

SVM Algorithm

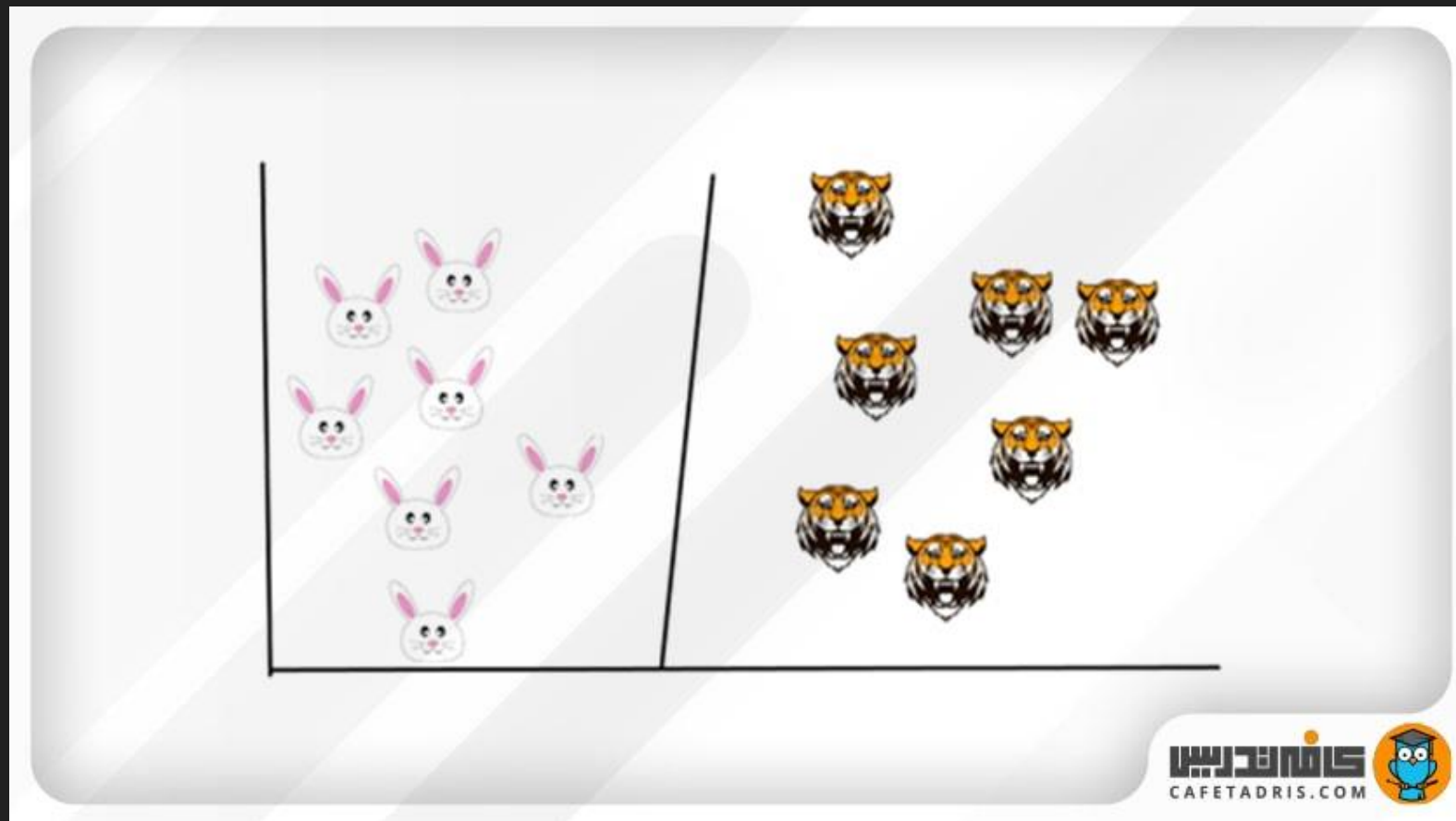


VIP Machine Learning Course

Support Vector Machine

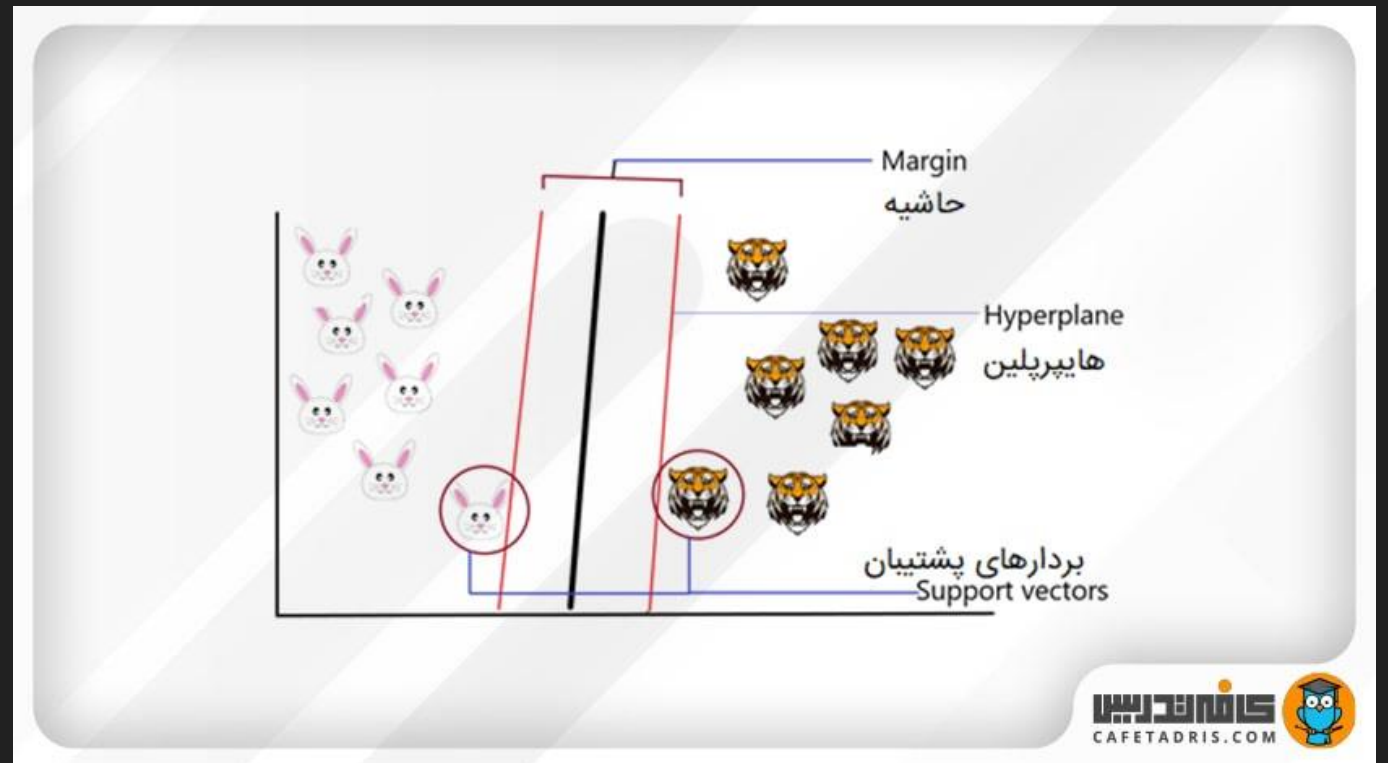
- One of the types of supervised learning algorithms tries to classify data by providing an optimal hyperplane (Classification) or describe data (Regression).

rabbits and lions example



rabbits and lions example

- The hyperplane is drawn randomly.
- Distances from the hyperplane to the nearest data points of each class are calculated.
- These points are called support vectors.
- The hyperplane that maximizes the distance from the support vectors is the best hyperplane.
- The distance between the hyperplane and the support vectors is called the margin.



