SUPPORT VECTOR MACHINE ALGORITHM

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Applications of Support Vector Machine

Face detection

Text and hypertext categorization

Classification of images

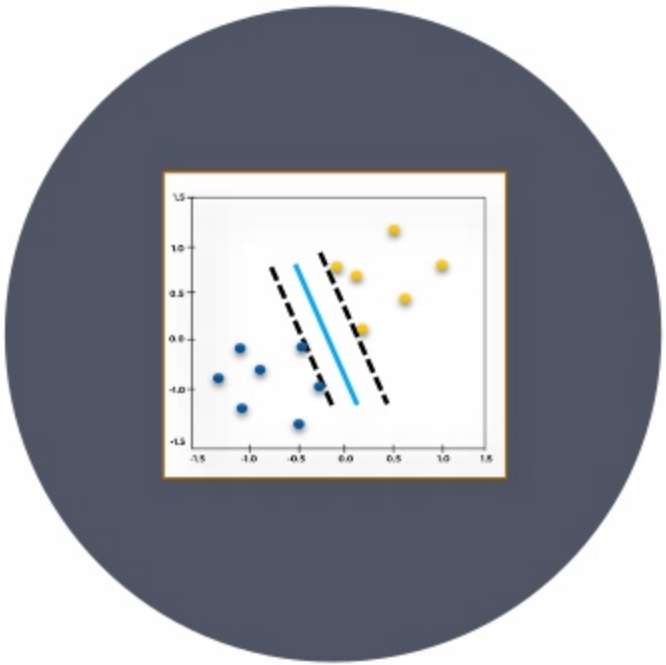
Bioinformatics

Agenda

- What is Machine learning?

Agenda

- What is Machine learning?
- Why Support Vector Machine?



Agenda

- What is Machine learning?
- Why Support Vector Machine?
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- What is Support Vector Machine?
- Understanding Support Vector Machine

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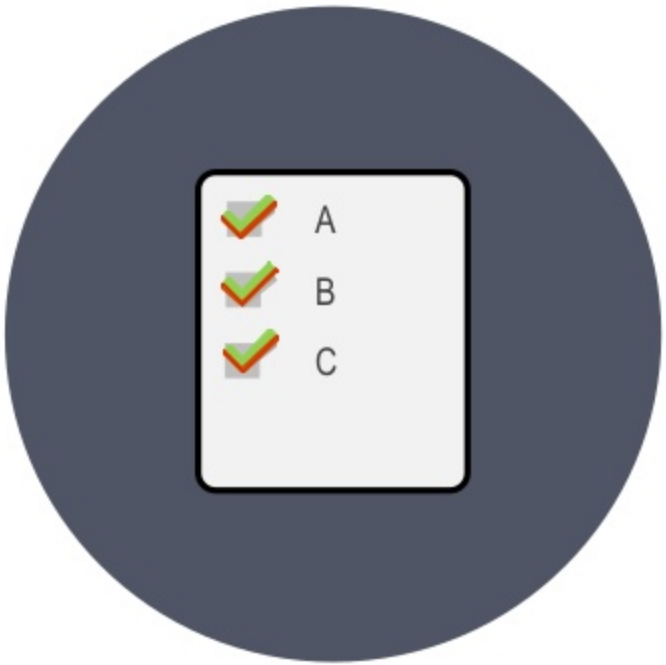
- Advantages of Support Vector Machine



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Agenda

- What is Machine learning?
- Why Support Vector Machine?
- What is Support Vector Machine?
- Understanding Support Vector Machine
- Advantages of Support Vector Machine
- Use Case in Python

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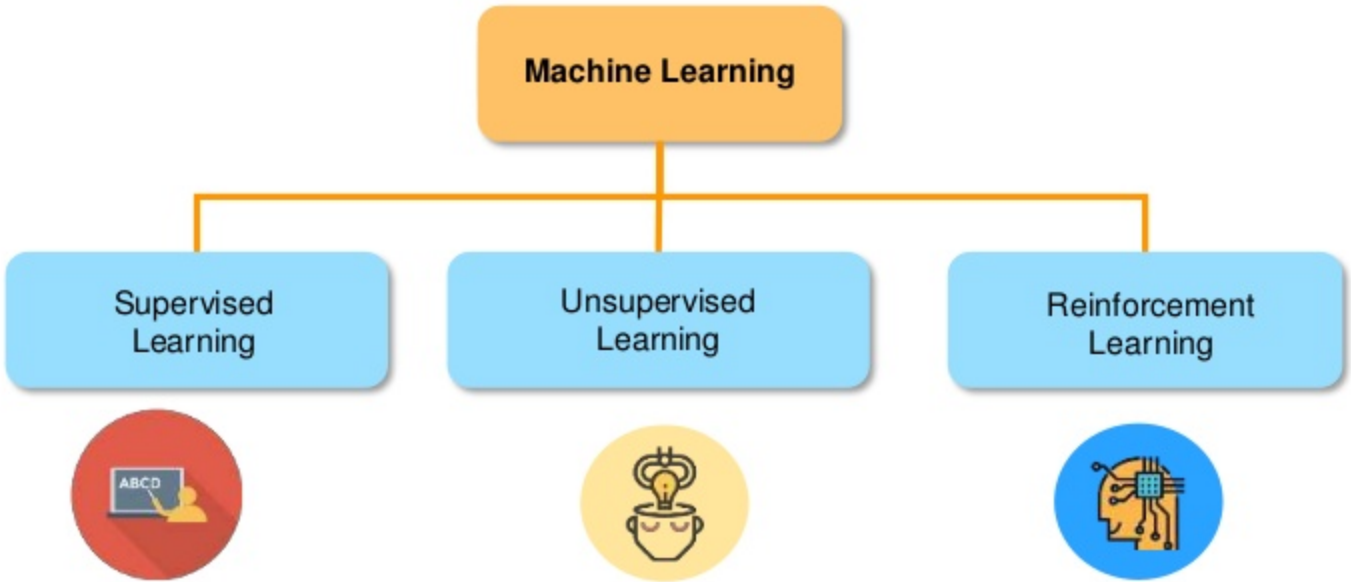
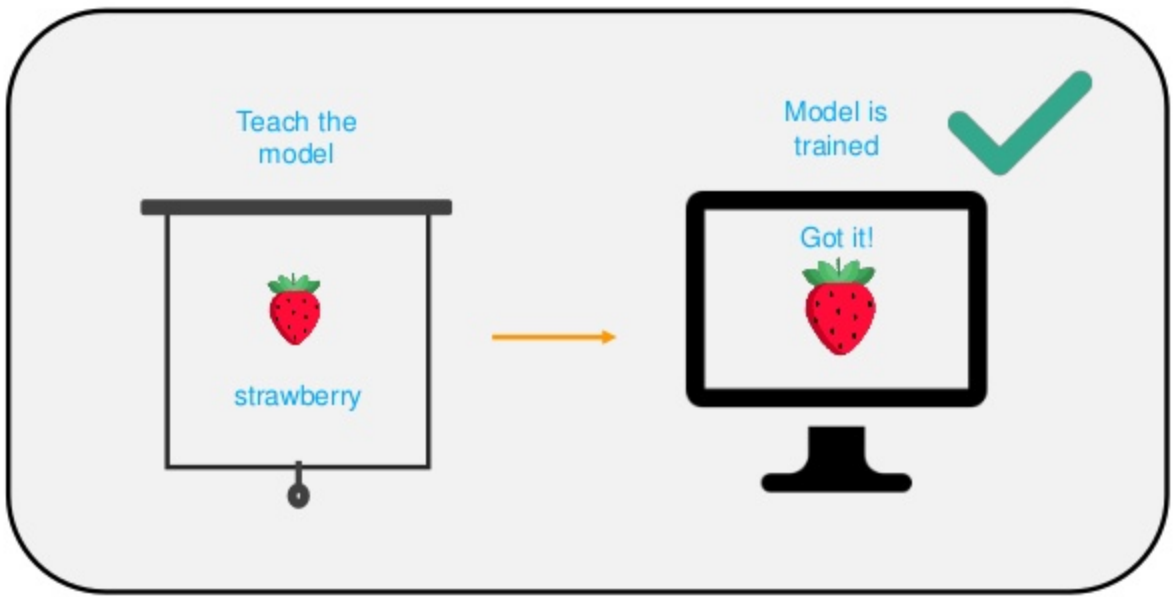
What is Machine learning?



What is Machine learning?

Supervised Learning

Machine learning model learns from the past input data and makes future prediction as output



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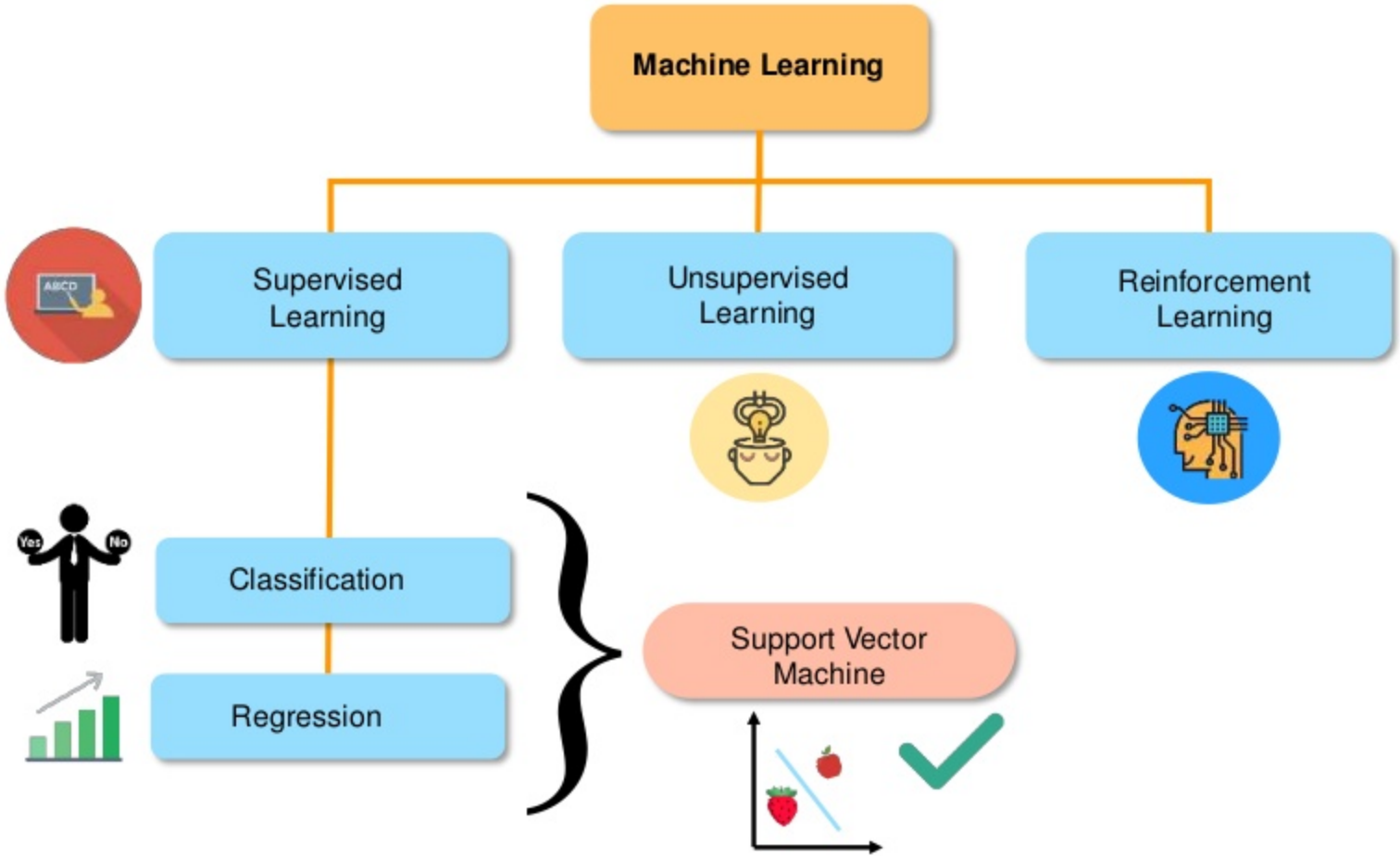
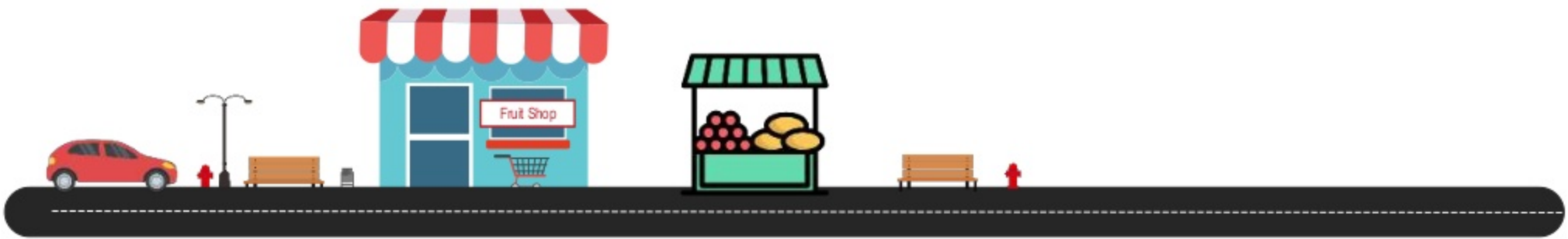


Why Support Vector Machine?

Last week, my son and I visited a fruit shop

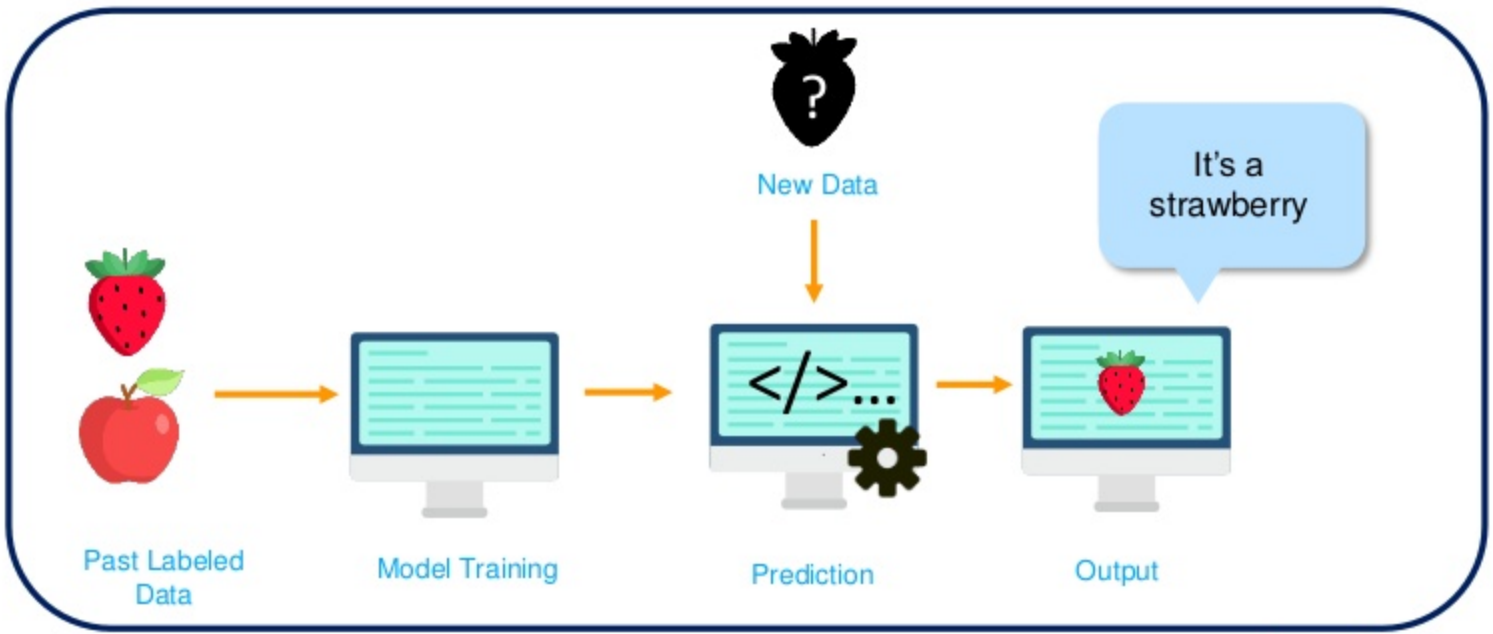


Why Support Vector Machine?

Why Support Vector Machine?

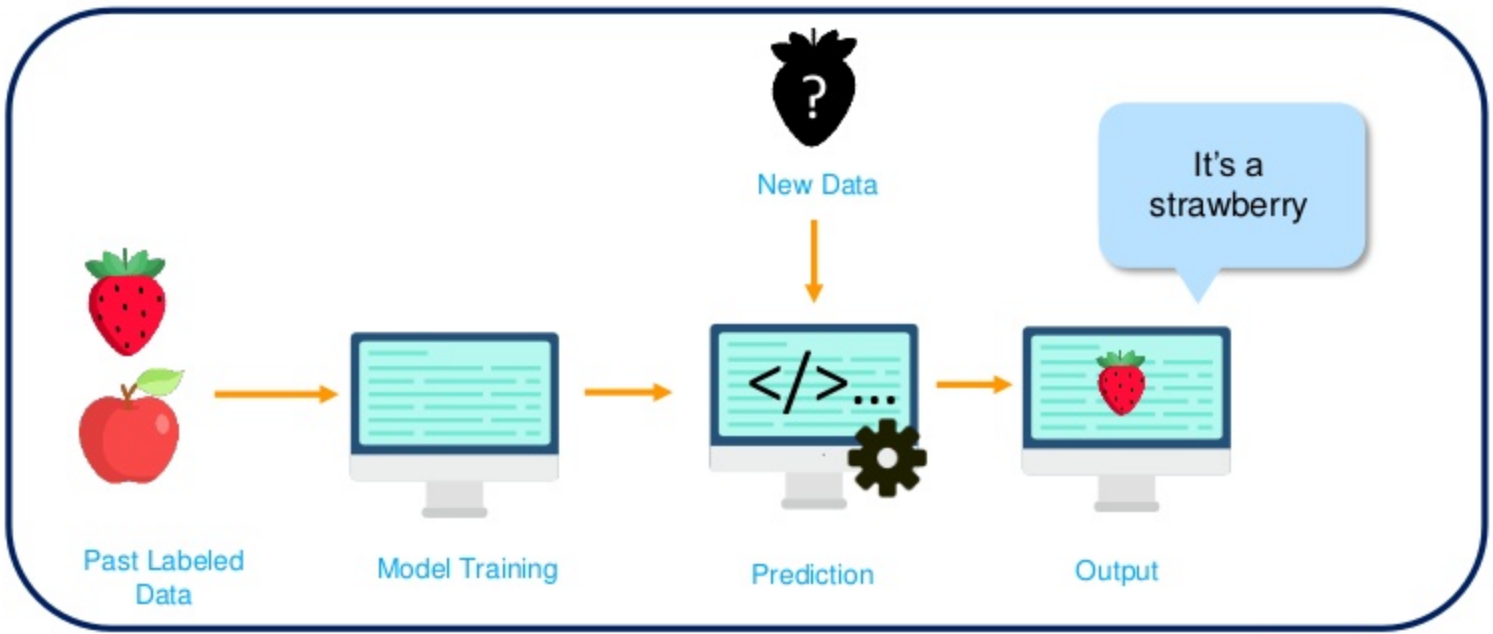
Why Support Vector Machine?

