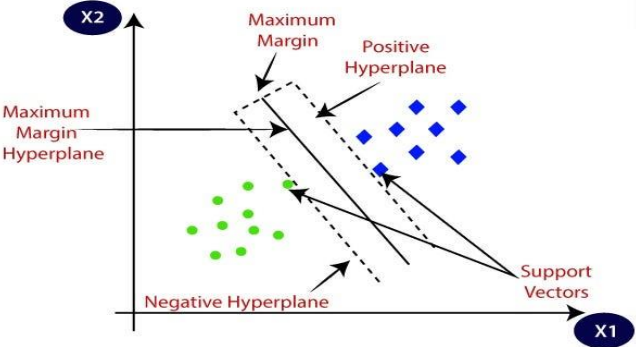
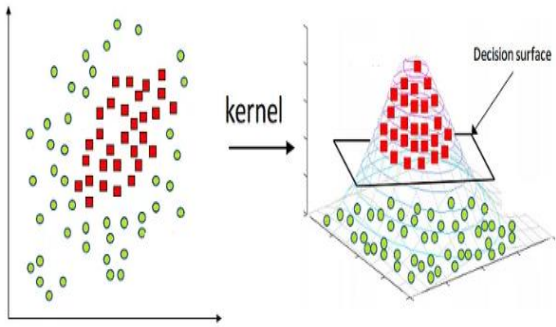



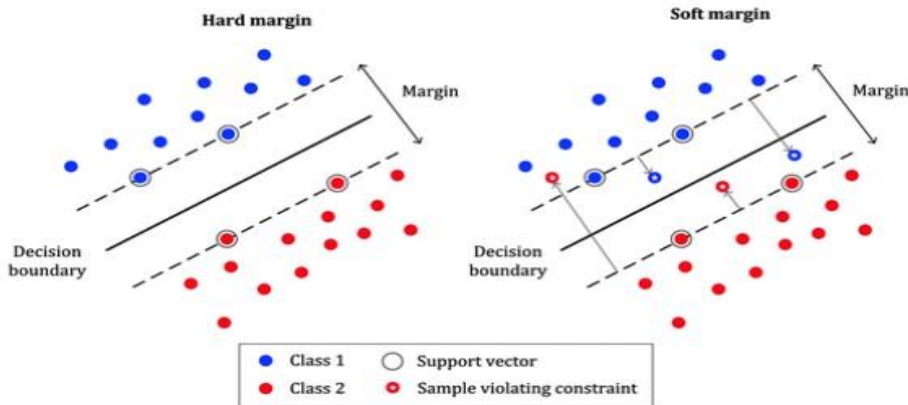
## SUPPORT VECTOR MACHINE INTERVIEW QUESTIONS & ANSWERS

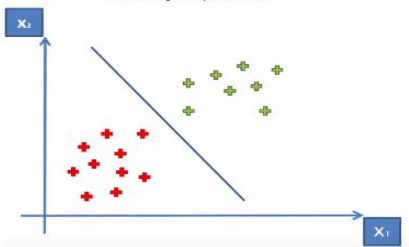
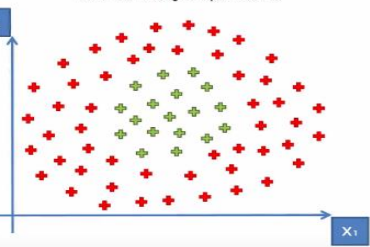
### (SVM)

It is used in both classification (SVC) and regression problem (SVR).

Q. NO	QUESTION & ANSWER	Remark
1	<p><b>What is SVM?</b></p> <p>SVM is a supervised machine learning algorithm that works on both classification and regression problem statements.</p> <p>For classification problem statements, it tries to differentiate data points of different classes by finding a hyperplane that maximizes the margin between the classes in the training data.</p> <p>In simple words, SVM tries to choose the hyperplane which separates the data points as widely as possible since this margin maximization improves the model's accuracy on the test or the unseen data</p>	
2	<p><b>How does SVM work?</b></p> 	
3	<p><b>What is the basic principle of a Support Vector Machine?</b></p> <p>It's aimed at finding an optimal hyperplane that is linearly separable, and for the dataset which is not directly linearly separable, extends its formulation by transforming the original data to map into new space, which is also called kernel trick. Ex-1D to 2D or 2D to 3D space</p>	
4	<p><b>What are the Assumptions of SVM?</b></p> <p>There are <b>no certain assumptions</b> about the SVM algorithm. Instead, the algorithm learns from the data and its patterns. If any data fed to the algorithm, the algorithm will take time to learn the patterns of the data, and then it will result accordingly to the data and its behavior</p>	

Q. NO.	QUSTION& ANSWER	
5	<b>What is Kernel Trick in SVM</b>	
		
	<ul style="list-style-type: none"> <li>- It uses a mathematical function (the kernel) to transform the data into a higher dimension, making it easier to separate groups with complex boundaries. This trick helps SVM handle more complicated patterns and relationships in the data.</li> </ul>	
6	<b>How Would You Explain SVM to a Nontechnical Person?</b>	
	<p>As we can see in the road image, there are a total of three lines that are present on the road; the middle line divides the route into two parts, which can be understood as a line dividing for positive and negative values, and the left and right bar are them which signifies the limit of the road, means that after this line, there will be no driving area.</p> 	
7	<b>Why Support Vector Machine is a Nonparametric Algorithm?</b>	
	<p>Support Vector Machine (SVM) is considered a non-parametric algorithm because it does not assume a specific form for the data distribution. Instead of relying on predefined functions, SVM learns directly from the patterns in the data provided. This flexibility allows SVM to adapt to various types of data without being limited by strict assumptions, unlike parametric algorithms which require the data fit specific assumptions. This makes SVM highly versatile and capable learning from any dataset..</p>	