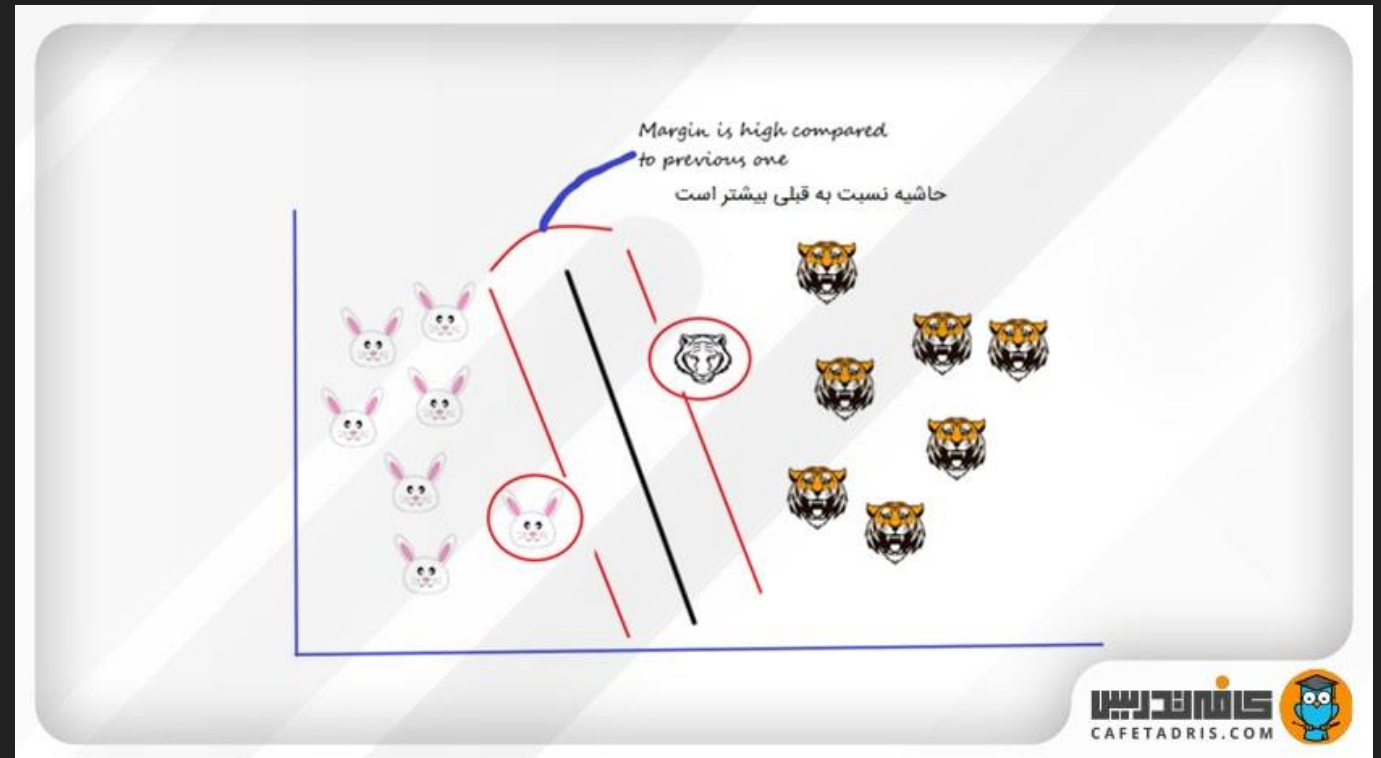
rabbits and lions example

- What happens if new data is added?



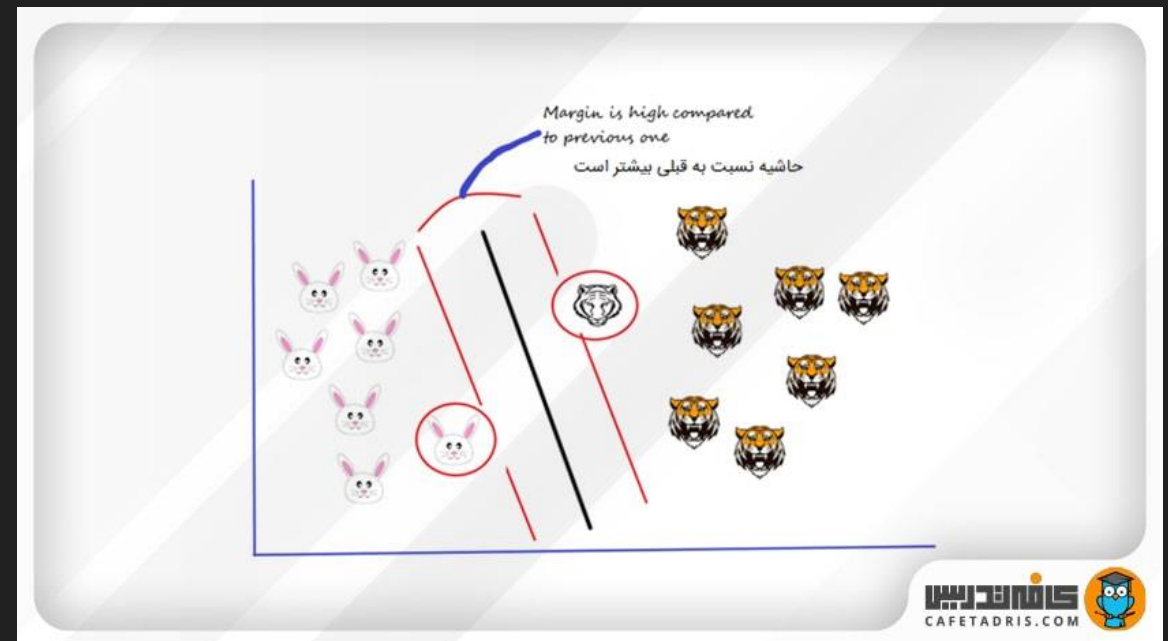
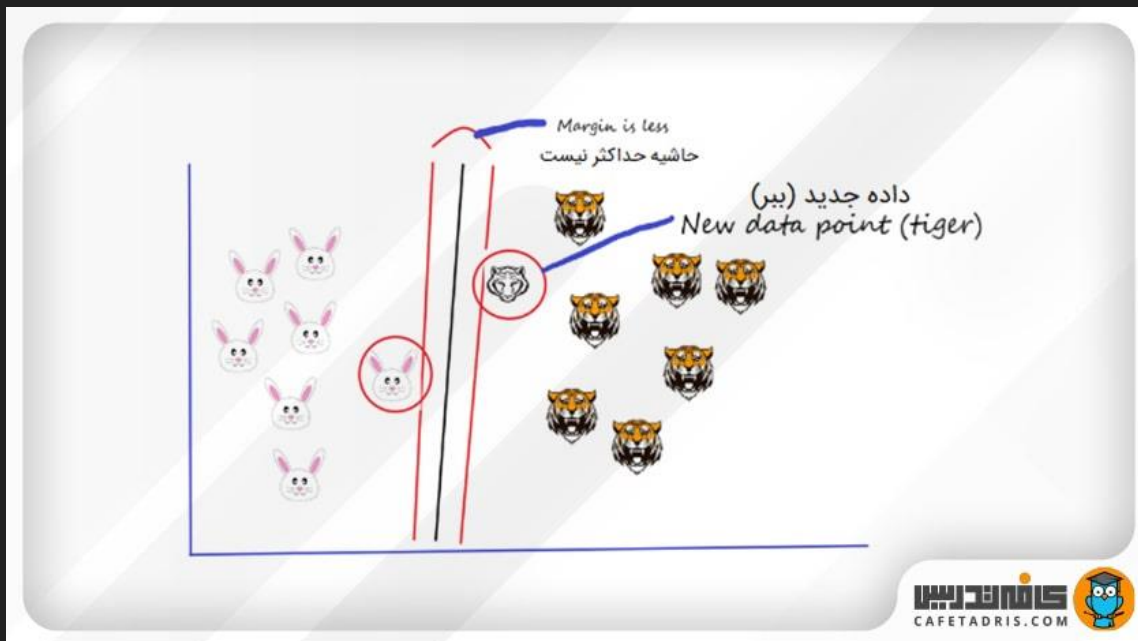
rabbits and lions example