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



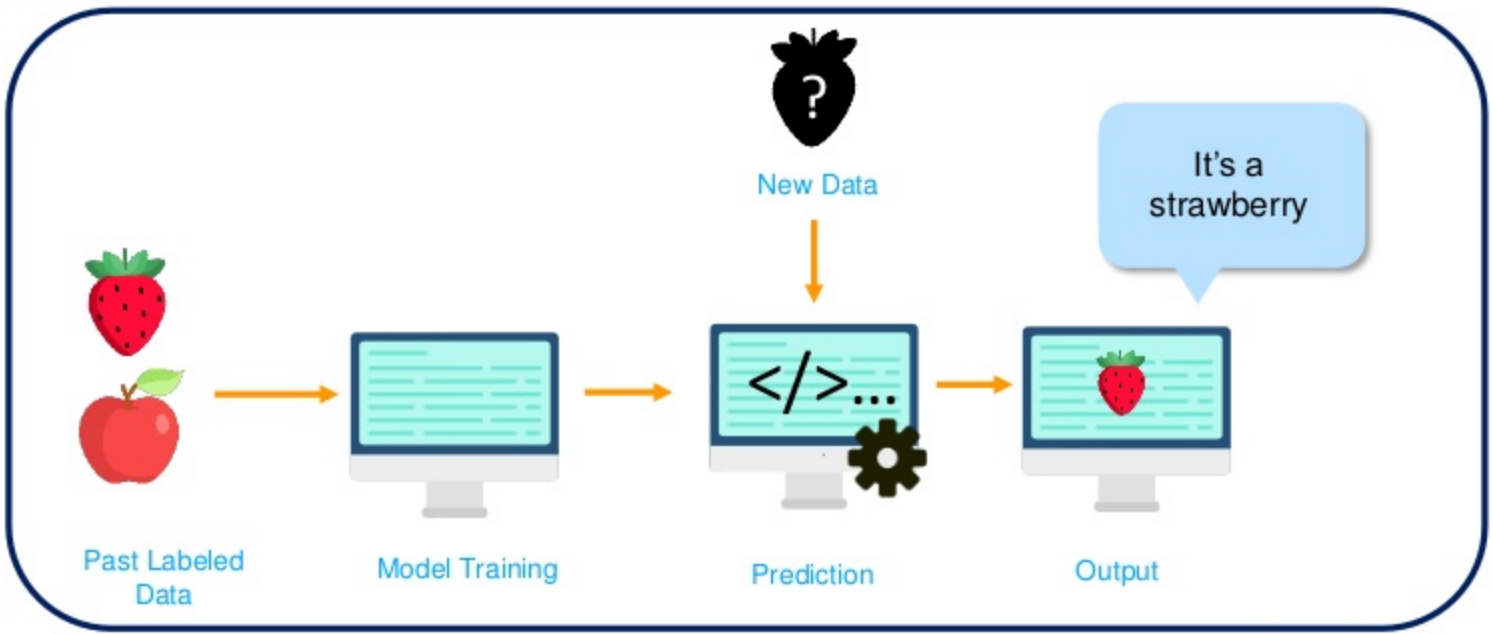
Why Support Vector Machine?

This is Support Vector Machine



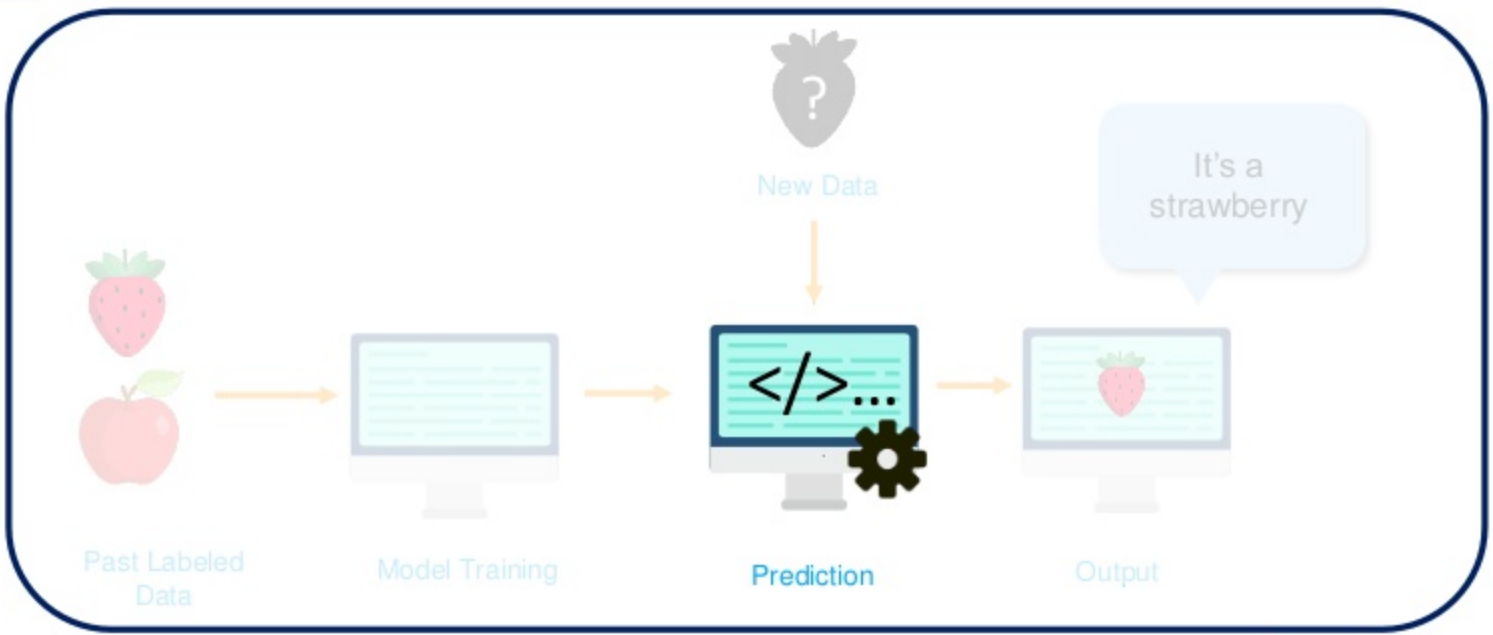
Why Support Vector Machine?

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?



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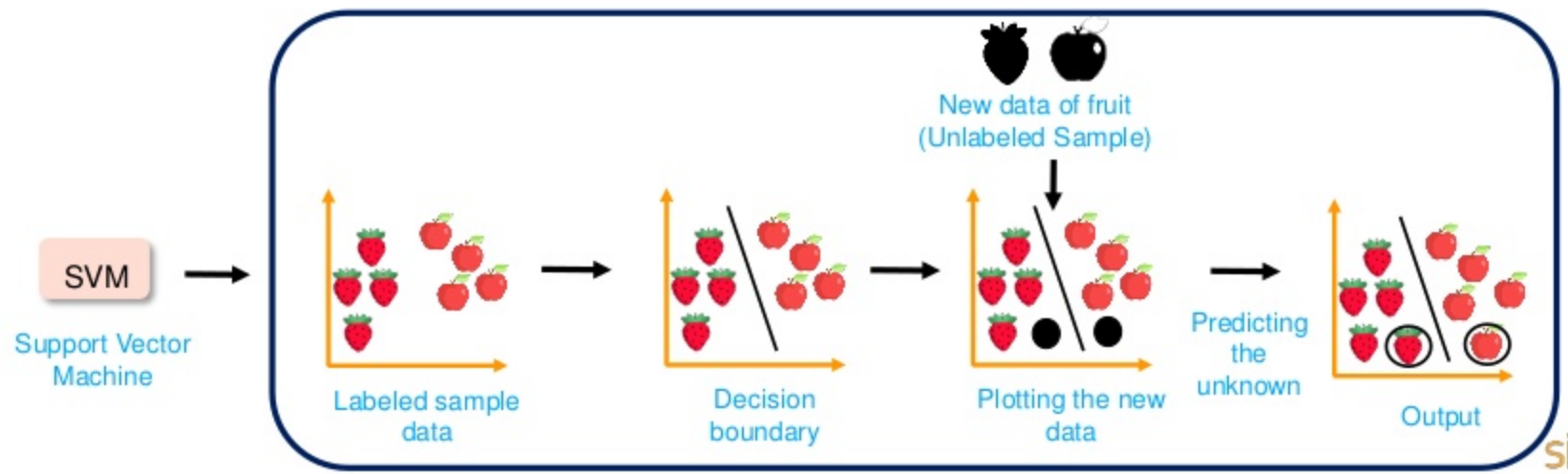

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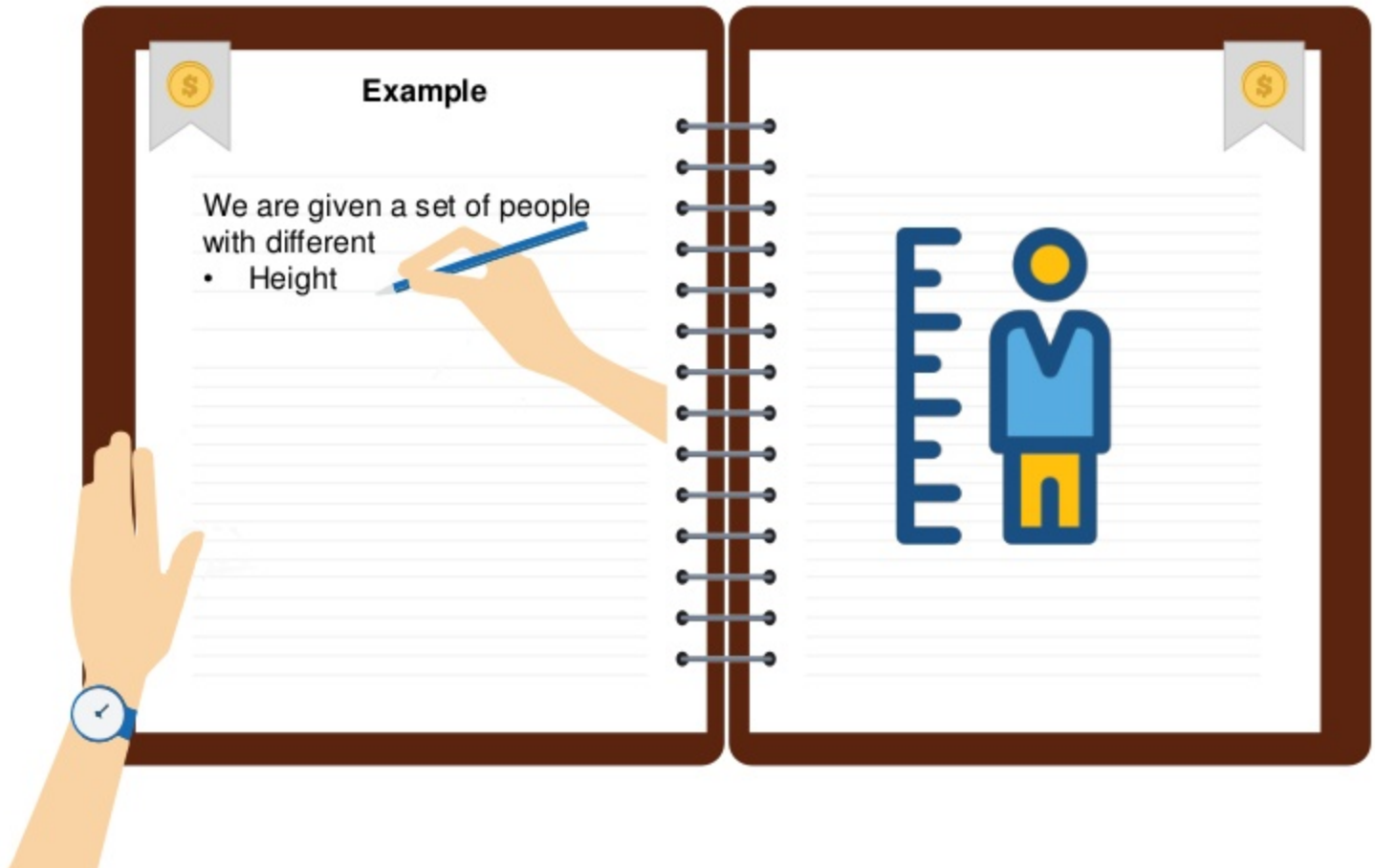
What is Support Vector Machine?



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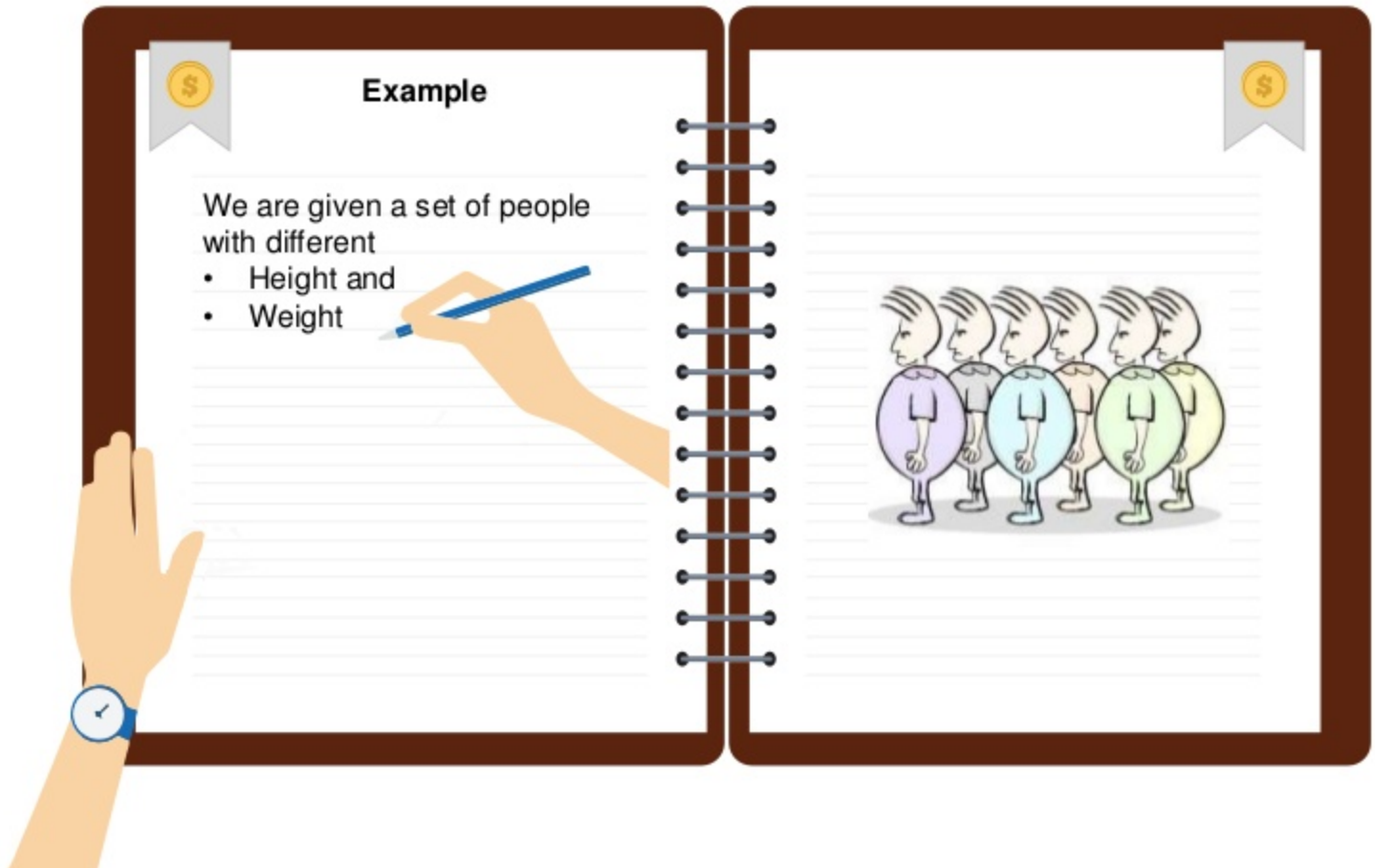

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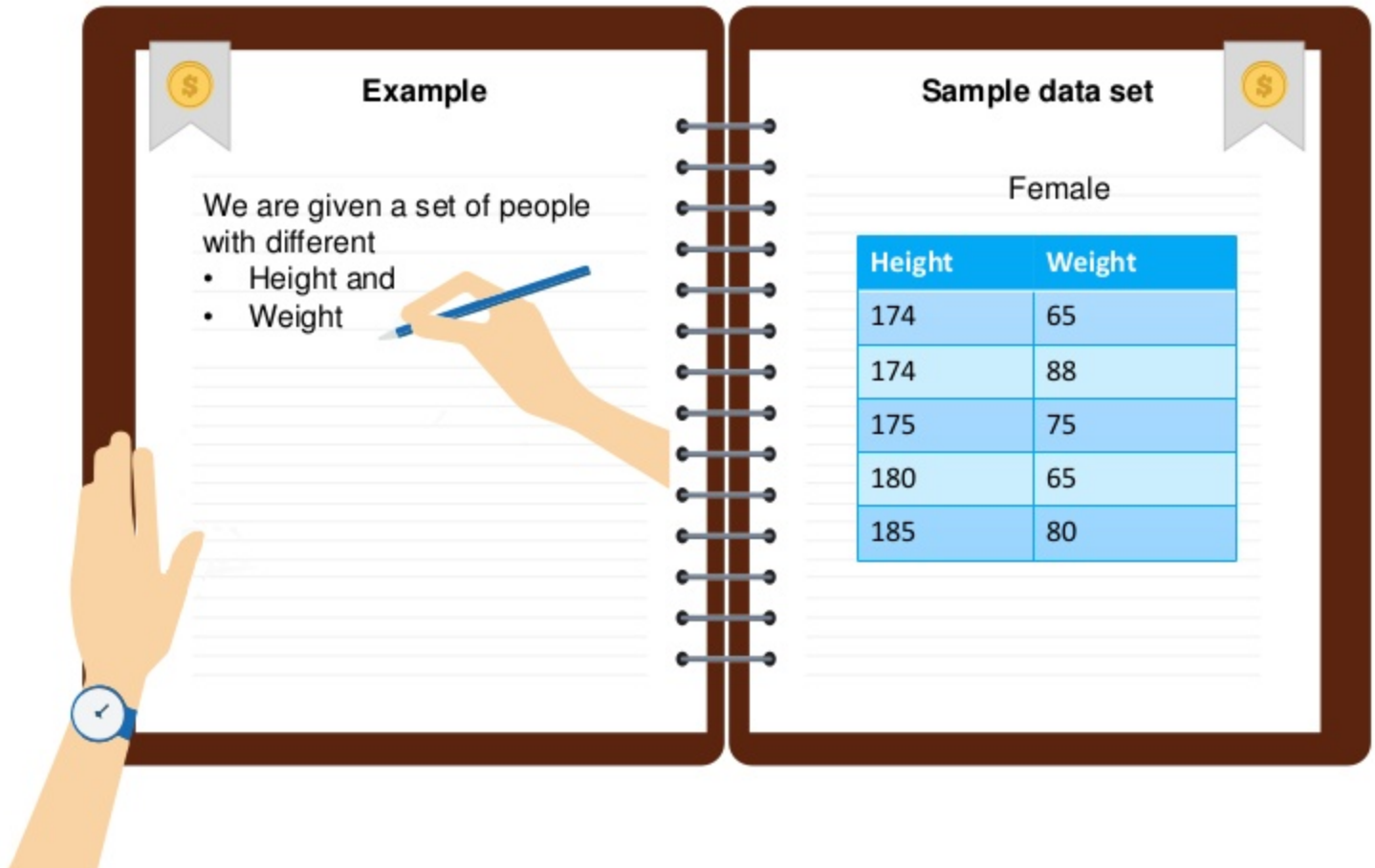

