**1 -What is the underlying concept of Support Vector Machines?**

SVM or Support Vector Machine is a linear model for classification and regression problems. It can solve linear and non-linear problems and work well for many practical problems. The idea of SVM is simple: **The algorithm creates a line or a hyperplane which separates the data into classes**

2 - **What is the concept of a support vector?**

A support vector machine (SVM) is **a type of deep learning algorithm that performs supervised learning for classification or regression of data groups**. In AI and machine learning, supervised learning systems provide both input and desired output data, which are labeled for classification.

3**- When using SVMs, why is it necessary to scale the inputs?**

**Because Support Vector Machine (SVM) optimization occurs by minimizing the decision vector w, the optimal hyperplane is influenced by the scale of the input features** and it's therefore recommended that data be standardized (mean 0, var 1) prior to SVM model training

4**. When an SVM classifier classifies a case, can it output a confidence score? What about a percentage chance?**

An SVM classifier can give the distance between the test instance and the decision boundary as output, so **we can use that as a confidence score**, but we cannot use this score to directly converted it into class probabilities.

5. **Should you train a model on a training set with millions of instances and hundreds of features using the primal or dual form of the SVM problem?**

We **should definitely use the primal form**, because the dual form will be much too slow. Say you trained an SVM classifier with an RBF kernel.

6. **Let's say you've used an RBF kernel to train an SVM classifier, but it appears to underfit the training collection. Is it better to raise or lower (gamma)? What about the letter C?**

If an SVM classifier trained with an RBF kernel underfits the training set, there might be too much regularization. To decrease it, you need to increase gamma or C (or both).

C is a hyperparameter.

7. **To solve the soft margin linear SVM classifier problem with an off-the-shelf QP solver, how should the QP parameters (H, f, A, and b) be set?**

Let’s call the QP parameters for the hard-margin problem H′, f′, A′ and b′. The QP parameters for the soft-margin problem have m additional parameters (np = n + 1 + m) and m additional constraints

(nc = 2m). They can be defined like so:

* H is equal to H′, plus m columns of 0s on the right and m rows of 0s at the bottom
* f is equal to f′ with m additional elements, all equal to the value of the hyperparameter C.
* b is equal to b′ with m additional elements, all equal to 0.
* A is equal to A′, with an extra m × m identity matrix Im appended to the right,

8.

9.

10.