- With the addition of new data, for example, a new tiger, the optimal hyperplane must be redrawn.
- As before, we start with a random hyperplane and then adjust it until the distance between the hyperplane and the support vectors is maximized (finding the best hyperplane).



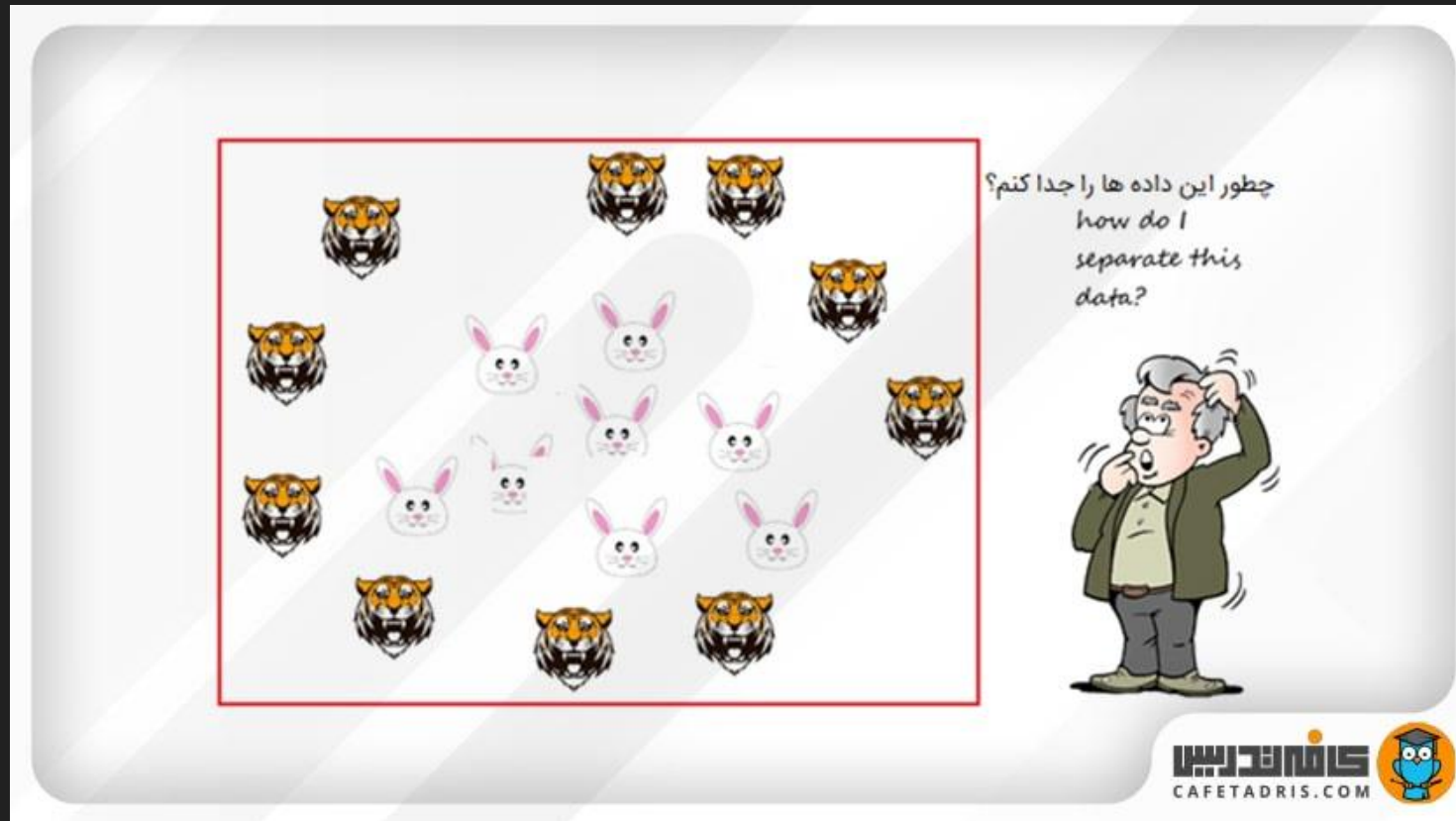
rabbits and lions example

- The hyperplane on the right is optimal because it has the maximum distance from each of the support vectors. Therefore, after the new data (the tiger data) is added, the algorithm selects this hyperplane over similar hyperplanes (like the one on the left).



