Question and Answers Document

1. What is the trade off between bias and variance?  
  
Bias is the error made by a model due to its systematic errors. Variance is the error made by a model due to its random errors. A model with high bias will make the same mistake over and over again, while a model with high variance will make different mistakes each time. The goal of machine learning is to find a model with low bias and low variance.  
  
2. Differentiate classification and regression tasks with examples.  
  
Classification is a task of assigning labels to data points. For example, in the MNIST dataset, the task is to classify images of handwritten digits as 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. Regression is a task of predicting continuous values. For example, in the Boston housing dataset, the task is to predict the median price of a house in Boston.  
  
3. What is imbalanced dataset? How would you handle it?  
  
An imbalanced dataset is a dataset where the number of samples in each class is not equal. This can be a problem for machine learning algorithms, because they can be biased towards the majority class. There are a number of ways to handle imbalanced datasets, including oversampling the minority class, undersampling the majority class, and using cost-sensitive learning.  
  
4. Why XOR problem cannot be solved by a single layer perceptron?  
  
A single layer perceptron is a neural network with one hidden layer. It can be used to solve classification problems, but it cannot be used to solve regression problems. The XOR problem is a Boolean function that takes two inputs and outputs 1 if the inputs are different and 0 if the inputs are the same. It cannot be solved by a single layer perceptron because the perceptron cannot learn a non-linear function.  
  
5. Define Markov decision process.  
  
A Markov decision process (MDP) is a mathematical model of a decision-making process under uncertainty. It is a discrete-time model, which means that time is divided into discrete steps. The state of the MDP is a vector of variables that describes the current situation. The action of the MDP is a choice that the decision-maker can make at each step. The reward of the MDP is a number that is given to the decision-maker at each step. The goal of the MDP is to maximize the expected reward over time.  
  
6. Discuss the importance of pooling layer in convolutional neural networks.  
  
Pooling layers are used in convolutional neural networks to reduce the size of the feature maps. This is done by taking a small neighborhood of pixels and averaging them together. This reduces the number of parameters in the network and makes it more computationally efficient. Pooling layers also help to reduce overfitting by making the network less sensitive to small changes in the input data.  
  
7. What is Fi score? Explain its significance.  
  
The F1 score is a measure of the performance of a binary classifier. It is calculated as the harmonic mean of the precision and recall. The precision is the fraction of positive predictions that are correct, and the recall is the fraction of positive examples that are correctly predicted. The F1 score is a good measure of overall performance because it takes into account both precision and recall. It is often used in information retrieval and natural language processing.