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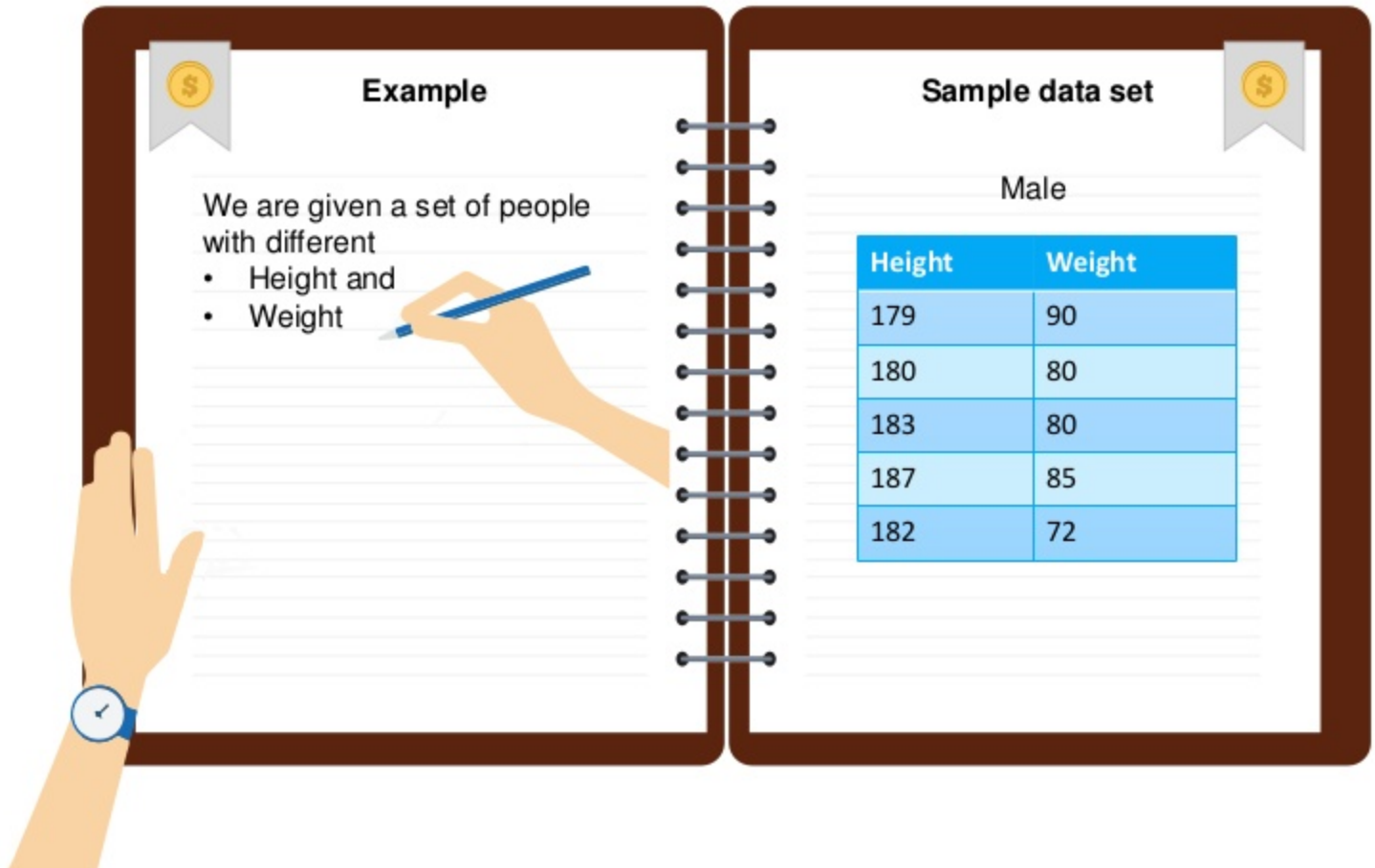

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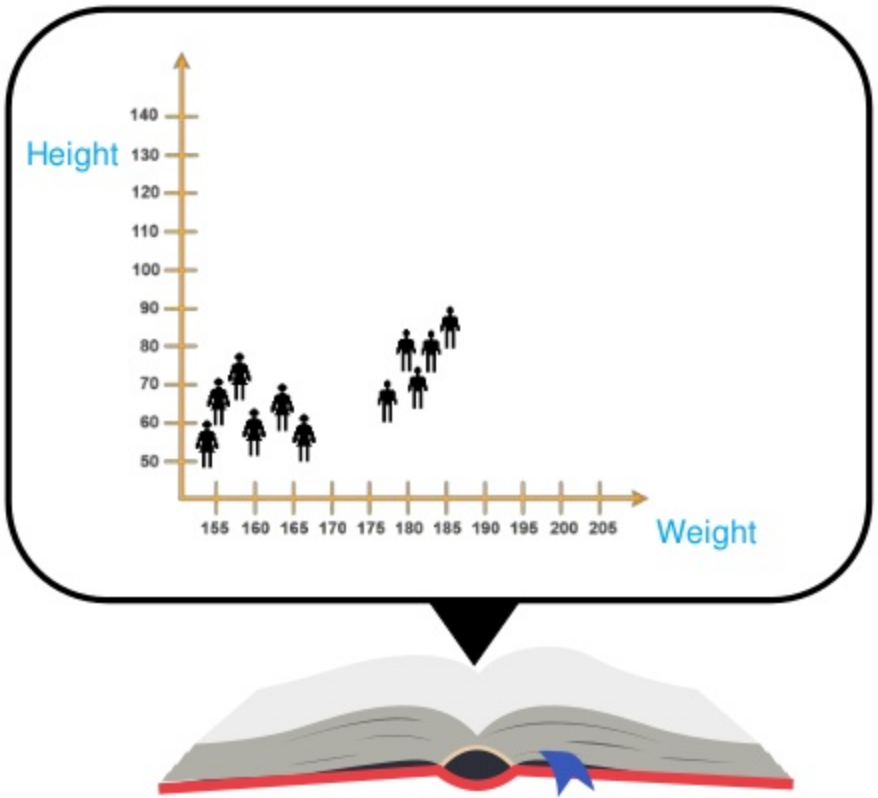
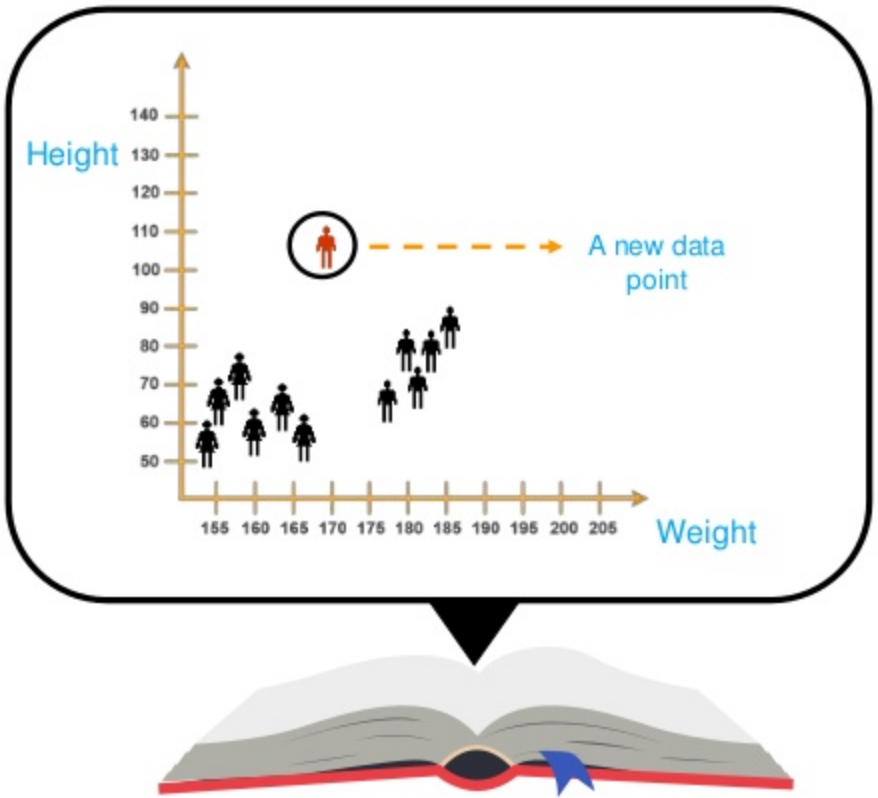


Let's add a new data point and figure out if it's a male or a female?

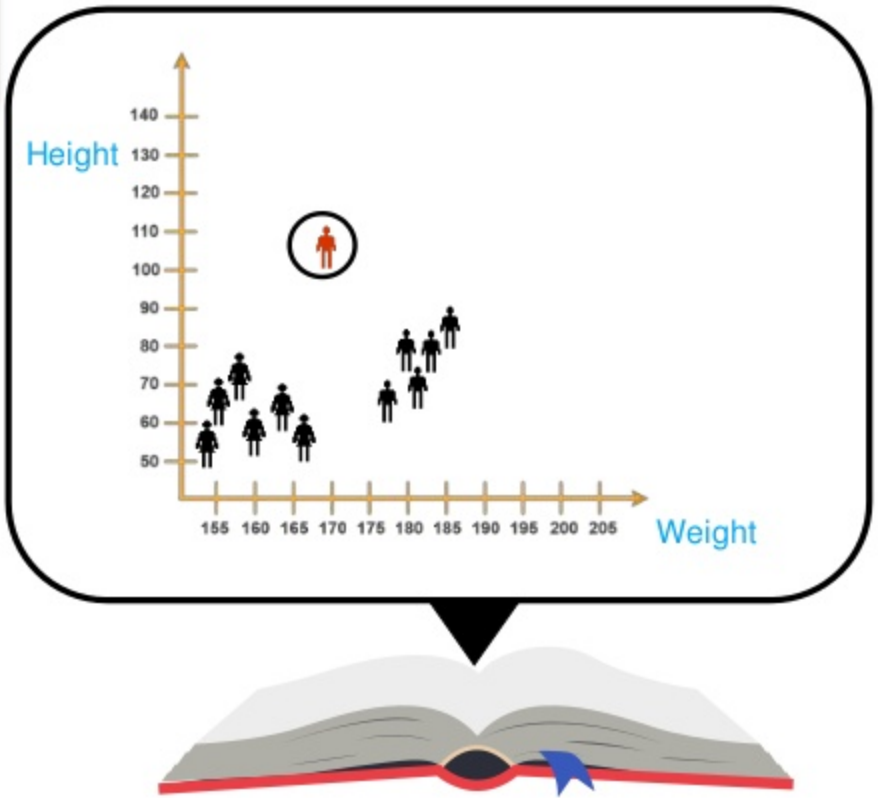
What is Support Vector Machine?



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

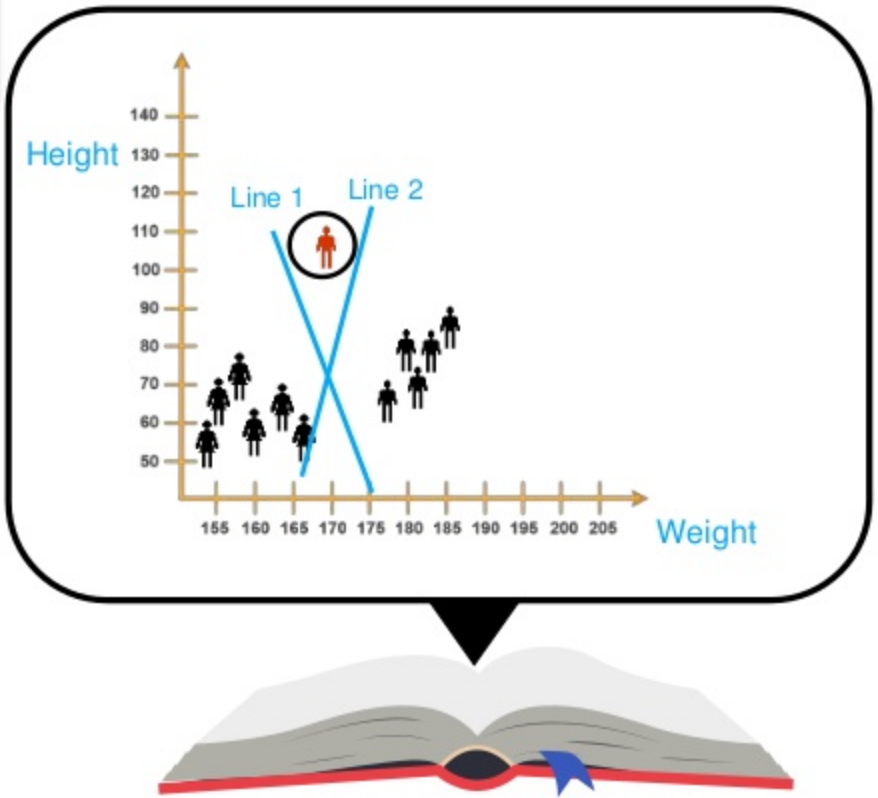
What is Support Vector Machine?

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



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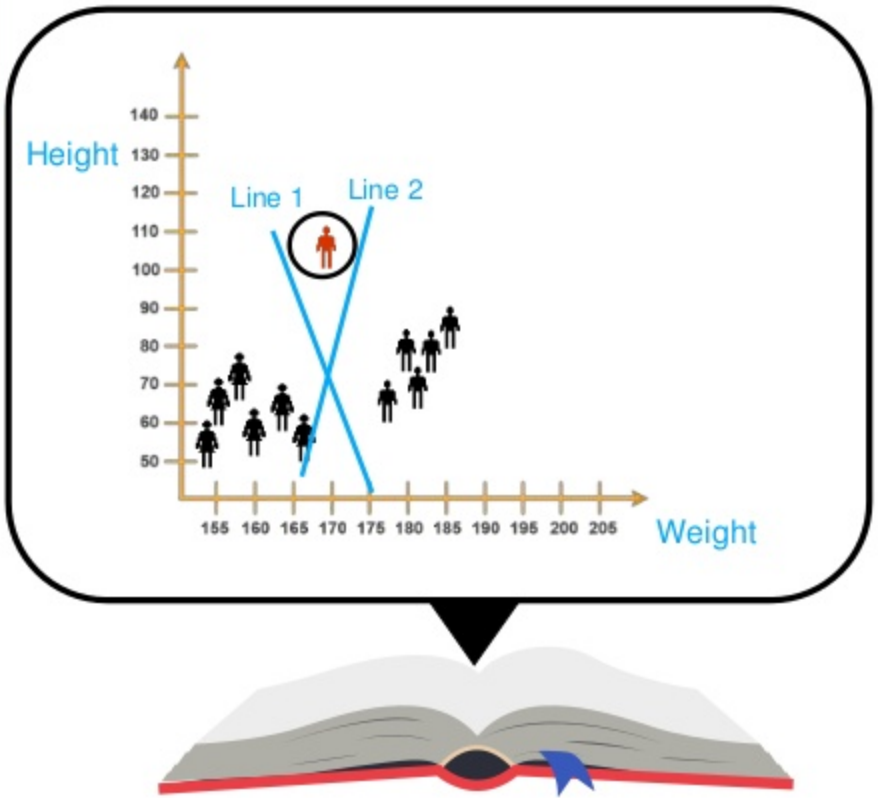
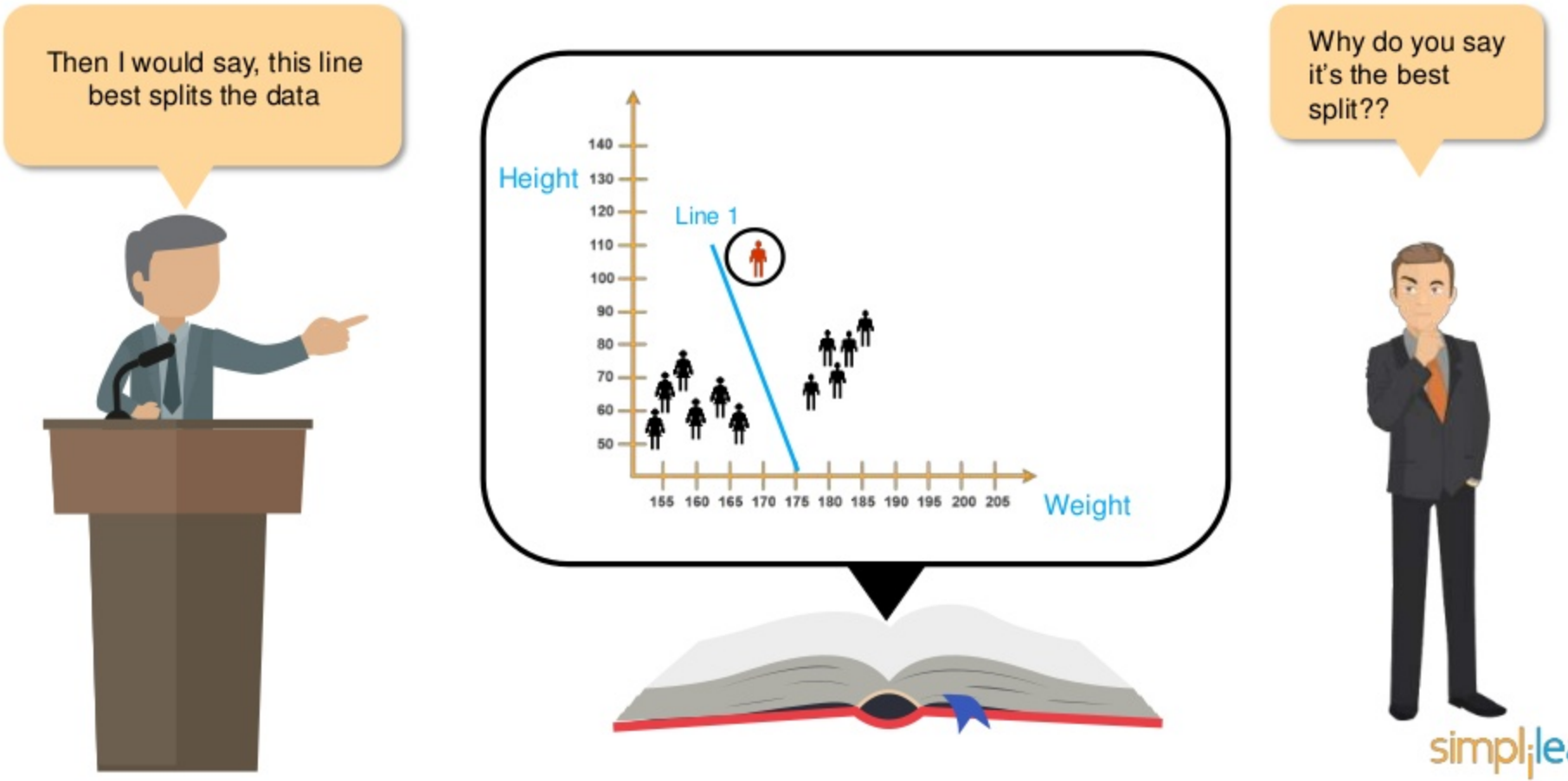
What is Support Vector Machine?

