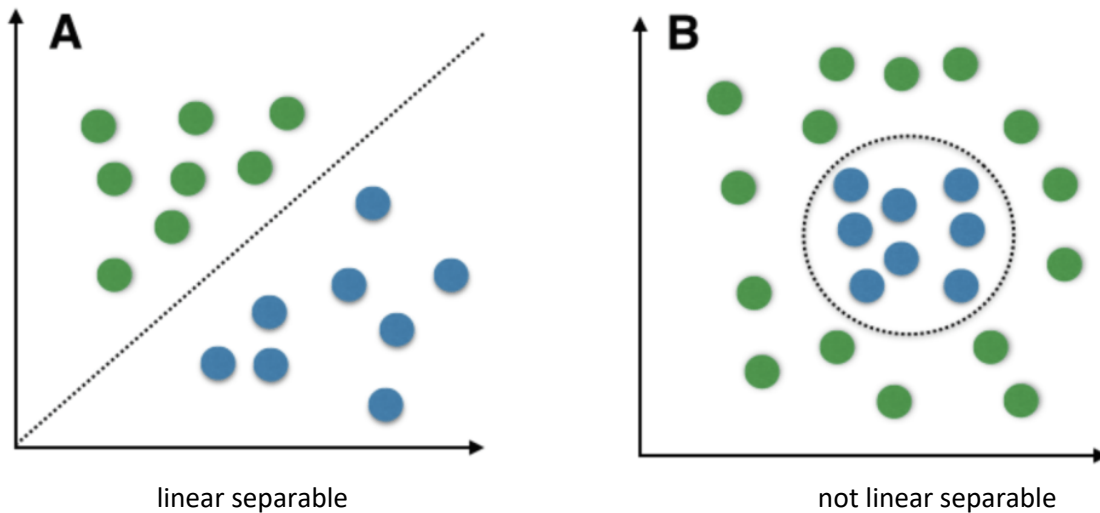
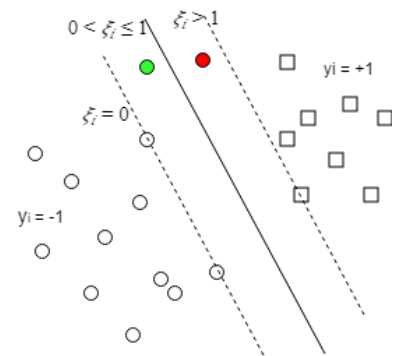


Two sets in the euclidean space are linearly separable if a hyperplane exists which separates these sets. The SVM requires the problem to be linearly separable in order to create a hyperplane which can be used for classification. If a given problem is not linear separable the SVM uses the so called “kernel trick”. Here, the data is transformed in a higher dimension in a way that the problem is linear separable. Afterwards, the Euclidean Space is transformed back into the original dimensionality, including the hyperplane which is probably not a plane (not linear) anymore. There are many different kernel functions for the mentioned space transformation. The selection of an appropriate function is dependent on the problem.



[https://i0.wp.com/www.tarekatwan.com/wp-content/uploads/2017/12/linear\\_sep.png?resize=1000%2C409](https://i0.wp.com/www.tarekatwan.com/wp-content/uploads/2017/12/linear_sep.png?resize=1000%2C409)

Slack variables are tool to allow for outliers in the trainings data. This way, there are points within the margin created by the support vectors and the separating plane (green and red dot).



(<https://nianlonggu.github.io/img/2019-06-07-SVM/svm-slack-variable.svg>)