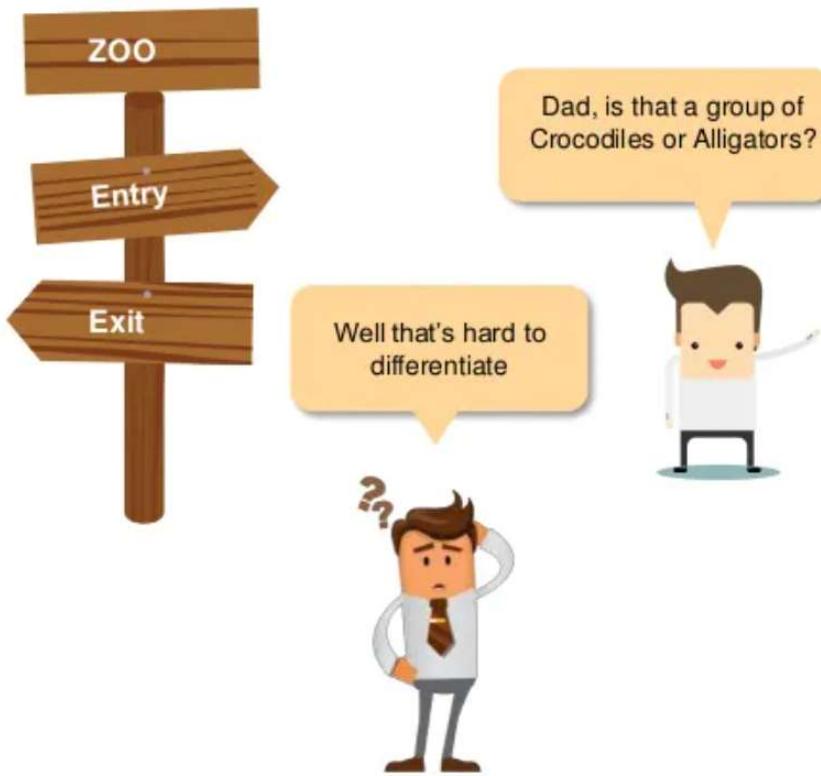
Understanding Support Vector Machine



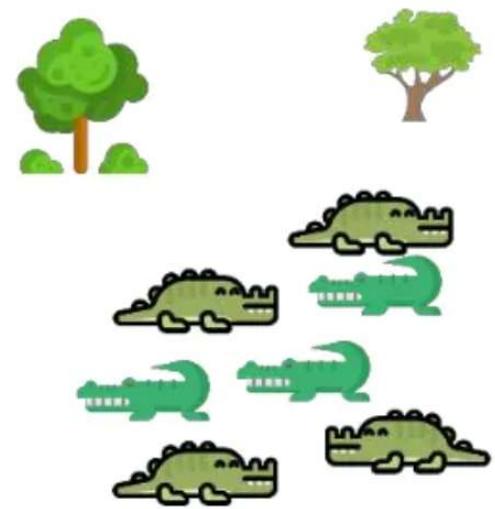
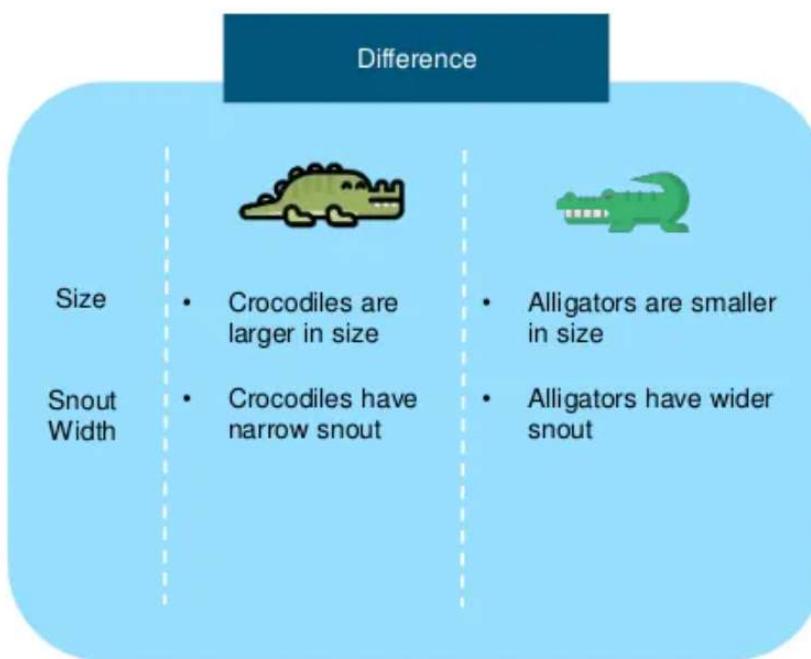
Advantages of Support Vector Machine