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

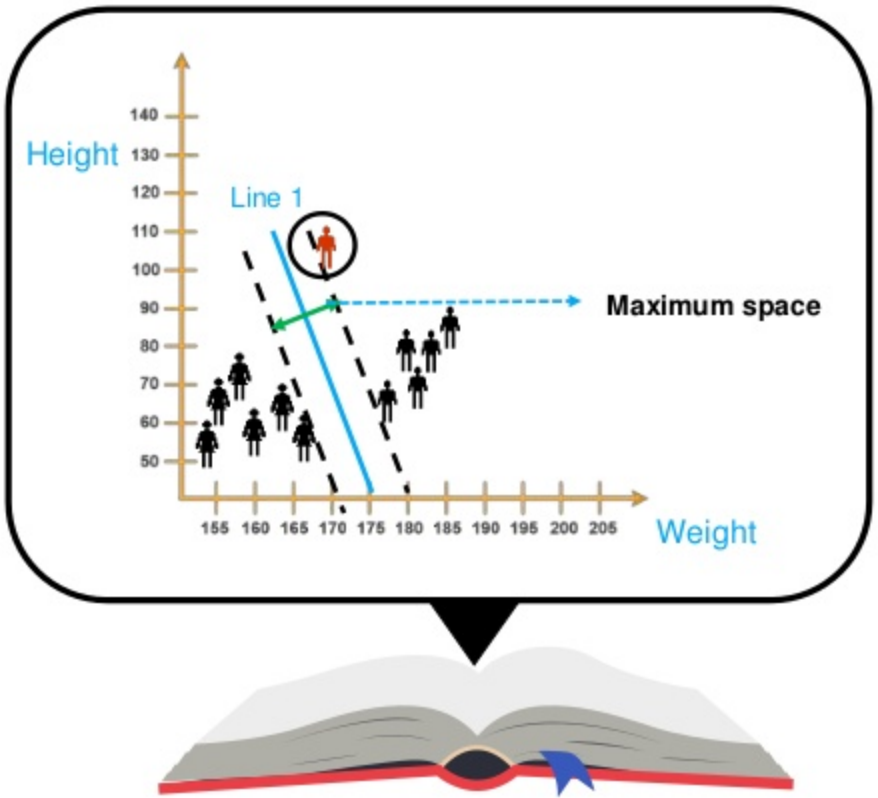


What is Support Vector Machine?



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??

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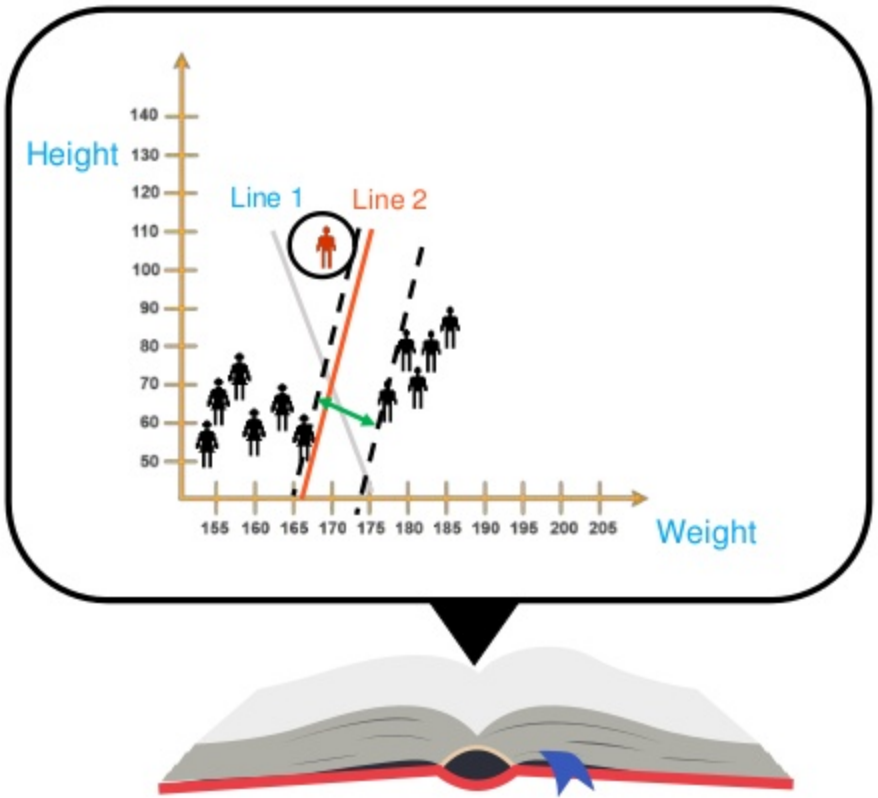
What is Support Vector Machine?

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



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

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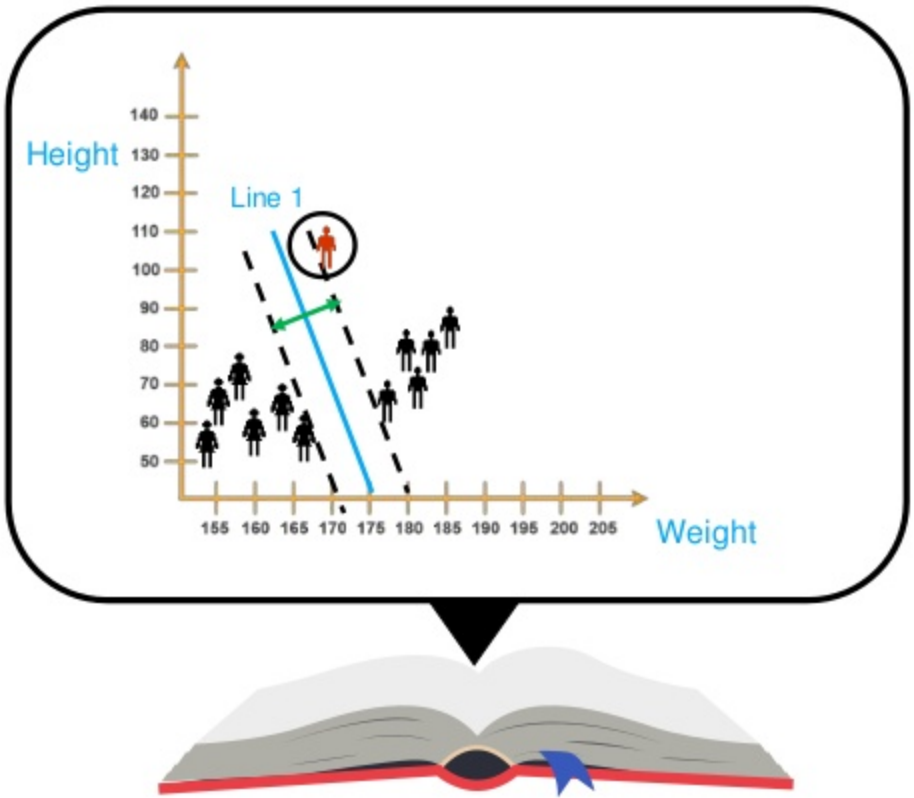
What is Support Vector Machine?

That is why this line best splits the data



Well yes.. This is the best split!

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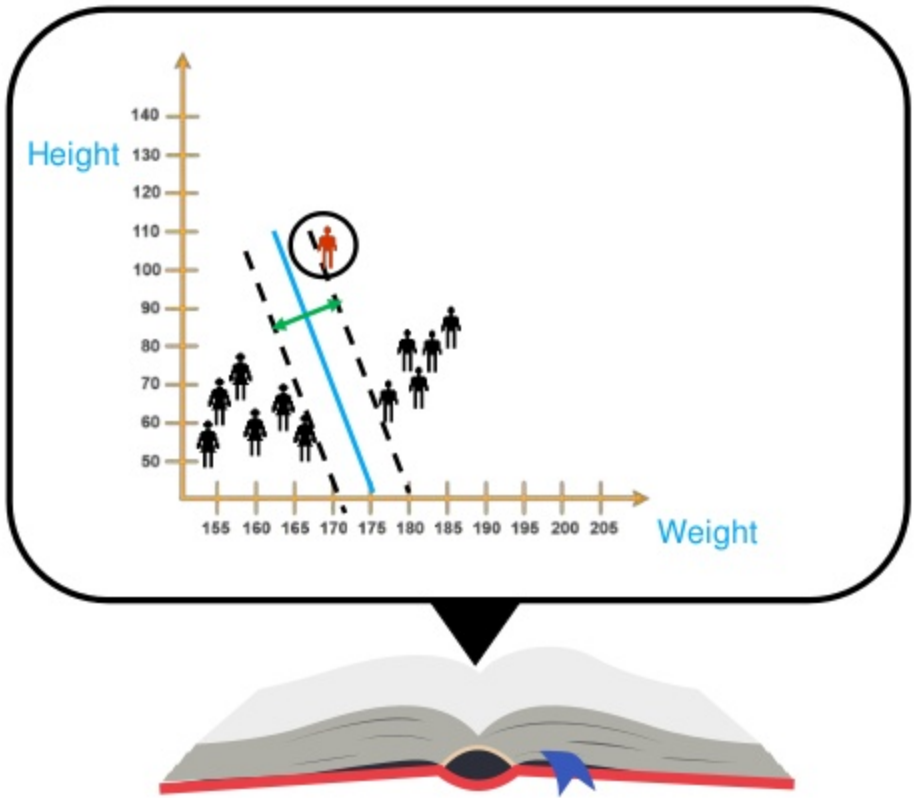
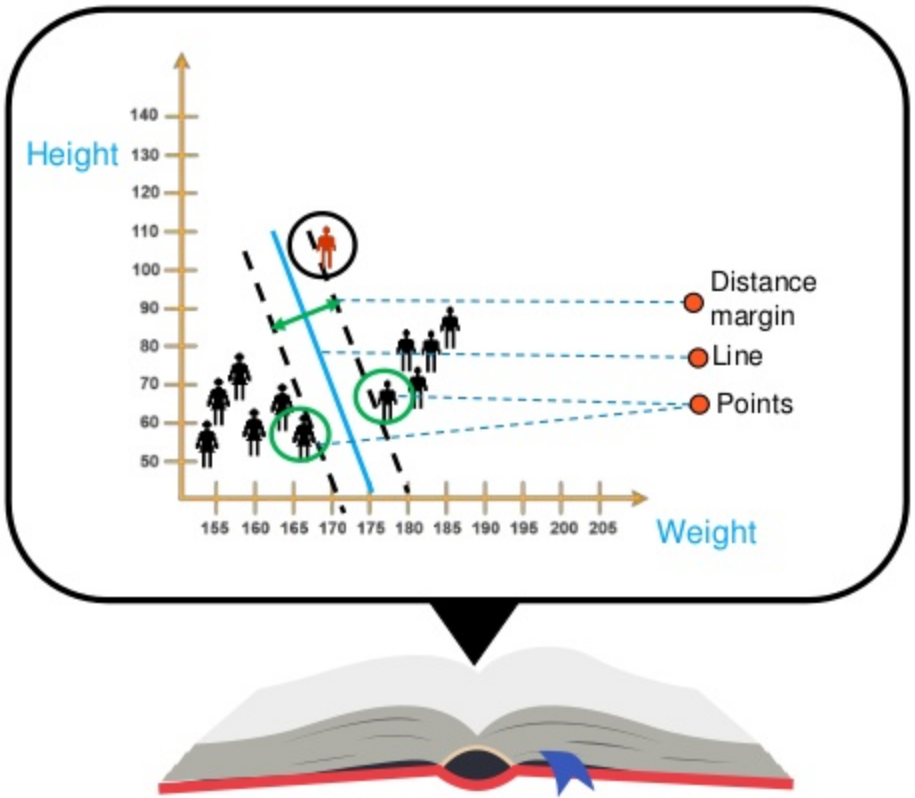
What is Support Vector Machine?



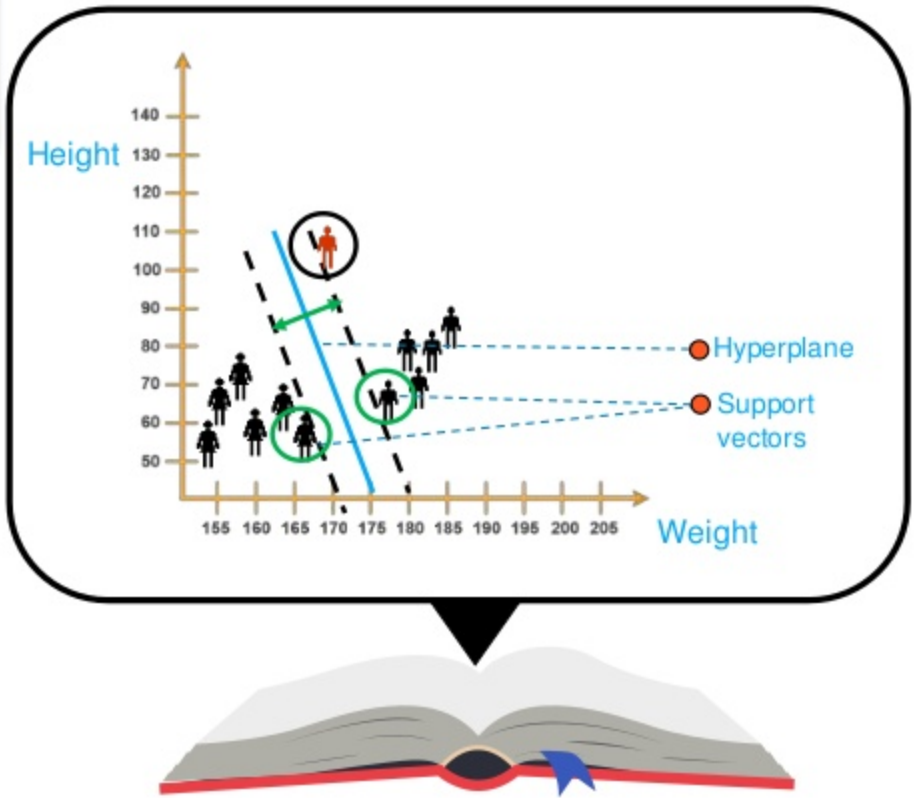
What is Support Vector Machine?

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



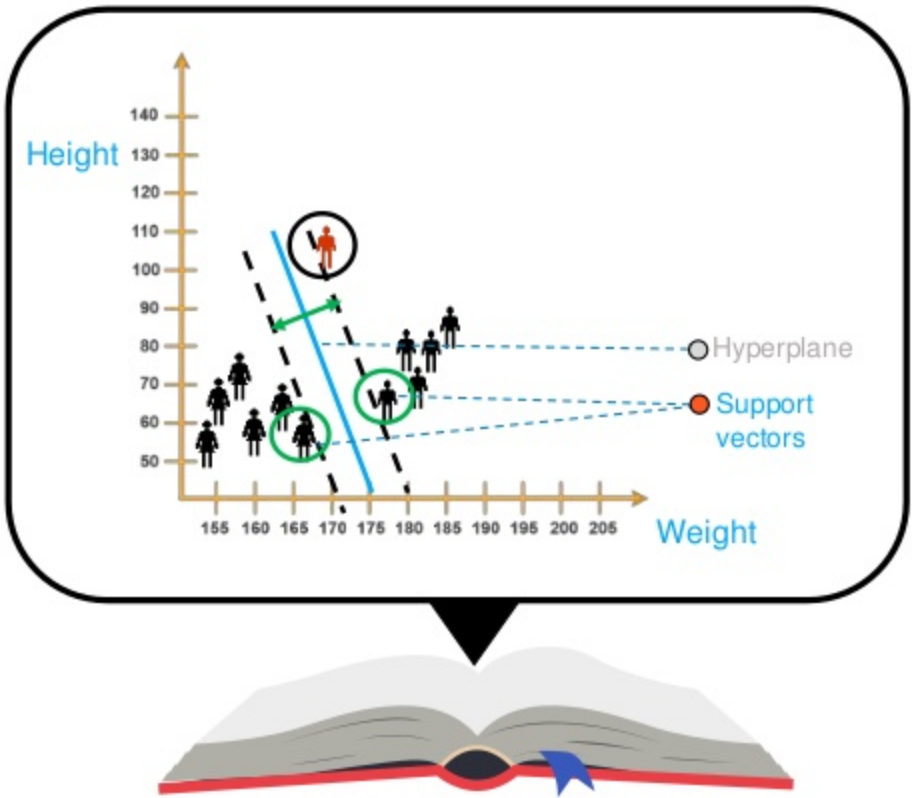
What is Support Vector Machine?