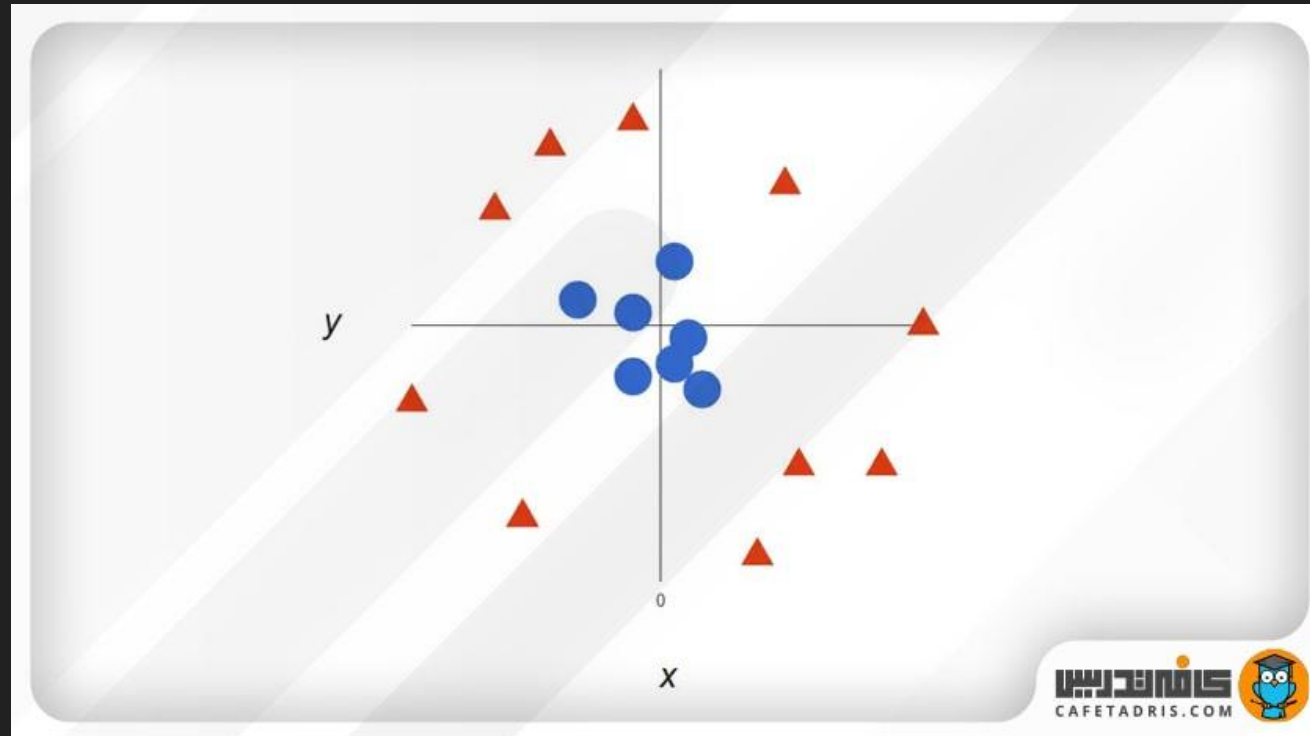
If the data is not linear

- Separating non-linearly separable data is difficult. (Non-linear problem)