Use case – Problem Statement



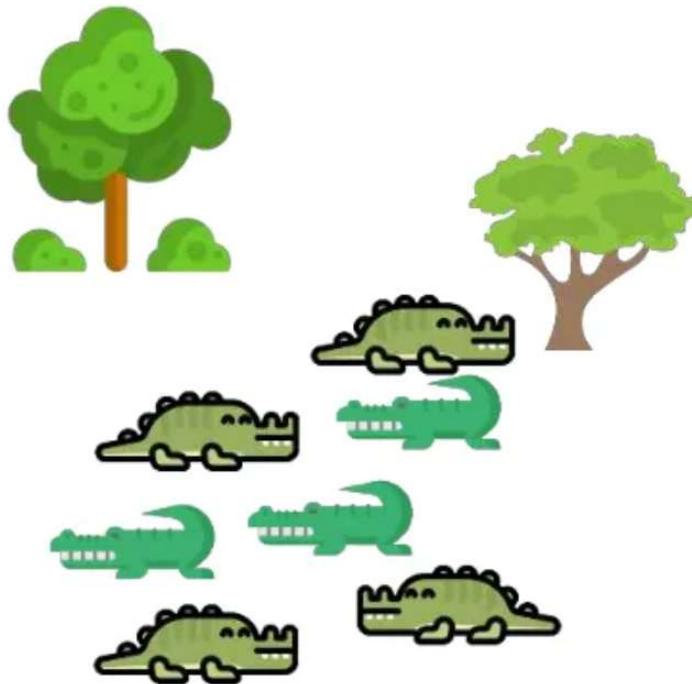
Use case – Problem Statement



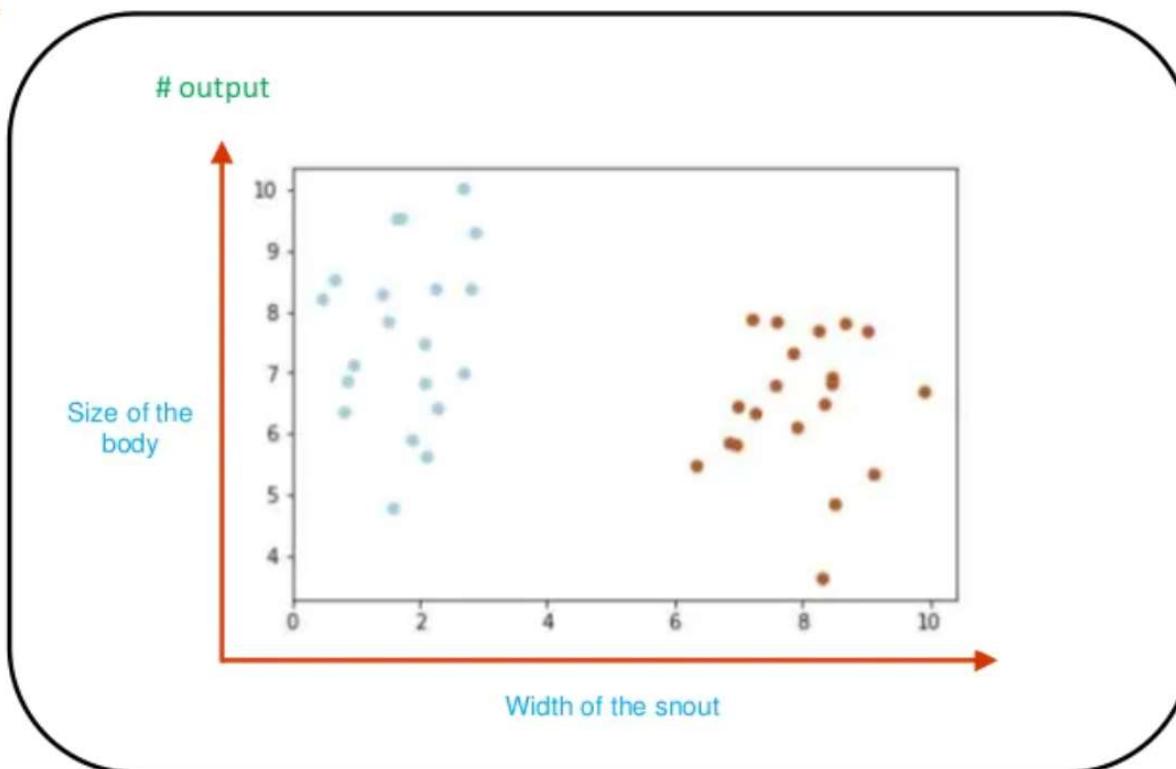
Use case – Problem Statement

