**1. What does one mean by the term "machine learning"?**

It is a branch of AI which involves the use of data and algorithms in such a manner that they can be used to learn the way humans learn and solve complex problems without any human interaction.

**2.Can you think of 4 distinct types of issues where it shines?**

Machine learning helps in solving different types of issues such as credit card fraud detection, house price prediction, self driving cars, cancer detection, email spam filtering, conversational AI etc.

**3.What is a labeled training set, and how does it work?**

A labelled training dataset contains a target class variable along with the other variables. It can be used to train a supervised machine learning model.

**4.What are the two most important tasks that are supervised?**

The two most important tasks in supervised machine learning are classification and regression tasks.

**5.Can you think of four examples of unsupervised tasks?**

* Clustering
* Visualization
* Dimensionality Reduction
* Association Rule Learning

**6.State the machine learning model that would be best to make a robot walk through various unfamiliar terrains?**

We can use reinforcement learning to perform the given task.

**7.Which algorithm will you use to divide your customers into different groups?**

I will use clustering algorithms for dividing the customers into different groups, if we have not classified them into different groups. If we have that data, then we can go for any supervised machine learning approach.

**8.Will you consider the problem of spam detection to be a supervised or unsupervised learning problem?**

I will consider the problem as a supervised learning problem as humans can label the spam email to a very good extent.

**9.What is the concept of an online learning system?**

An online learning system learns from new data on-the-fly. As a result, the system is trained incrementally either by using one example at a time or using a mini-batch approach. This keeps each learning step cheap and memory efficient

**10.What is out-of-core learning, and how does it differ from core learning?**

Out-of-core learning is used when a dataset is too large to fit into a computer's memory. The algorithm loads part of the data, runs a training step, then repeats the process until it has run on all the data.

**11.What kind of learning algorithm makes predictions using a similarity measure?**

Instance-based learning algorithms use a measure of similarity to generalize to new cases. In an instance-based learning system, the algorithm learns the examples by heart, then uses the similarity measure to generalize.

**12.What's the difference between a model parameter and a hyperparameter in a learning algorithm?**

A hyperparameter is a parameter of the learning algorithm, not the model. For example, in a simple linear regression problem our model is parameterized by theta which is a vector of weights. In order to find the best values for theta we have a cost function which is run repeatedly by the gradient descent algorithm. Gradient descent has a hyperparameter called alpha which is the learning rate of the algorithm.

**13.What are the criteria that model-based learning algorithms look for? What is the most popular method they use to achieve success? What method do they use to make predictions?**

The goal for a model-based algorithm is to be able to generalize to new examples. To do this, model based algorithms search for optimal values for the model's parameters, often called theta. This searching, or "learning", is what machine learning is all about. Model-based systems learn by minimizing a cost function that measures how bad the system is at making predictions on new data, plus a penalty for model complexity if the model is regularized. To make a prediction, a new instance's features are fed into a hypothesis function which uses the minimized theta found by repeatedly running the cost function.

**14.Can you name four of the most important Machine Learning challenges?**

* Not gathering enough data, or sampling noise. Sampling noise means we'll have non-representative data as a result of chance.
* Using a dataset that is not representative of the cases you want to generalize to. This is called sampling bias. For example, if you want to train an algorithm with "cat videos", and all your videos are from YouTube, you're actually training an algorithm to learn about "YouTube cat videos."
* Your dataset is full of missing values, outliers, and noise (poor measurements).
* The features in your dataset are irrelevant. Garbage in, garbage out.

**15.What happens if the model performs well on the training data but fails to generalize the results to new situations? Can you think of three different options?**

* To counteract overfitting, we can reduce the complexity of the model by removing features or constraining the parameters.
* We could gather more data.
* Finally we can reduce noisiness in the data by fixing errors and removing outliers.

**16.What exactly is a test set, and why would you need one?**

A test set is a set of data points kept for testing the performance of the trained model and the results generated can be used to evaluate the performance of the model.

**17.What is a validation set's purpose?**

Validation set is used to test the model in real life. Sometimes the model generalizes according to training as well as the testing dataset, which results in difference in accuracy. To get an exact view of how our model works, we holdout one set called the validation set.

**18.What precisely is the train-dev kit, when will you need it, how do you put it to use?**

A train dev kit is a key which is used to divide data in specified distribution so that proper and more precise results can be achieved in a machine learning algorithm development process.

**19.What could go wrong if you use the test set to tune hyperparameters?**

Our model will fail to generalise properly, resulting in inaccurate results.