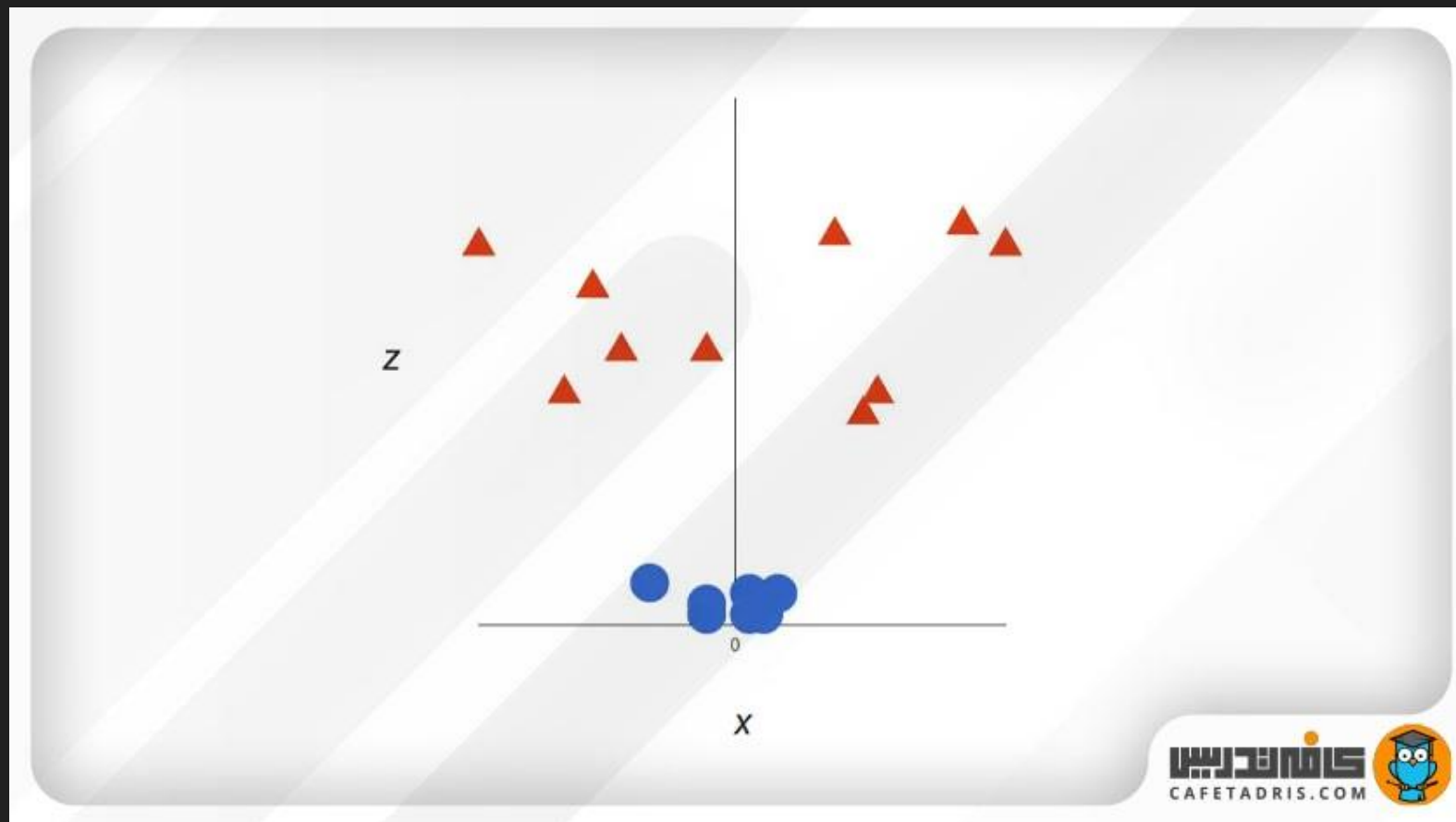


If the data is not linear

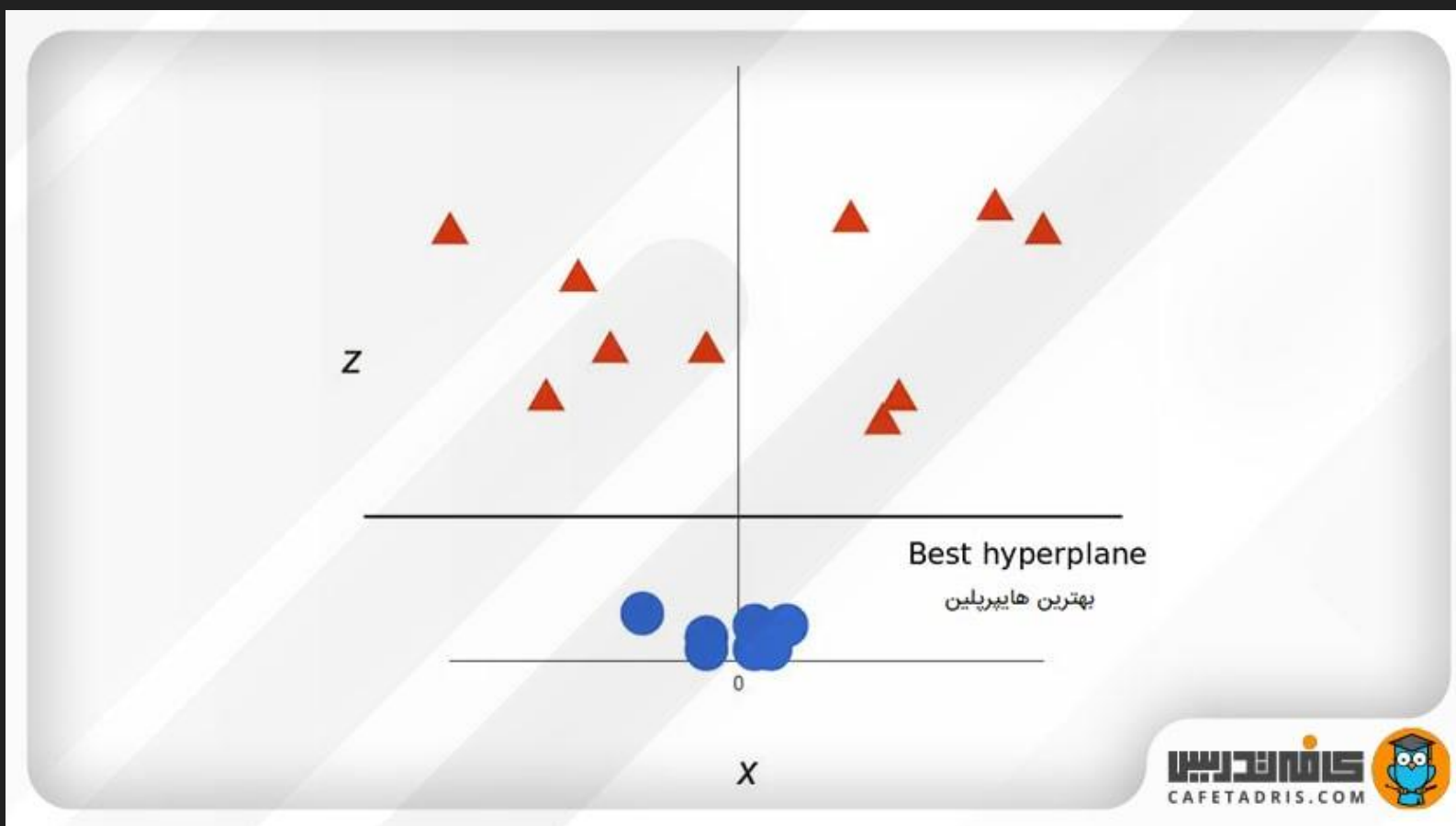
- For example, consider the following non-linear data. In this case, we cannot separate the data in two dimensions and need to add a third dimension to the data. (In SVM, this process of transforming two-dimensional data into three-dimensional data is also known as the Kernel Trick.)