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



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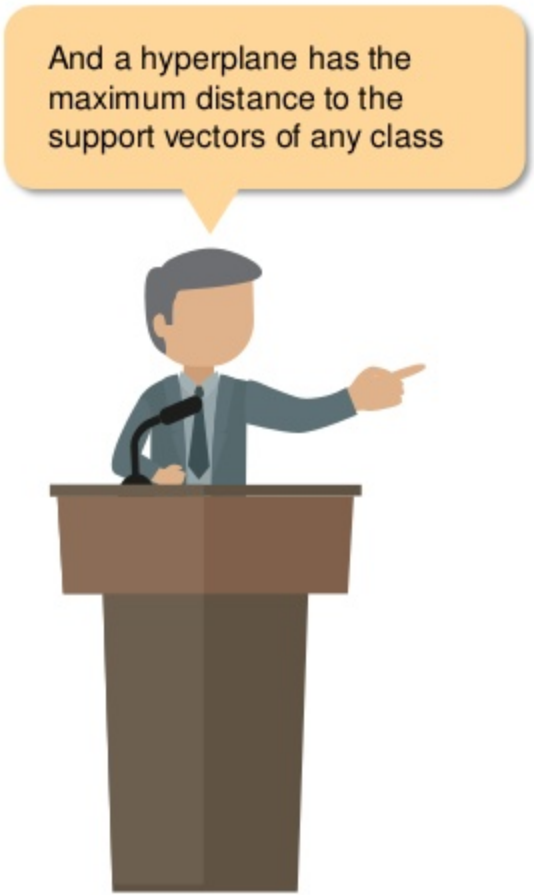

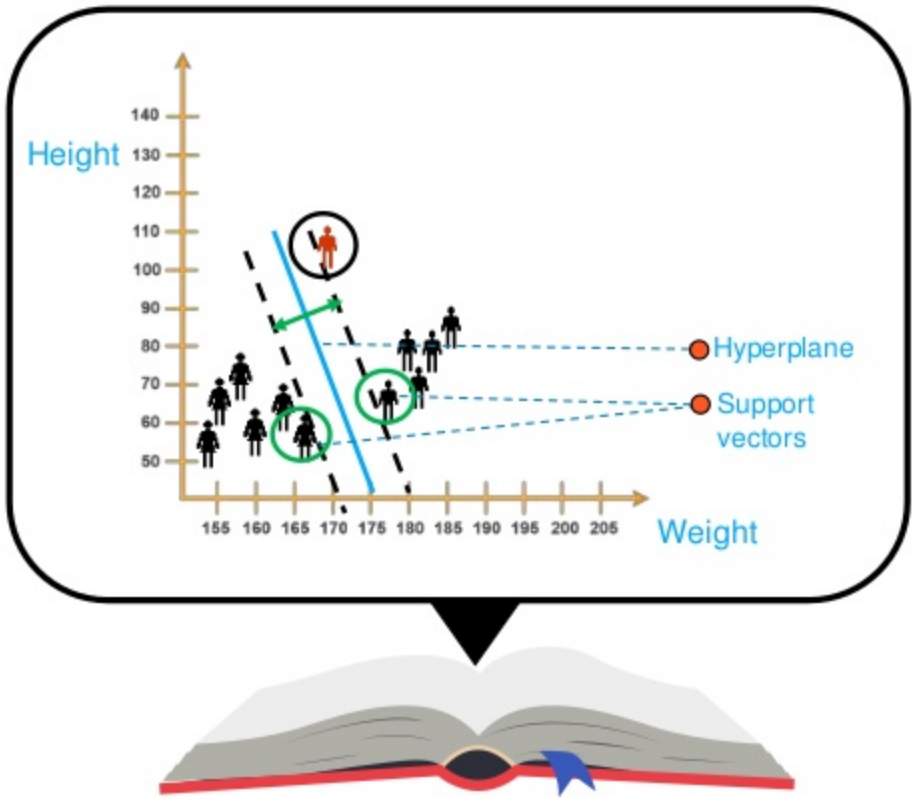

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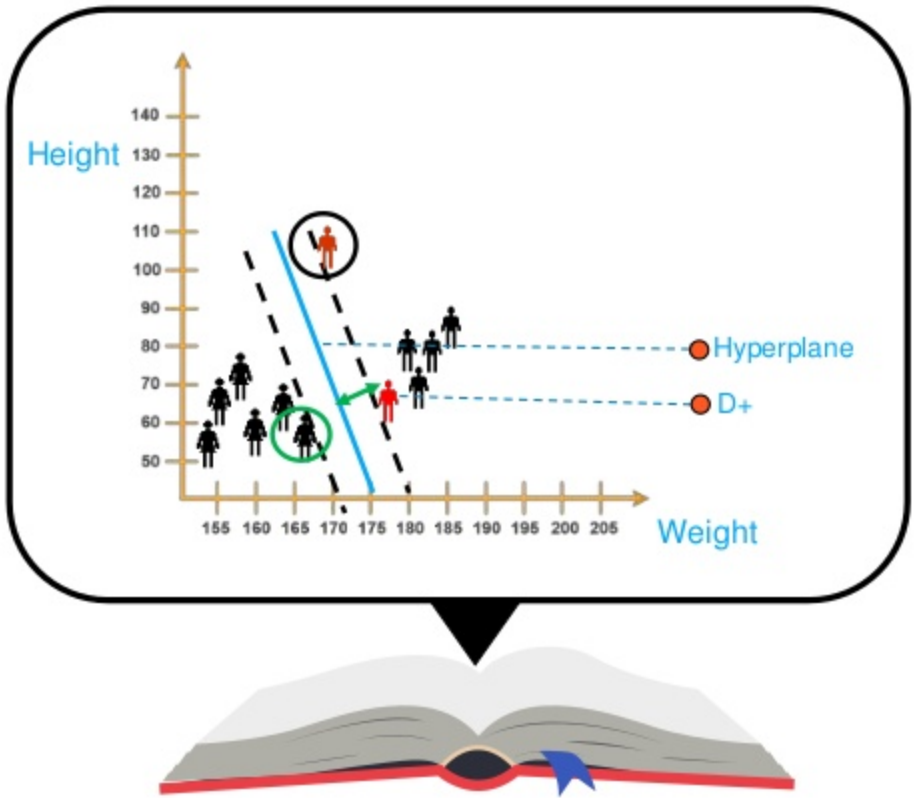

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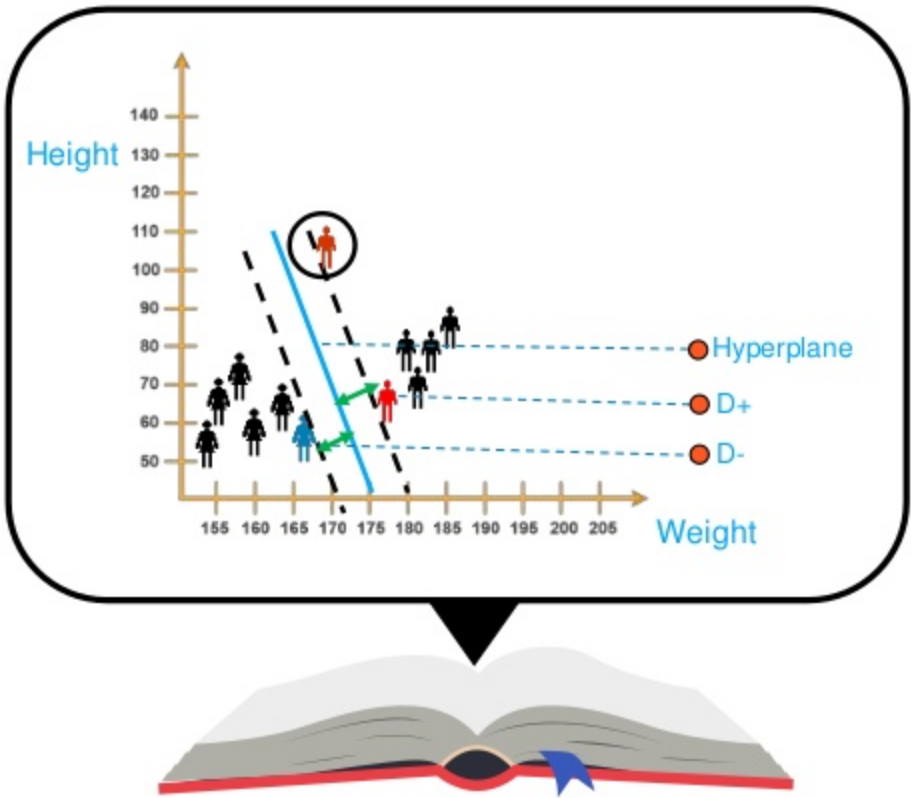

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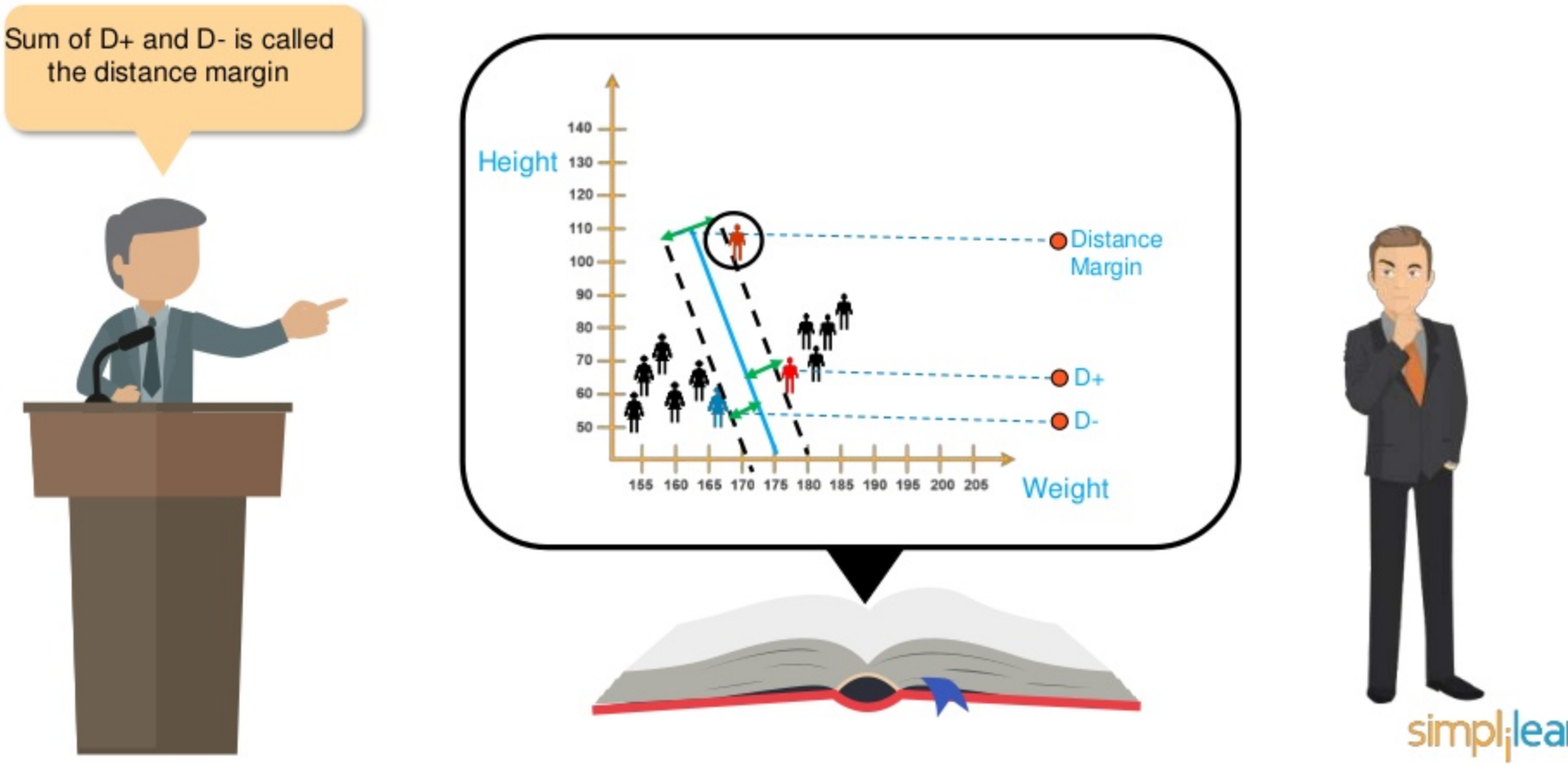
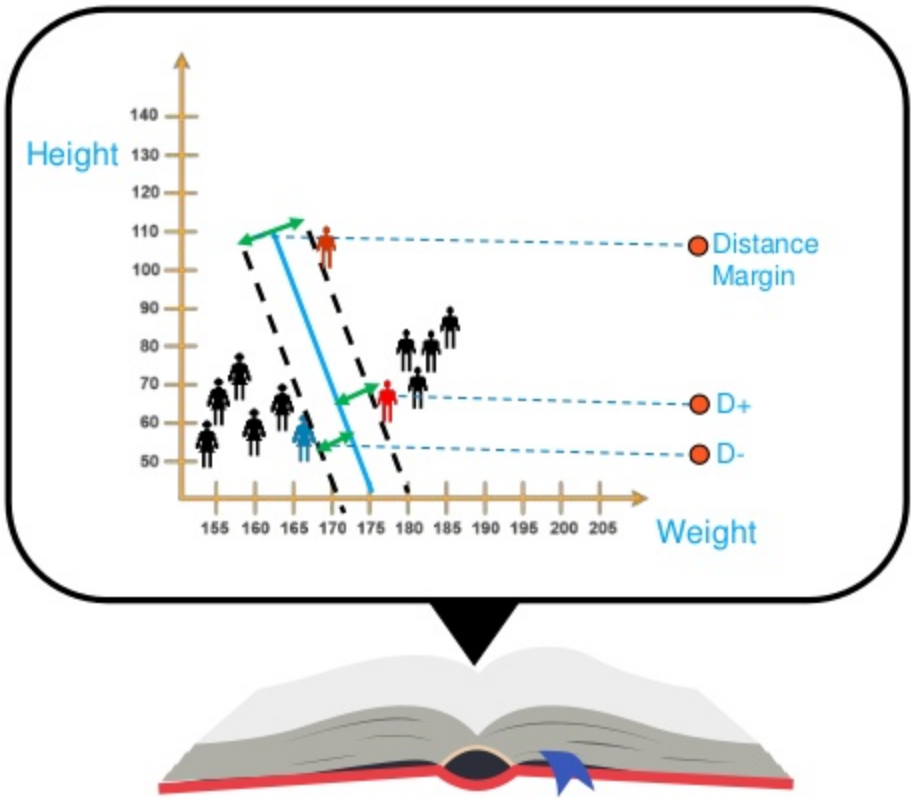


What is Support Vector Machine?

From the distance margin, we get an optimal hyperplane



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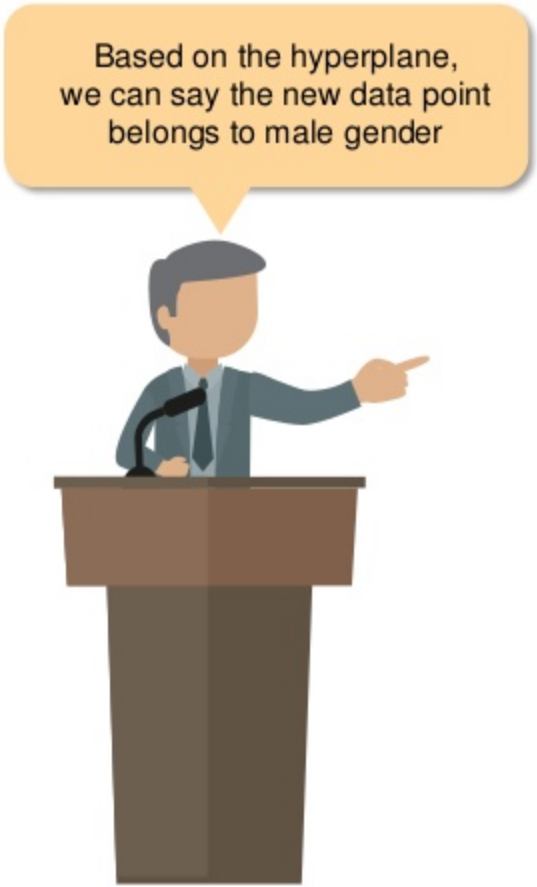
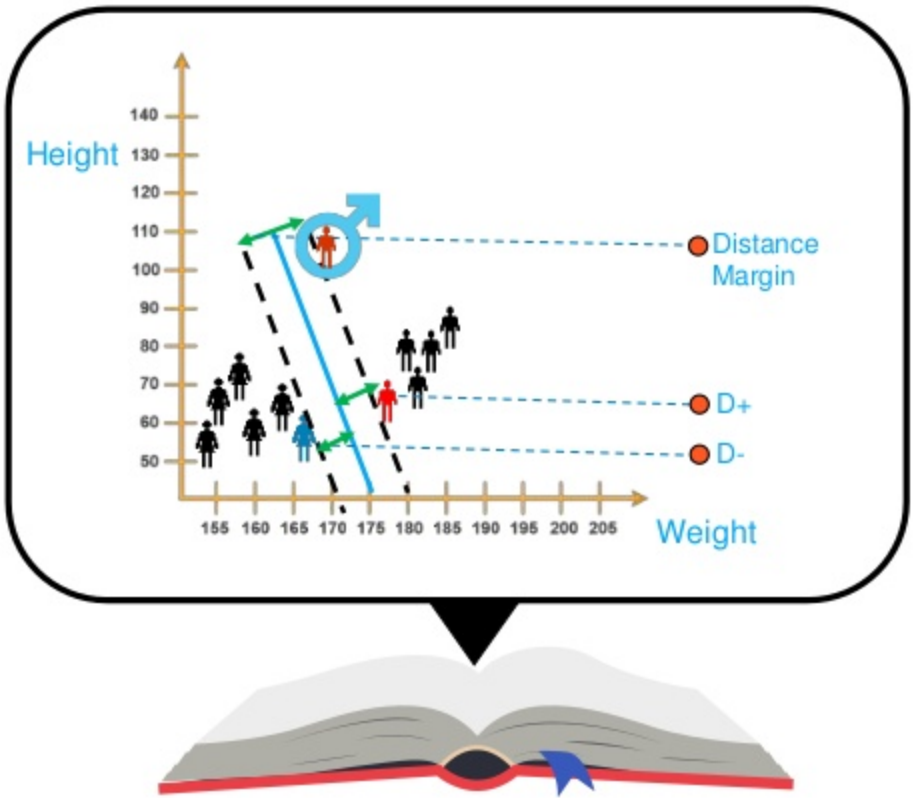
What is Support Vector Machine?





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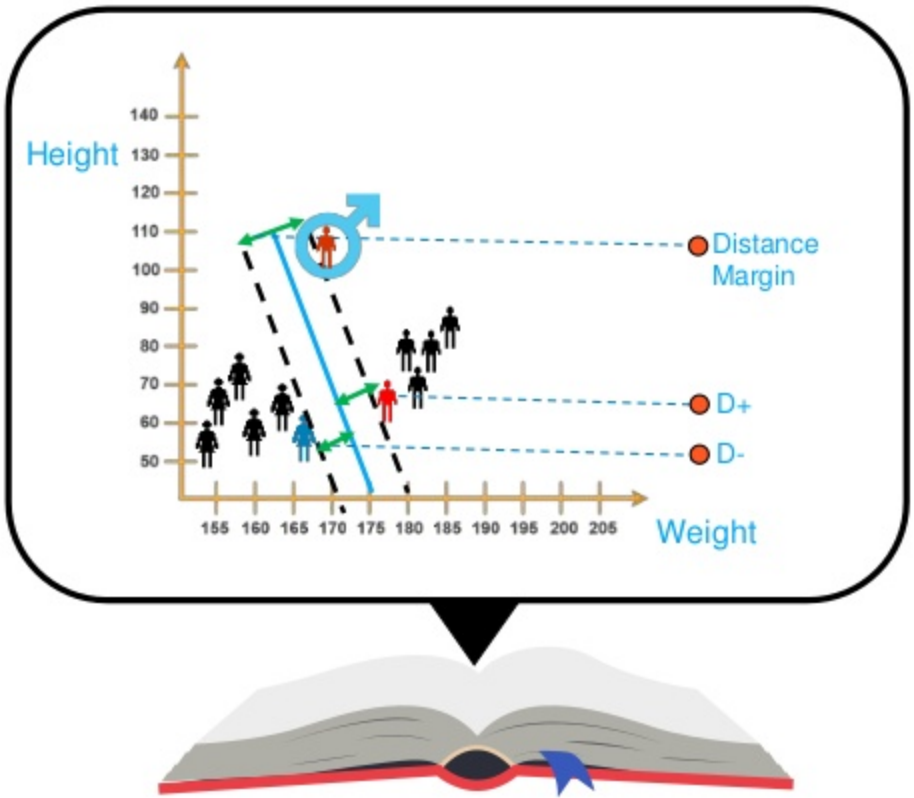
What is Support Vector Machine?

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



That was so clear!