Let Support Vector
Machine segregate the two
groups

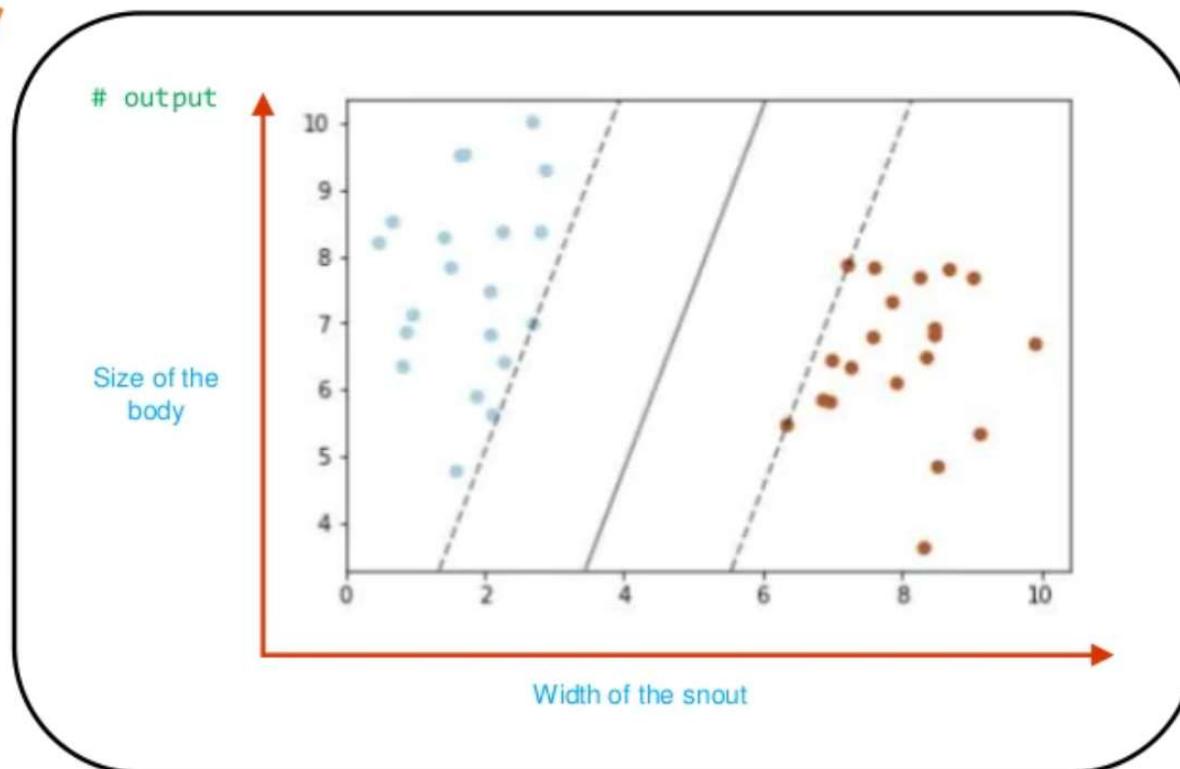
Dad, is that a group of
Crocodiles or Alligators?