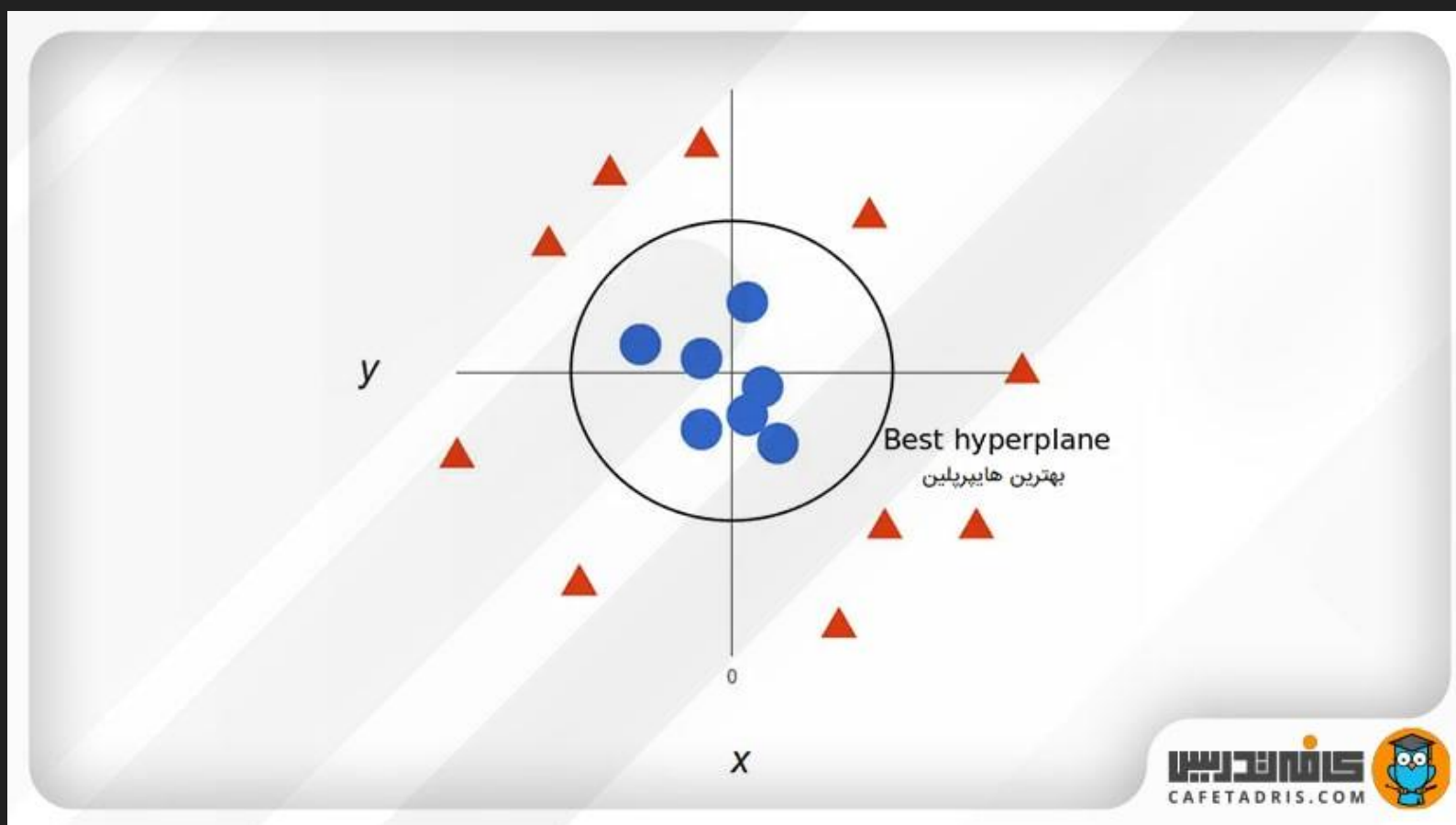
If the data is not linear



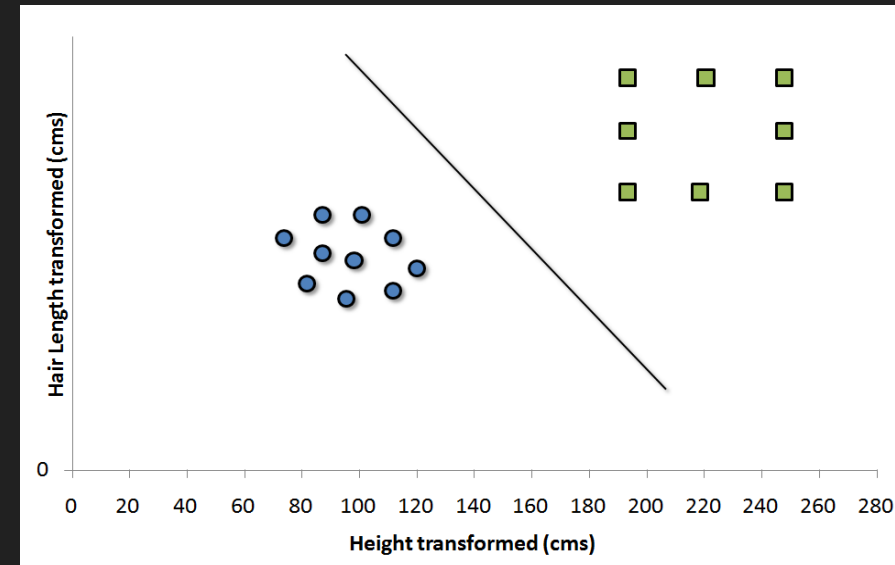
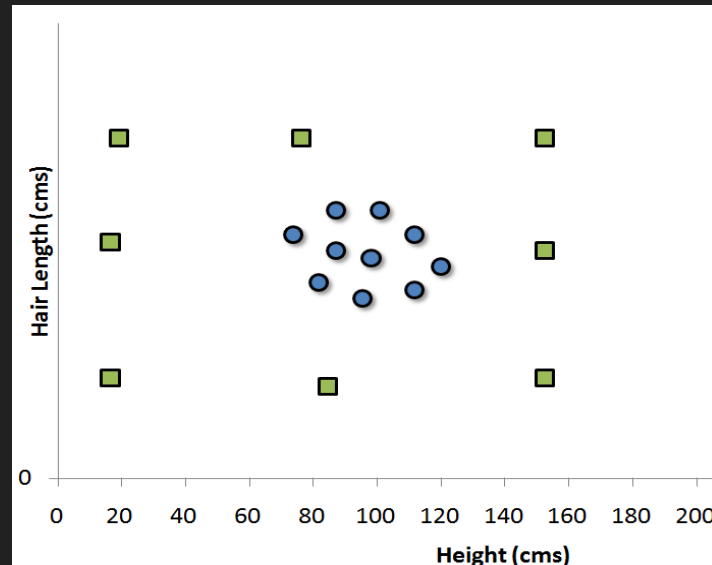
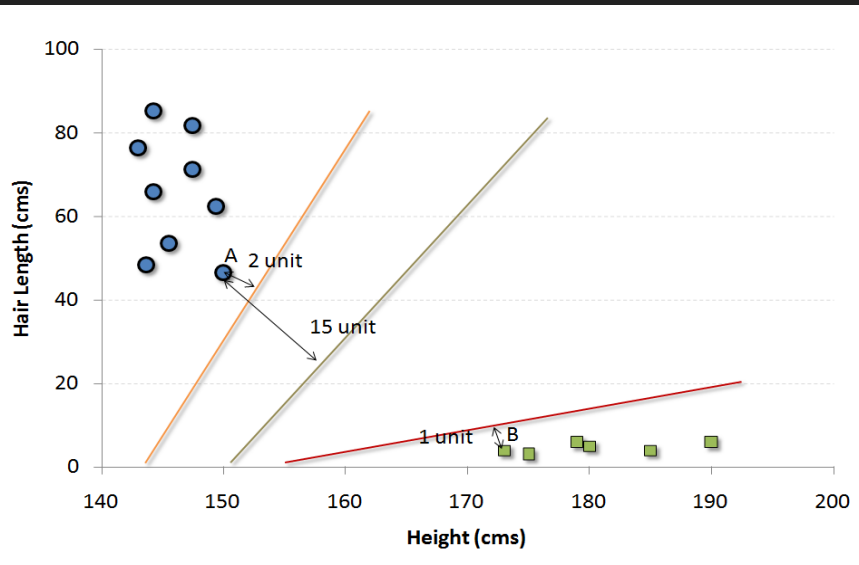
If the data is not linear