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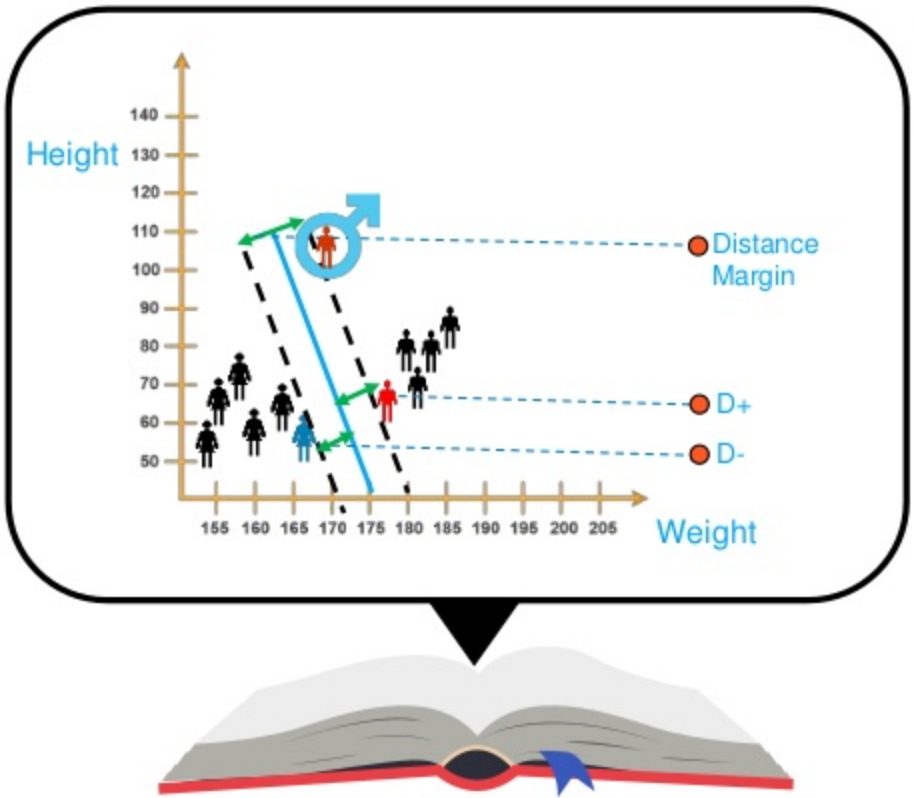
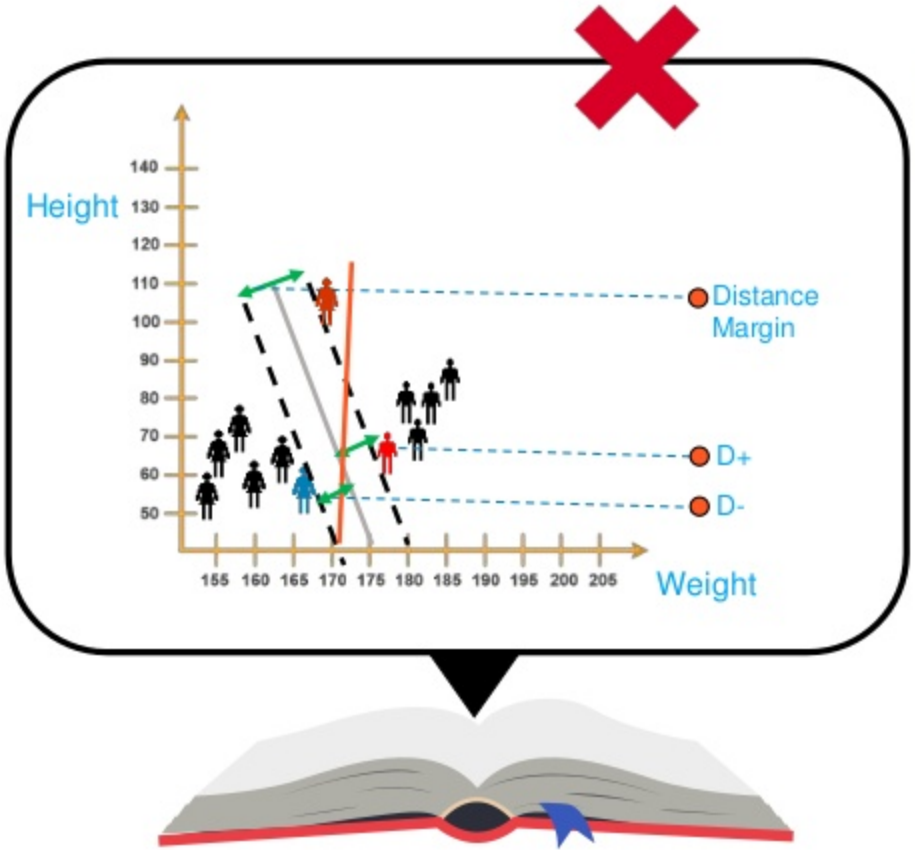
What is Support Vector Machine?



What is Support Vector Machine?

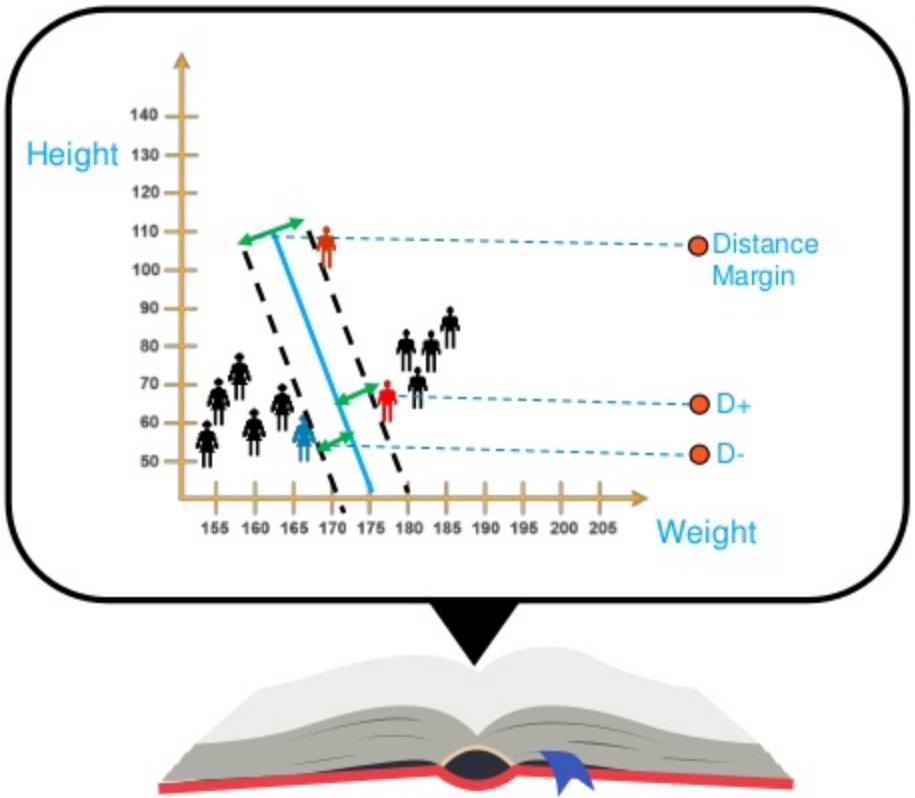
If we select a hyperplane having low margin then there is high chance of misclassification



But what happens if a hyperplane is not optimal?

What is Support Vector Machine?

What we discussed so far, is also called as **LSVM**



But what happens if a hyperplane is not optimal?

Understanding Support Vector Machine

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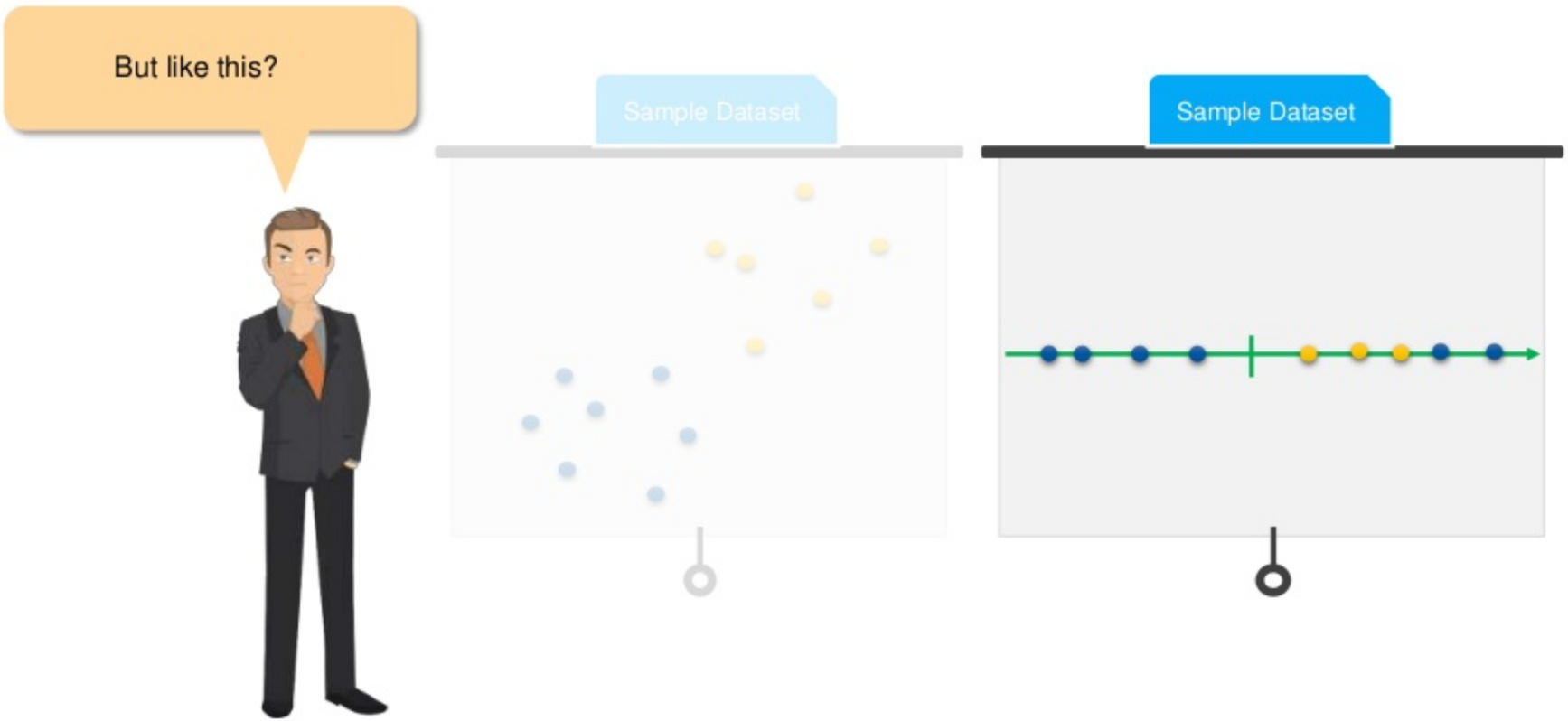

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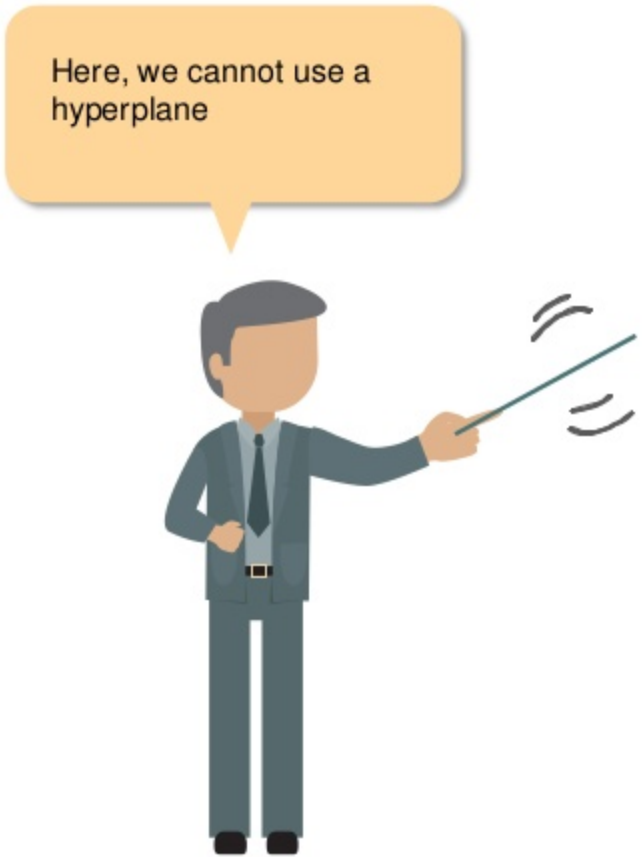

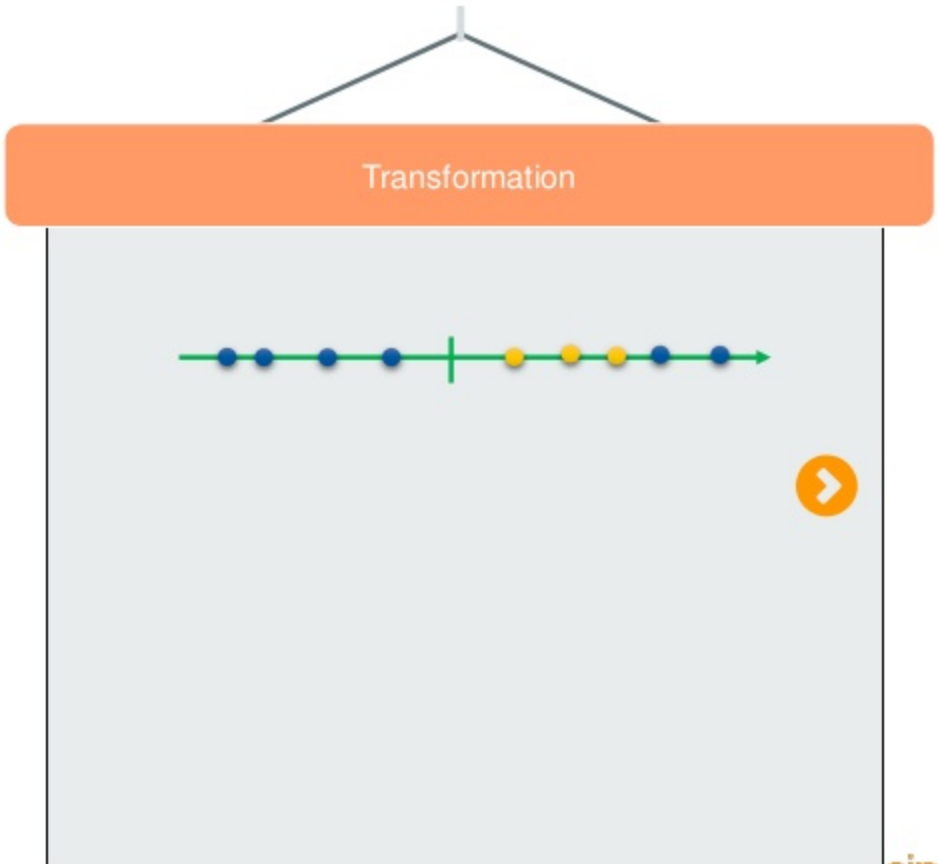

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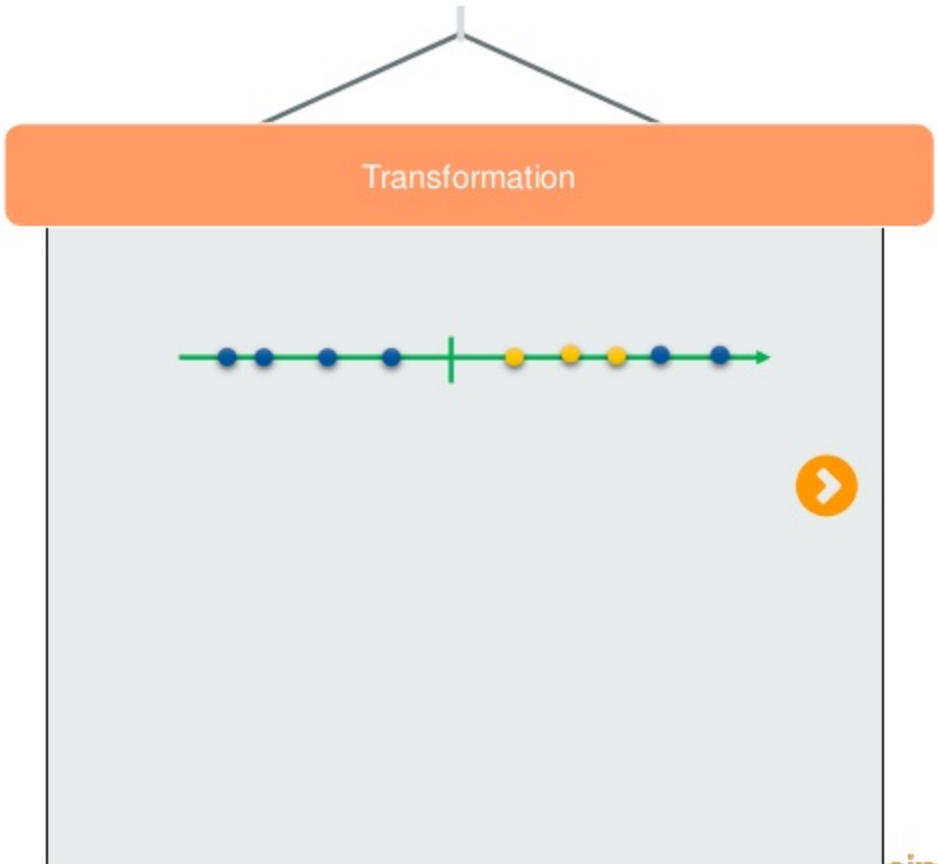

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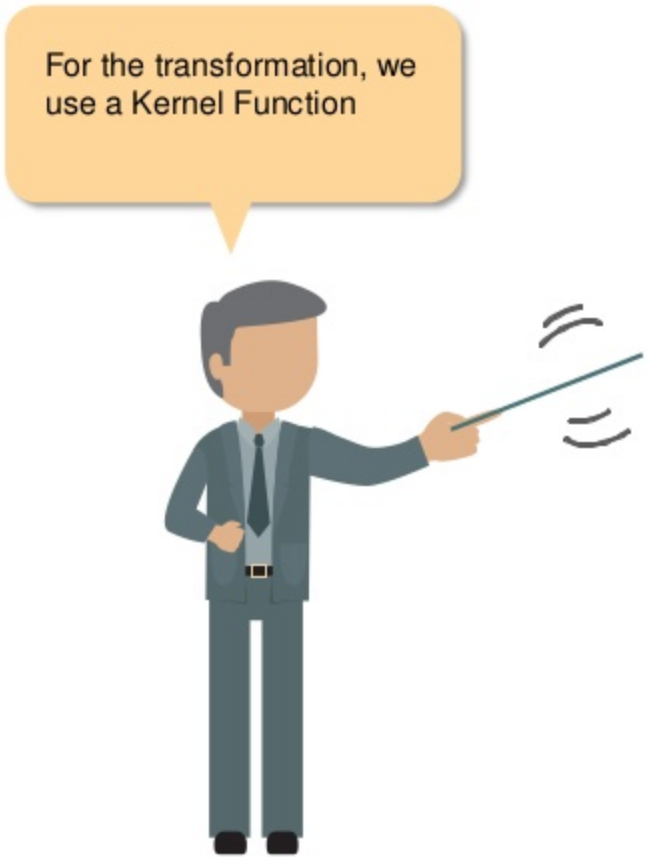

