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

Ans : Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves.

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

Ans: Machine learning algorithms have had good results on problems such has spam detection in email, cancer diagnosis, fraudulent credit card transactions, and automatically driving vehicles.

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

Ans : Labelled Training set means that the output is given adjacent to the given data. The training set is used to train the algorithm, and then you use the trained model on the test set to predict the response variable values that are already known. The final step is to compare the predicted responses against the actual (observed) responses to see how close they are.

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

Ans : Regression and classification.

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

Ans : 1. Customer segmentation

2. Recommender systems

3. Anomaly detection

4. Genetics : clustering DNA patterns

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

Ans : Reinforced Learning

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

Ans : K-Means clustering

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

Ans : supervised Learning

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

Ans:

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

Ans : Out-of-core leanring refers to the machine learning algorithms working with data cannot fit into the memory of a single machine, but that can easily fit into some data storage such as local hard disk or web repository.

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

Ans : 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?

Ans : 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?

Ans : 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 system learn by minimizing a cost function that measures how bad the system is at making predicitons 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?

Ans :

1.Not gathering enough data, or sampling noise. Sampling noise means we'll have non-representative data as a result of chance.

2.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."

3.Your dataset is full of missing values, outliers, and noise (poor measurments).

4.The features in your dataset are irrelevant. Garbage in, garbage out.

* + Feature selection - choose the most relevant features from your dataset
  + Feature extraction - combine features in your dataset to generate a new, more useful feature

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?

Ans: This is a case where the model is overfitting the training data. To counter 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?

Ans: When we want to know how well our model generalizes to new cases we prefer to use a test set instead of actually deploying the system. To build the test set we split the training data (50-50, 60-40, 80-20 are common splits) into a training set and test set. Our model is training with the training set. Then we use the model to run predictions on the test set. Our error rate on the test set is called the generalization error or out-of-sample error. This error tells us how well our model performs on examples it has never seen before.

If the training error is low, but the generalization error is high, it means we're overfitting our model.

17.What is a validation set's purpose?

Ans : The validation set is a set of data, separate from the training set, that is used to validate our model performance during training. This validation process gives information that helps us tune the model's hyperparameters and configurations accordingly.

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

Ans: The goal of dev-set is to rank the models in term of their accuracy and helps us decide which model to proceed further with. Using Dev set we rank all our models in terms of their accuracy and pick the best performing model.

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

Ans : We will end up getting more generalization error when we will start the prediction process with the same model.