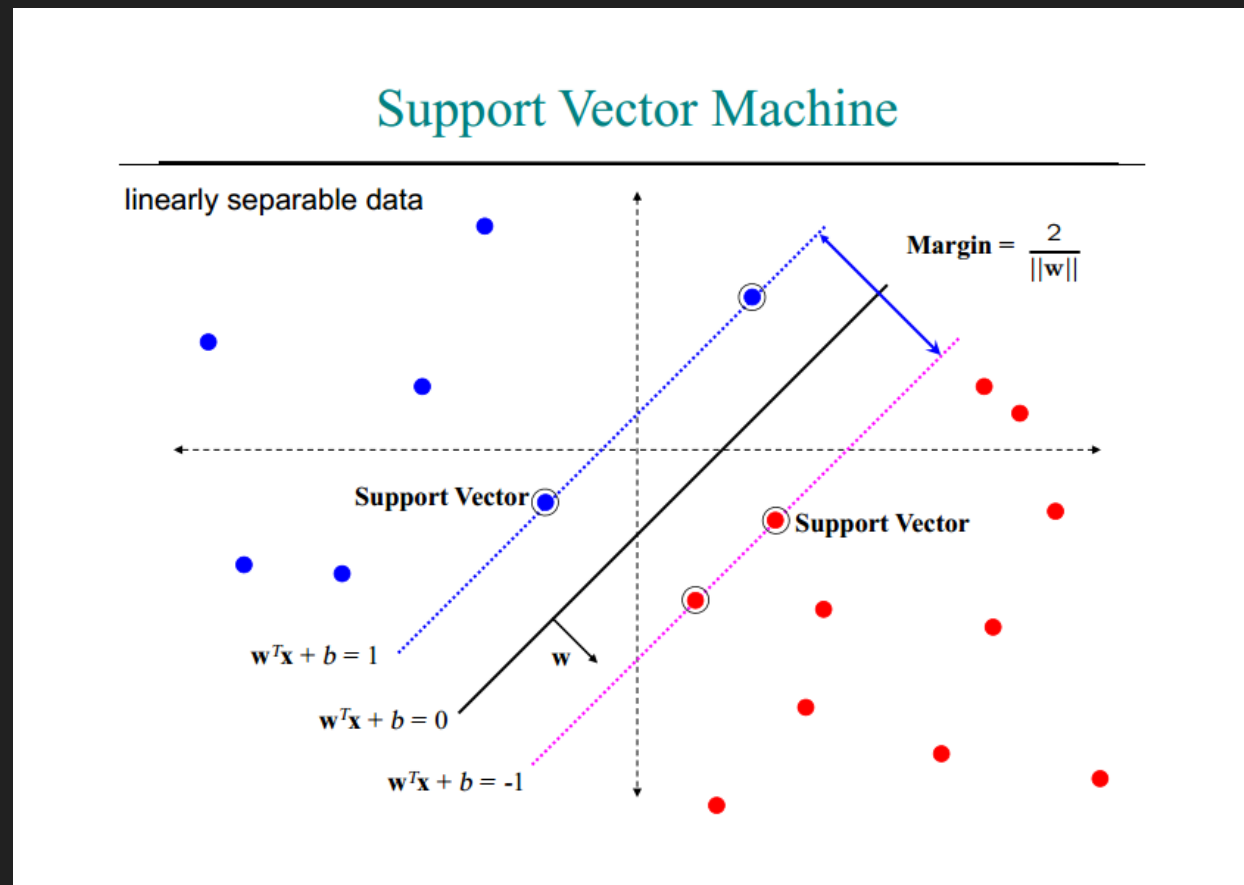
If the data is not linear



Difference Between Linear and Non-Linear Data in SVM

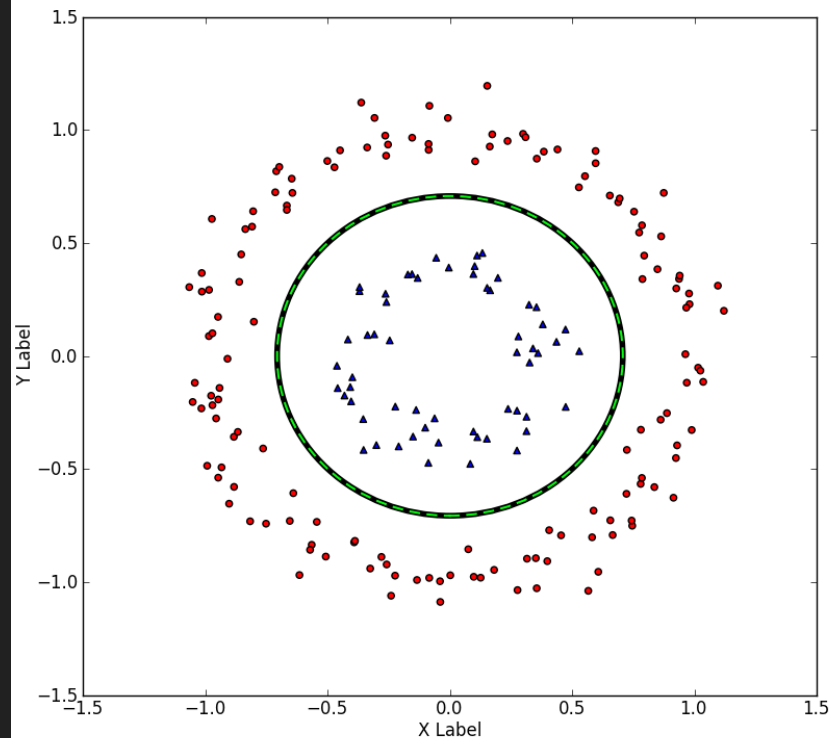


Equations of Lines Used in SVM

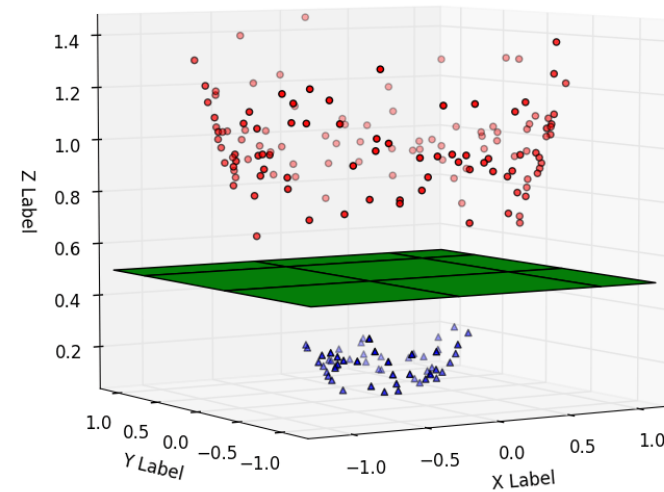


Dimensional Transformation in SVM

Non Linear Set

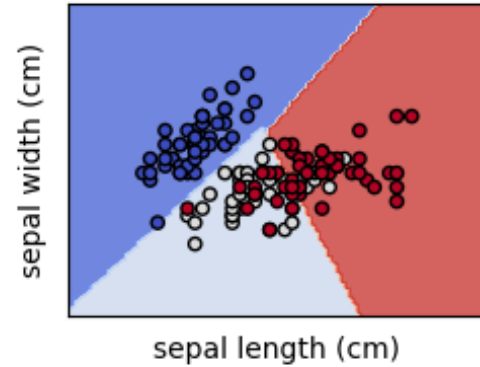


Transformed into 3 dimensional set

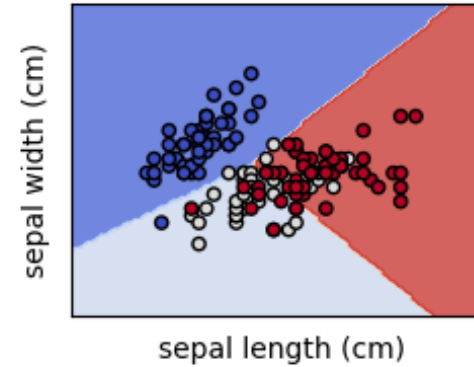


Type of Kernel in SVM

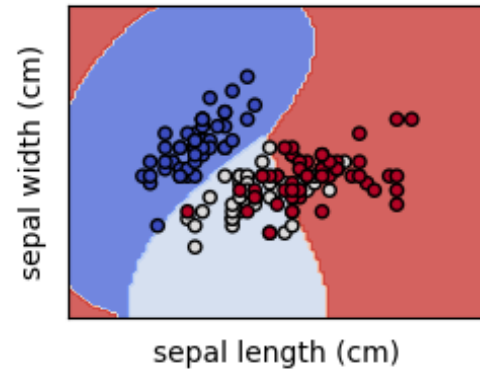
SVC with linear kernel



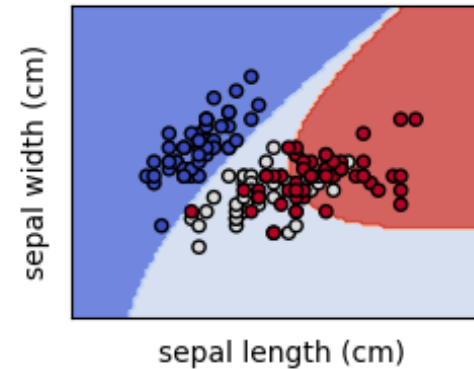
LinearSVC (linear kernel)