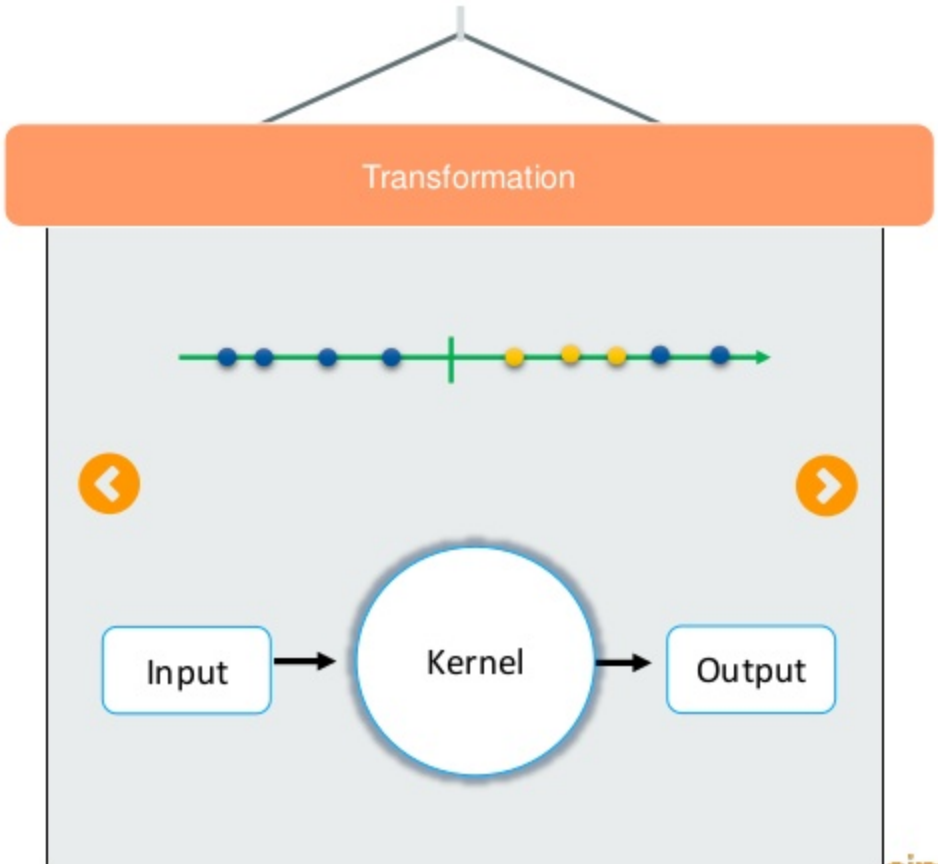

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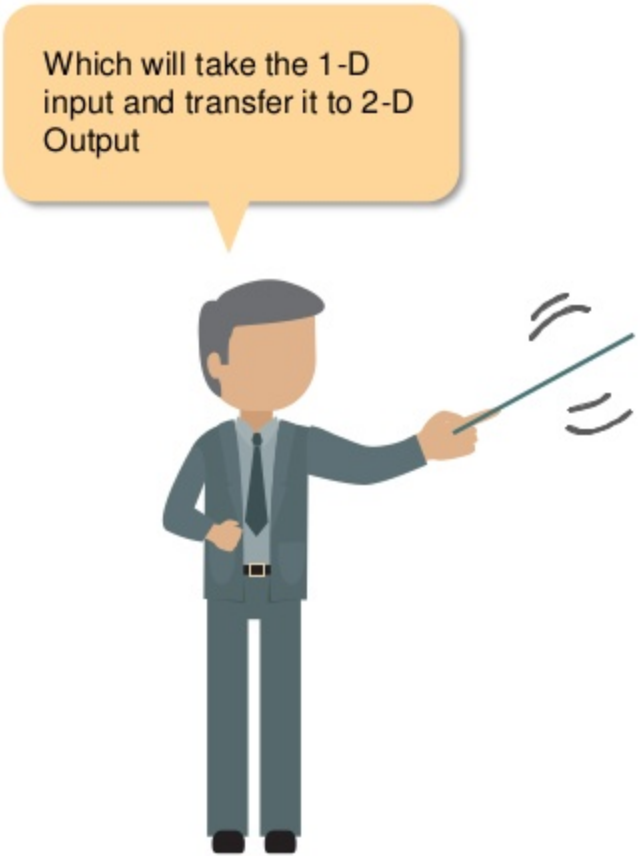

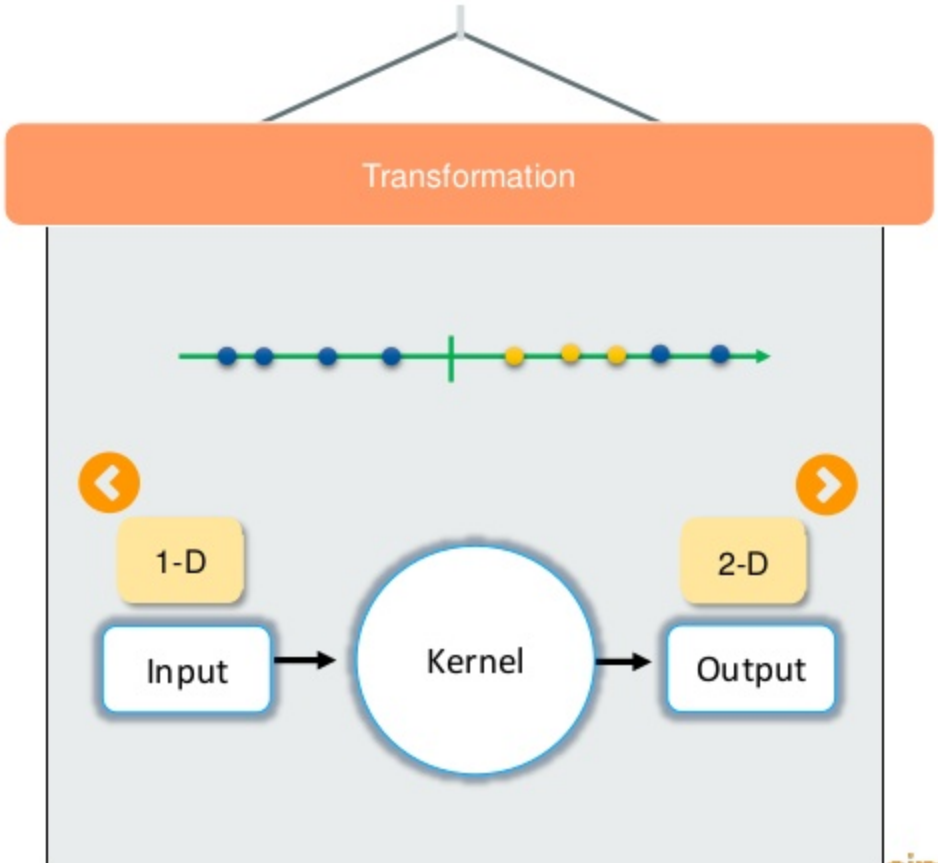

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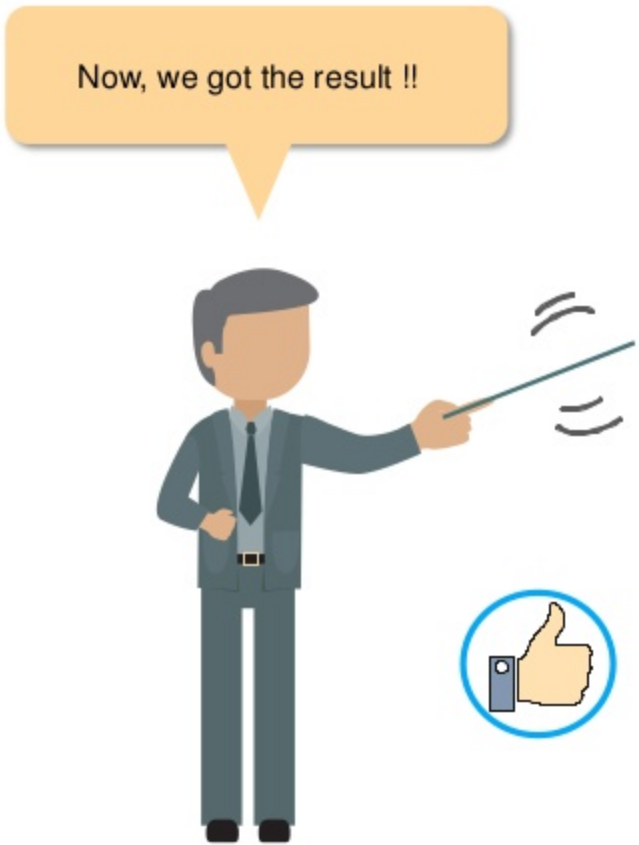
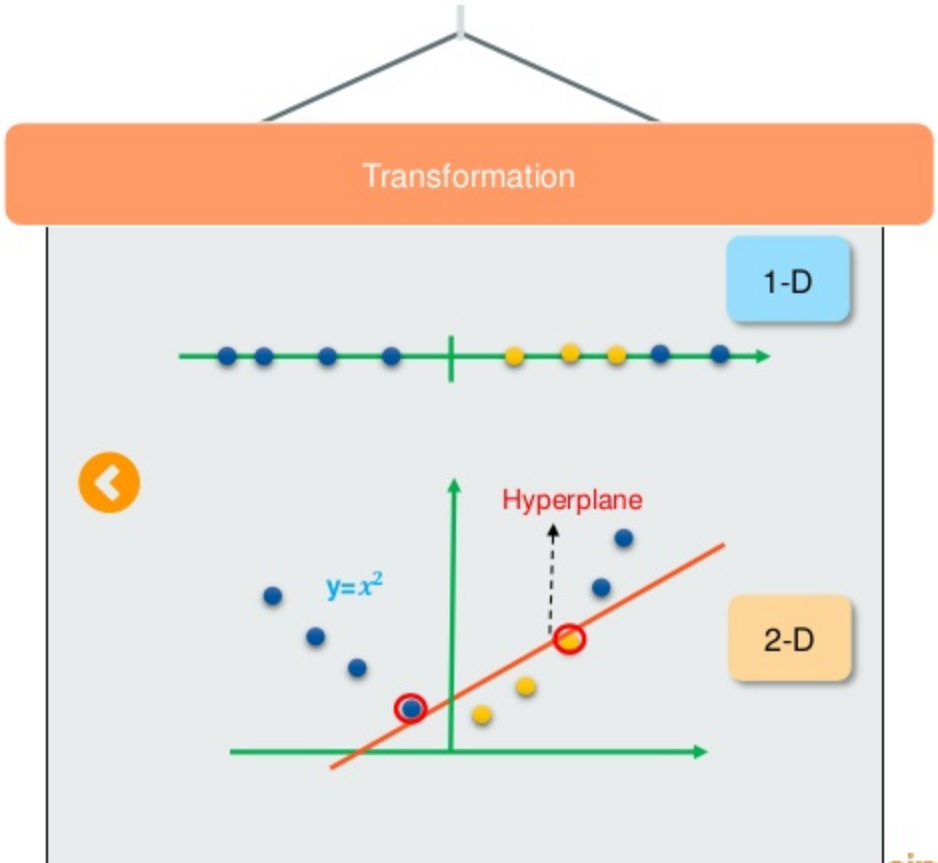
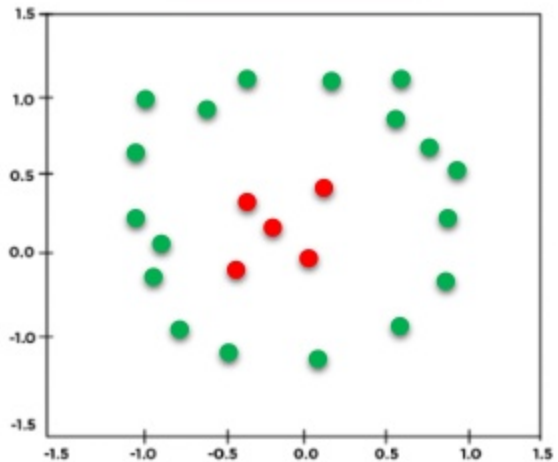




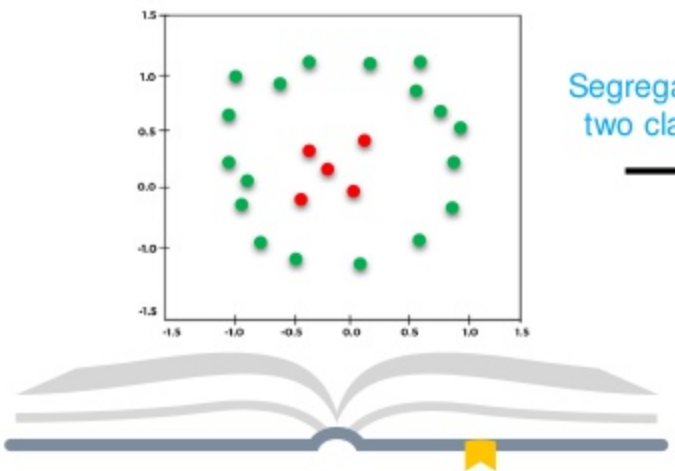
Understanding Support Vector Machine

How to perform SVM for this type of dataset?