Q. NO.	QUSTION& ANSWER	
8	<b>When do we consider SVM as a Parametric Algorithm?</b>	
	In the case of linear SVM, the algorithm tries to fit the data linearly and produces a linear boundary to split the data; here, as the regression line or the boundary line is linear, its principle is the same as the linear regression, and hence the direct function can be applied to solve the problem, which makes the algorithm parametric.	
9	<b>What is Hard and Soft margin SVMs?</b>	
	 <p>The diagram illustrates the difference between Hard margin and Soft margin SVMs. In the Hard margin plot, data points of two classes (blue and red) are separated by a solid decision boundary, with dashed lines indicating the margins. In the Soft margin plot, some data points (red circles) are shown violating the margin constraints, with arrows indicating the distance from the decision boundary. A legend at the bottom identifies the symbols: blue dot for Class 1, red dot for Class 2, white circle for Support vector, and red circle with a dot for Sample violating constraint.</p>	
	<p><b>Hard margin:</b> A type of SVM that tries to perfectly separate the data into classes with no misclassifications.</p> <p><b>Use Case:</b> Only works well when data is linearly separable <b>without</b> any overlap or noise.</p> <p><b>Soft Margin:</b> A type of SVM that allows some <b>misclassifications or overlaps</b> to find a better overall boundary.</p> <p><b>Use Case:</b> Useful for real-world data that is not perfectly separable, accommodating noise and outliers.</p> <p>Hard margin SVMs aim for perfect separation, while soft margin SVMs balance separation and flexibility by allowing some errors</p>	
10	<b>What are Support Vectors in SVMs?</b>	
	Support vectors are the data points that are <b>closest to the line</b> (or boundary) that SVM draws. These points are important because they help determine exactly where the line should be placed to best separate the different groups.	
11	<b>What is the margin in SVM?</b>	
	The margin is the <b>distance between the boundary line and the closest data points</b> from each group. SVM aims to <b>maximize this margin</b> to ensure that the boundary is far away as possible from the nearest points in each group, making the separation clearer and more robust.	

Q. NO.	QUESTION& ANSWER	
12	<p><b>Can SVM be used for regression?</b></p> <p>Yes, SVM can be used for regression, which is called Support Vector Regression (SVR). Instead of finding a boundary line to separate groups, SVR finds a line that best fits the data points, with most points lying within a certain margin from this line</p>	
13	<p><b>Are SVMs sensitive to Feature Scaling?</b></p> <p>Yes</p>	
14	<p><b>Explain different types of kernel functions.</b></p> <p>1.Linear Kernel The simplest kernel. It doesn't transform the data, just computes the dot product of the input features. Use Case: When the data is linearly separable.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Fig.3</p> <p>Linearly Separable</p>  </div> <div style="text-align: center;"> <p>Fig.4</p> <p>Not Linearly Separable</p>  </div> </div> <p>2. Polynomial Kernel: Transforms the data into a higher-dimensional space using polynomial functions. Use Case: When the relationship between features is <b>polynomial</b></p> <p>3. Radial Basis Function (RBF) Kernel (or Gaussian Kernel): Uses the <b>distance of the points from a center</b> to transform the data into a higher-dimensional space. Use Case: When the decision boundary is not linear.</p>	
15.	<p><b>What is a slack variable?(C)</b></p> <p>A slack variable in SVM is a term introduced to allow some data points to be on the wrong side of the margin or even on the wrong side of the hyperplane in order to achieve a better separation. It helps us tune how much we want to penalize points lying either inside of our margin or complete misclassifications. It is recommended to use cross-validation to find out the best value of C</p>	
16.	<p><b>What is the difference in idea for using Support Vector Machine for regression and classification?</b></p> <p>For classification with SVM, our goal is <b>to maximize</b> the distance between our <b>decision boundary</b> and our support vectors (margin). For regression, the goal now is <b>keep all the points within the margin</b>.</p>	

Q. NO.	QUESTION& ANSWER	
17	<b>What are advantages of SVM?</b>	
	<p>SVM is more effective in high dimensional spaces.</p> <p>SVM is relatively memory efficient.</p> <p>SVM's are very good when we have no idea on the data.</p> <p>Works well with even unstructured and semi structured data like text, Images and trees.</p> <p>The kernel trick is real strength of SVM. With an appropriate kernel function, we can solve any complex problem.</p> <p>SVM models have generalization in practice, the risk of over-fitting is less SVM.</p>	
18.	<b>What are disadvantages of SVM?</b>	
	<p>More Training Time is required for larger dataset</p> <p>It is difficult to choose a good kernel function</p> <p>The SVM hyper parameters are Cost -C and gamma. It is not that easy to fine-tune these hyper-parameters. It is hard to visualize their impact.</p>	
19	<b>Impact of Missing Values?</b>	
	<b>Impact of outliers? Less sensitive to outliers</b>	
20	<b>Overfitting And Underfitting in SVM?</b>	
	<p>In SVM, to avoid overfitting, we choose a Soft Margin, instead of a Hard one i.e. we let some data points enter our margin intentionally (but we still penalize it) so that our classifier don't overfit on our training sample.</p>	
21	<b>Different Problem statement you can solve using SVM?</b>	
	<p>We can use SVM with every ANN usecases</p> <p>Intrusion Detection</p> <p>Handwriting Recognition</p>	