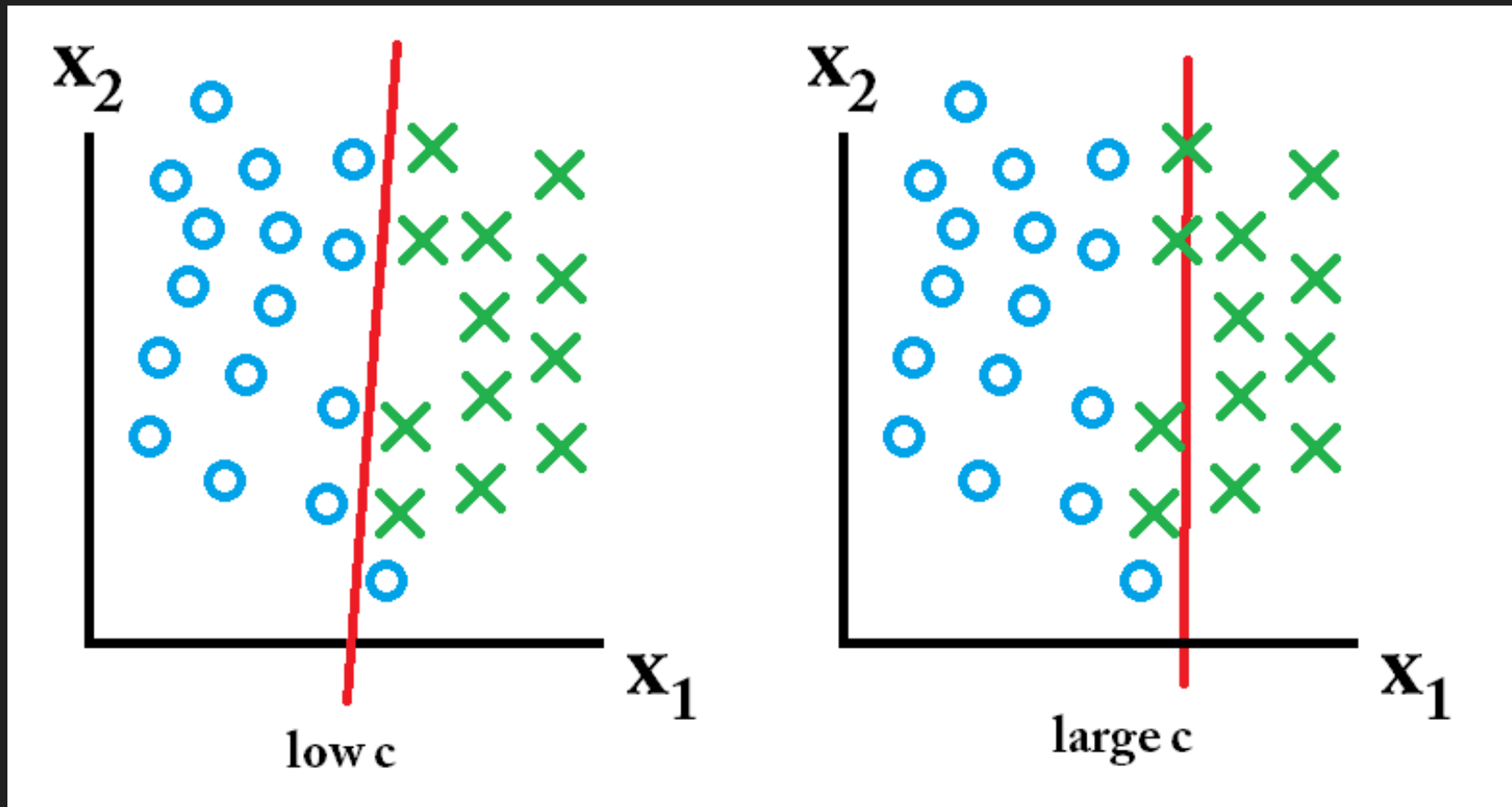
SVC with RBF kernel



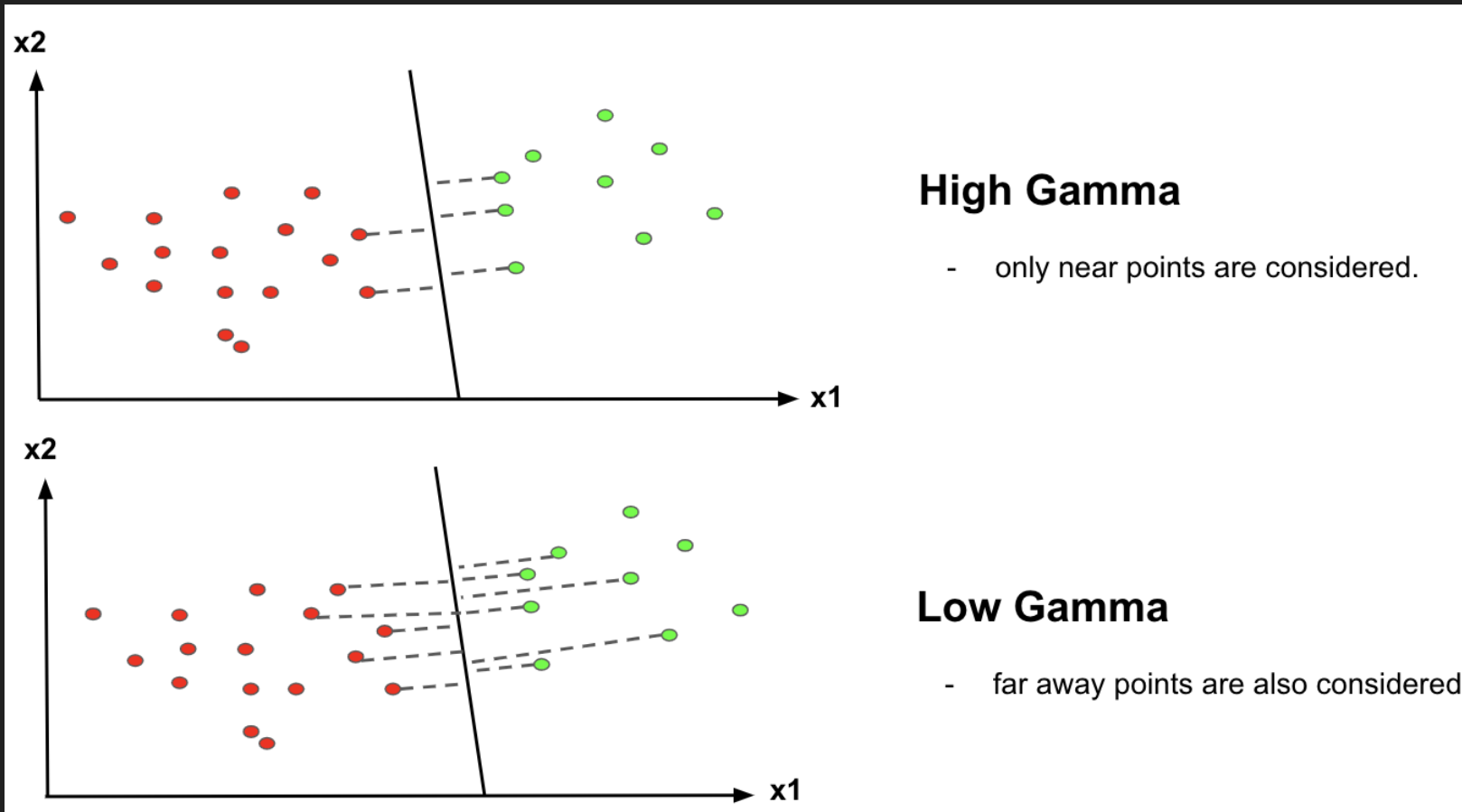
SVC with polynomial (degree 3) kernel



The parameter C in SVM



The parameter Gamma in SVM



Additional resources

https://en.wikipedia.org/wiki/Support_vector_machine

https://en.wikipedia.org/wiki/Kernel_method

<https://www.geeksforgeeks.org/support-vector-machine-algorithm>

<https://monkeylearn.com/blog/introduction-to-support-vector-machines-svm/>

<https://serokell.io/blog/support-vector-machine-algorithm>

<https://programmatically.com/understanding-hinge-loss-and-the-svm-cost-function/>

<https://www.theclickreader.com/support-vector-regression/>

<https://www.ritchieng.com/machine-learning-svms-support-vector-machines>

The End

Thank you for your attention. I wish you pleasant times ahead.