Sample Dataset



Understanding Support Vector Machine

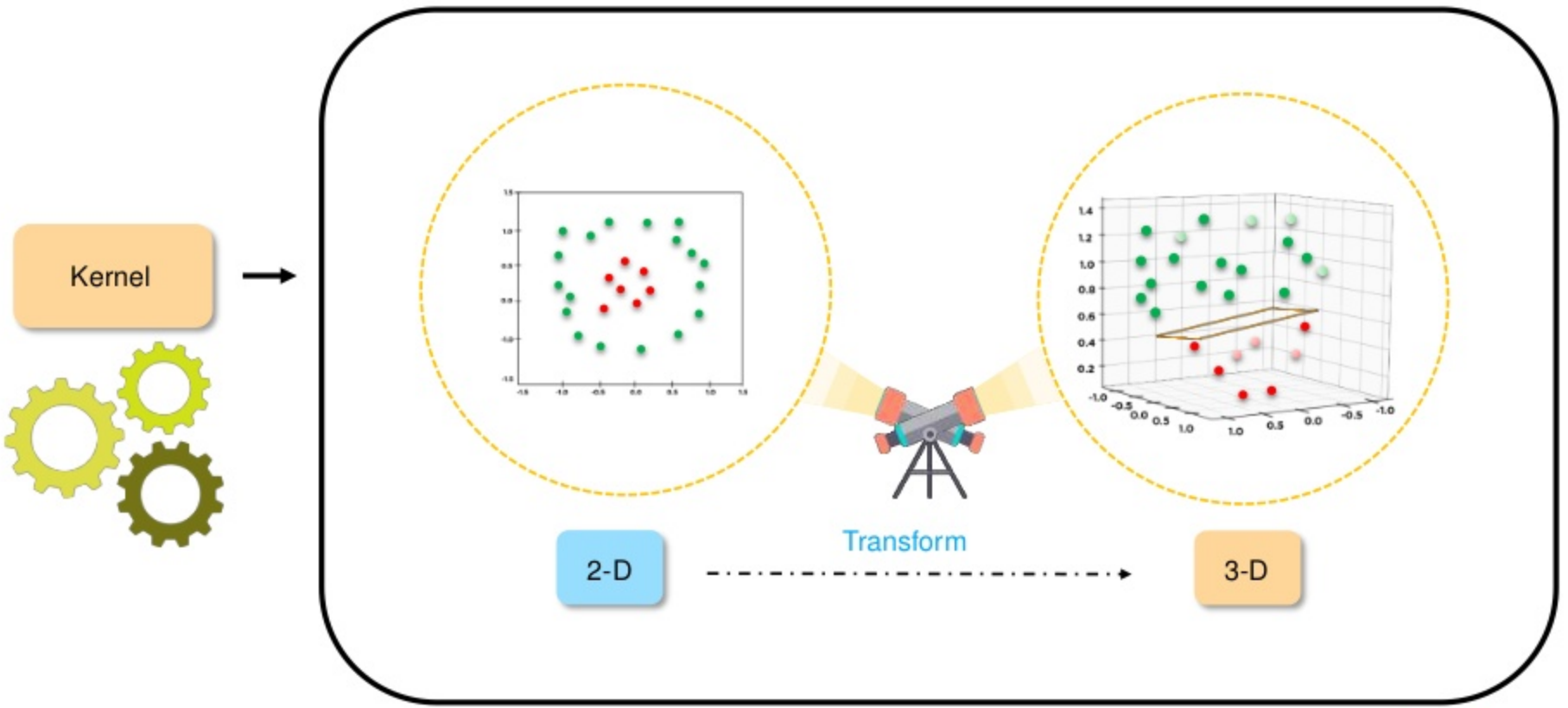


Sample Dataset

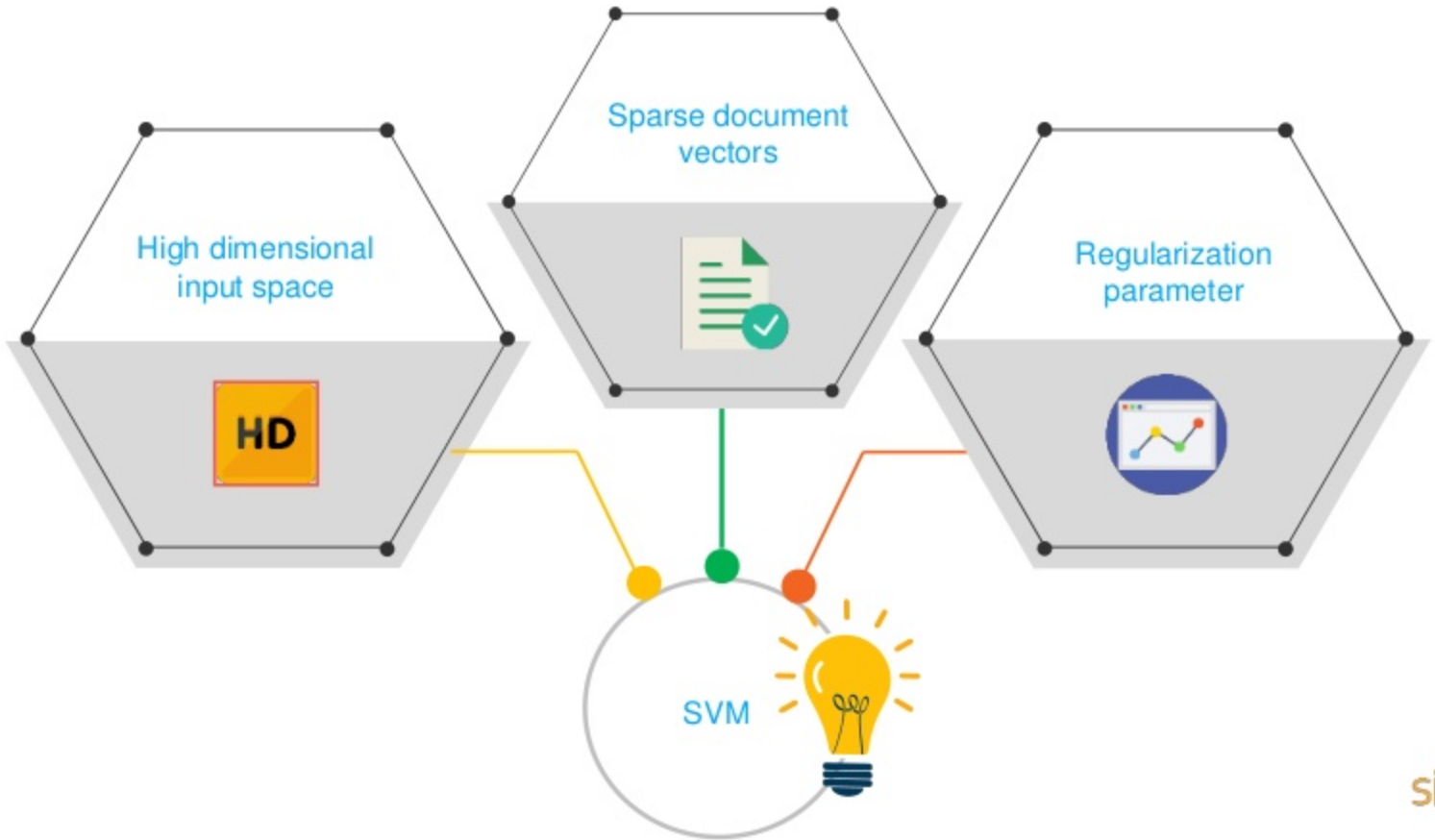
Segregate the two classes

Not an optimal hyperplane

Understanding Support Vector Machine



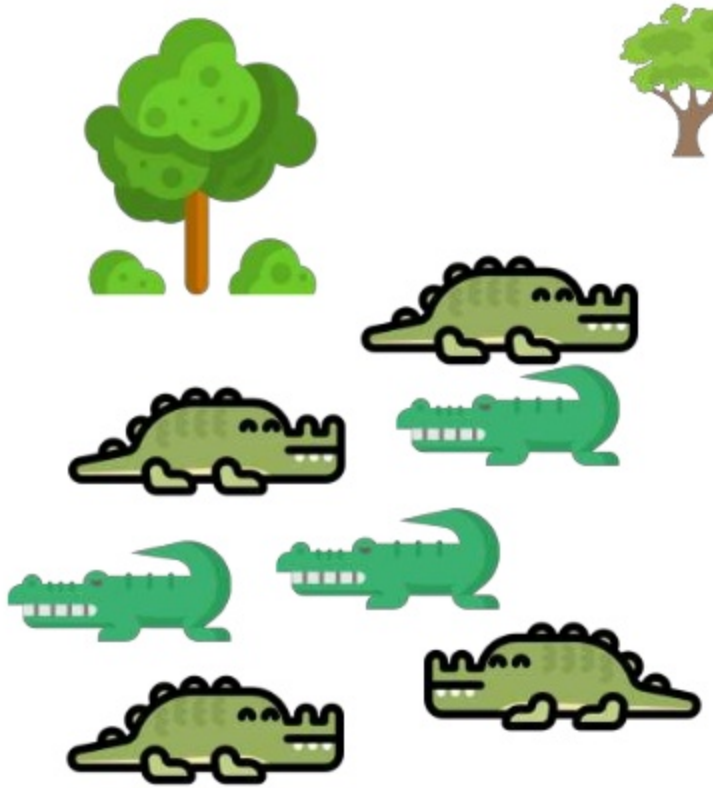
Advantages of Support Vector Machine



Use case – Problem Statement

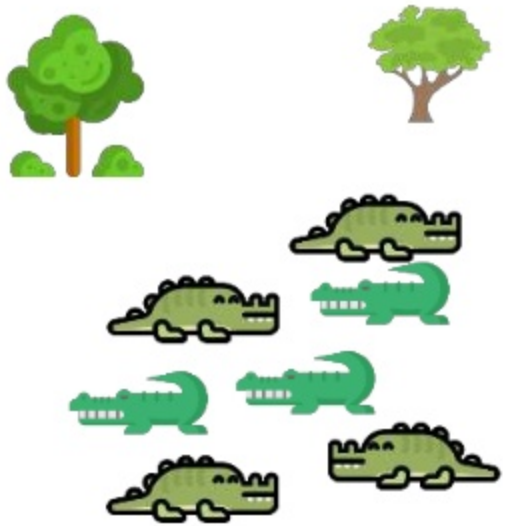
Dad, is that a group of Crocodiles or Alligators?

Well that's hard to differentiate



Use case – Problem Statement

Difference		
		
Size	• Crocodiles are larger in size	• Alligators are smaller in size
Snout Width	• Crocodiles have narrow snout	• Alligators have wider snout



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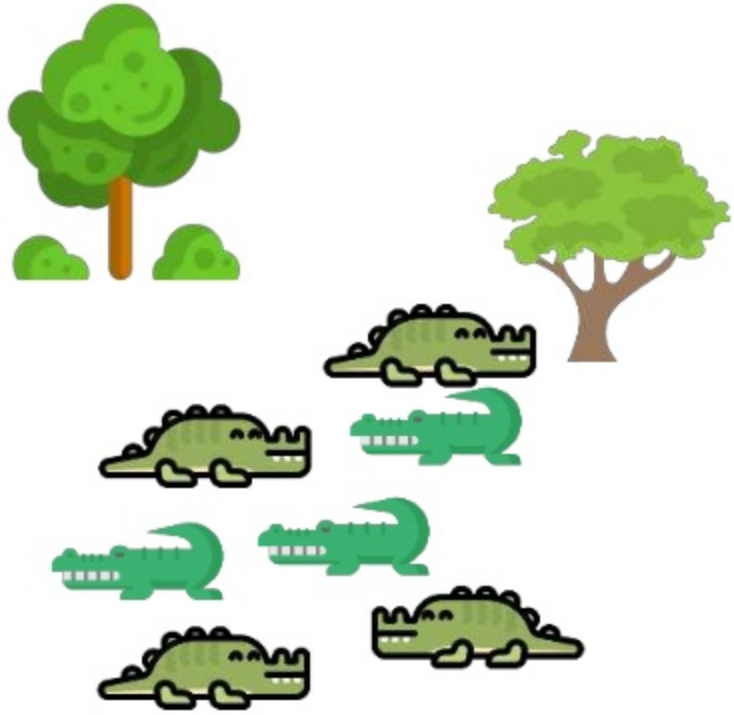
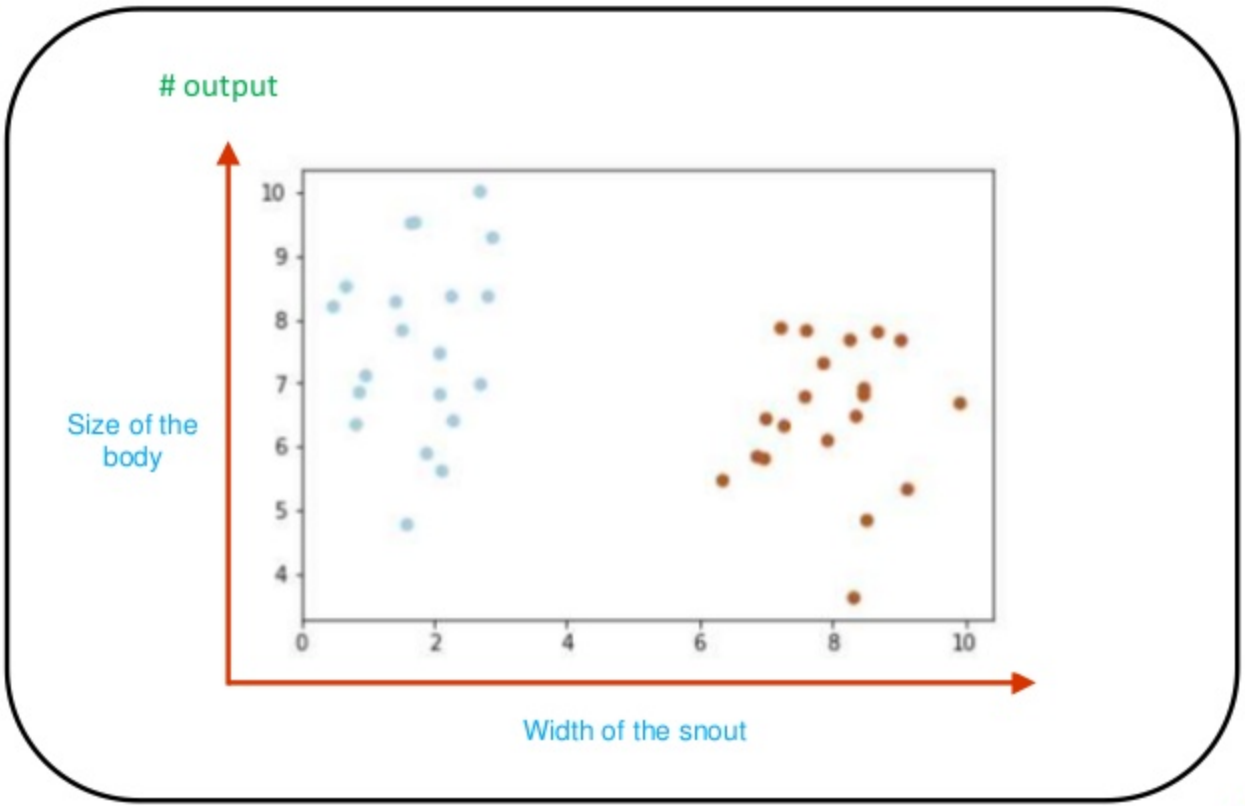
Use case – Problem Statement



Use case - Implementation

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn import svm
from sklearn.datasets.samples_generator import make_blobs
# we create 40 separable points
X, y = make_blobs(n_samples=40, centers=2, random_state=20)

# fit the model, don't regularize for illustration purposes
clf = svm.SVC(kernel='linear', C=1000)
clf.fit(X, y)

plt.scatter(X[:, 0], X[:, 1], c=y, s=30, cmap=plt.cm.Paired)
```

Use case - Implementation



Use case - Implementation

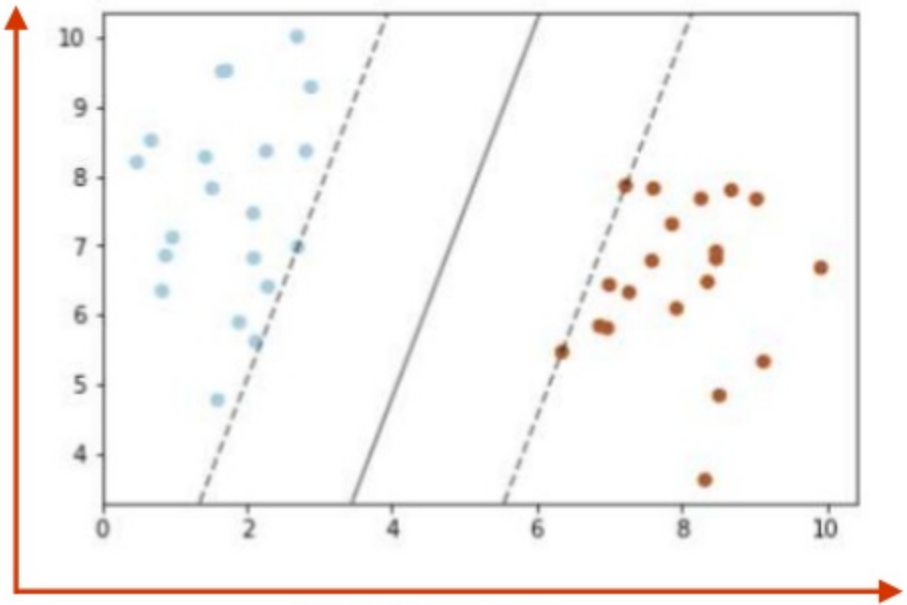
```
# fit the model, don't regularize for illustration purposes
clf = svm.SVC(kernel='linear', C=1000)
clf.fit(X, y)

plt.scatter(X[:, 0], X[:, 1], c=y, s=30,cmap=plt.cm.Paired)
plt.show

# plot the decision function
ax = plt.gca()
xlim = ax.get_xlim()
ylim = ax.get_ylim()

# create grid to evaluate model
xx = np.linspace(xlim[0], xlim[1], 30)
yy = np.linspace(ylim[0], ylim[1], 30)
YY, XX = np.meshgrid(yy, xx)
xy = np.vstack([XX.ravel(), YY.ravel()]).T
Z = clf.decision_function(xy).reshape(XX.shape)
```

Use case - Implementation

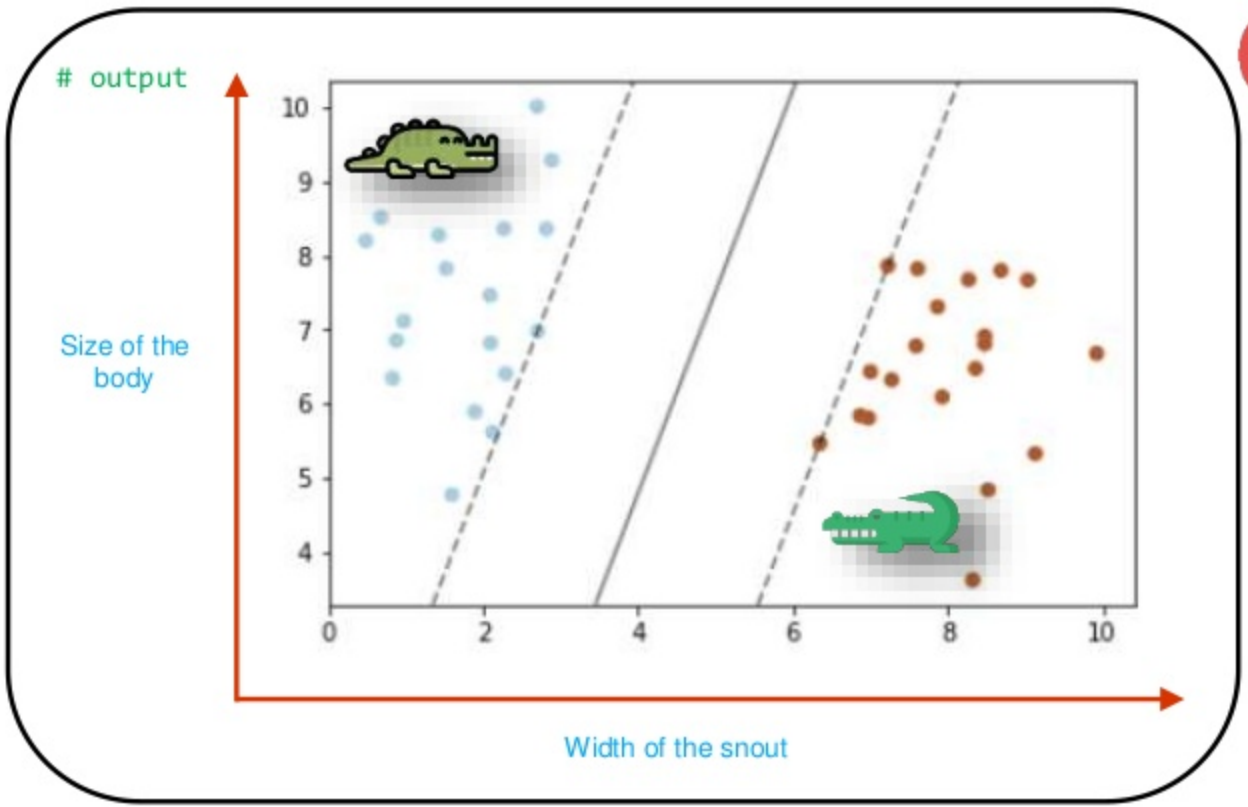
```
# plot decision boundary and margins
ax.contour(XX, YY, Z, colors='k', levels=[-1, 0, 1], alpha=0.5,
           linestyles=['--', '-', '--'])
# plot support vectors
ax.scatter(clf.support_vectors_[:, 0], clf.support_vectors_[:, 1],
s=100,
           linewidth=1, facecolors='none')
plt.show()
```

Use case - Implementation

```
# output
```



Use case - Implementation



Conclusion

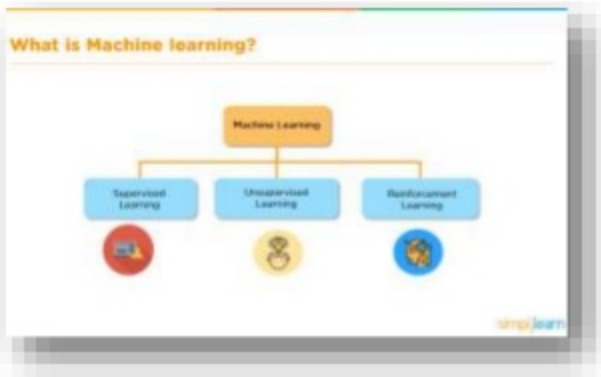
Congratulations!

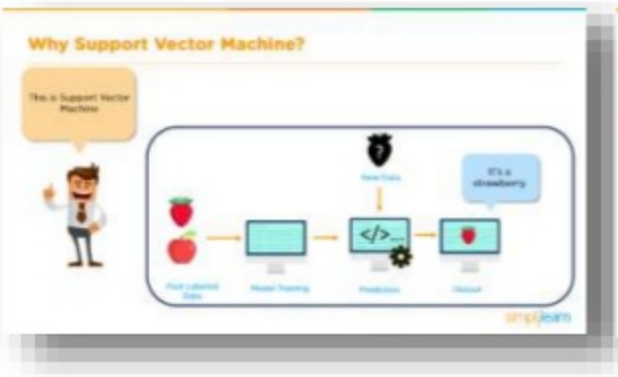
We have demonstrated Support vector machine by segregating the two classes

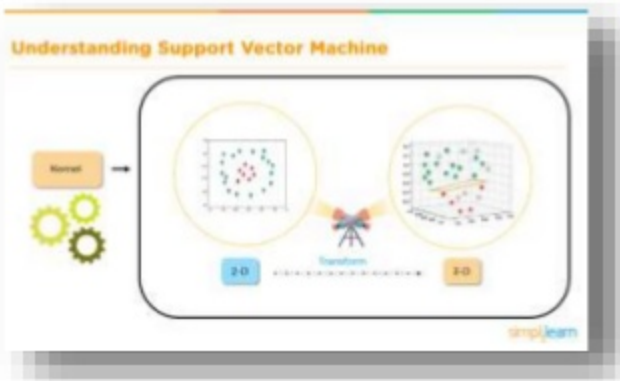
Where the blue data points represents crocodiles and the brown data points represents alligators

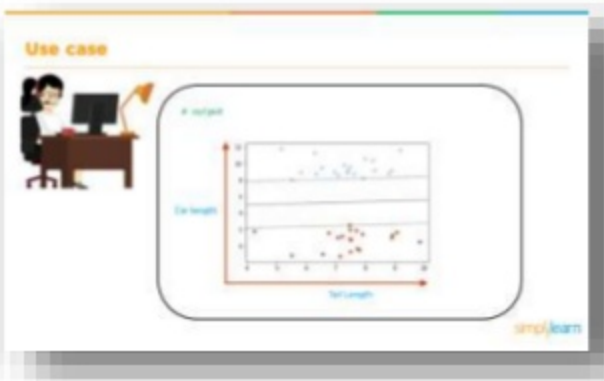
The hands on example will help you to encounter any Support Vector Machine project in future.

Key Takeaways










THANK YOU
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