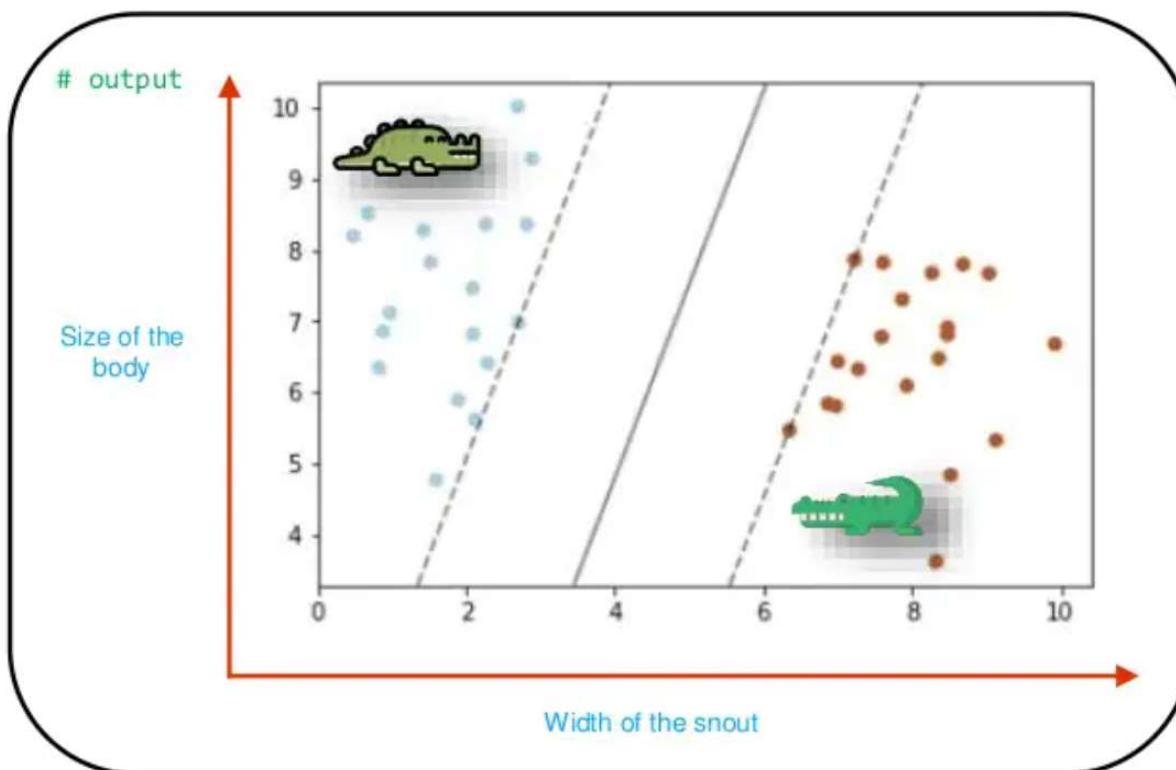
Use case - Implementation



Use case - Implementation



Use case - Implementation



Conclusion

Congratulations!

We have demonstrated
Support vector machine by
segregating the two classes

Where the blue data points
represents crocodiles and the
brown data points represents
alligators

The hands on example will help
you to encounter any Support
Vector Machine project in future.

Applications of Support Vector Machine



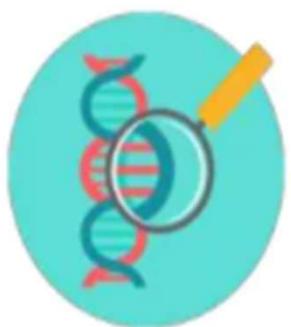
Face detection



Text and hypertext
categorization



Classification of images



Bioinformatics

END