1.What is the underlying concept of Support Vector Machines?

Ans.

Support Vector Machines (SVMs) are a type of supervised machine learning algorithm that can be used for classification or regression tasks. The underlying concept of SVMs is to find the hyperplane that best separates the data points into different classes, while maximizing the margin between the hyperplane and the closest points in each class.

2.What is the concept of a support vector?

Ans.

In SVMs, a support vector is a data point that lies closest to the hyperplane and contributes to the definition of the margin. These are the data points that have the greatest influence on the position of the hyperplane, and they are used to define the decision boundary between the different classes.

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

Ans.

It is necessary to scale the inputs when using SVMs because the algorithm is sensitive to the scale of the features. Features that have a larger scale will dominate the optimization process and may lead to suboptimal solutions. Scaling the features to a similar range can help to ensure that all features are equally important in the optimization process.

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

Ans.

Yes, an SVM classifier can output a confidence score, which represents the distance between the test data point and the decision boundary. However, this score cannot be interpreted as a percentage chance or probability, as SVMs do not provide a probabilistic interpretation of the classification results.

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?

Ans.

For a training set with millions of instances and hundreds of features, it is usually more efficient to use the dual form of the SVM problem, as it can be solved more efficiently using kernel methods.

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 appears to underfit the training data, it may be better to increase the value of gamma, which controls the width of the kernel. The parameter C, which controls the trade-off between maximizing the margin and minimizing the classification error, may also need to be adjusted to allow for more flexibility in the decision boundary.

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?

The QP parameters for solving the soft margin linear SVM classifier problem can be set as follows:

H: a diagonal matrix of ones

f: a vector of zeros

A: a matrix containing the training data with labels and a column of ones for the intercept term

b: a vector of ones multiplied by the slack variable C