1-Reinforcement Learning: is a field of machine learning used in many applications like games, machine control and self-driving cars, the idea in this field is different from other machine learning fields because here there is no prior knowledge of what the rules or the surrounding environment that will faced, here the model will learn from the surrounding environment as an example a simple video game that the pc will play this game alone without prior knowledge, the model here will try the available solutions and every time be wrong he will learn that solution no good and will try again to reach a good one and so one until reach its target, finally the model will learn from experiment and try and error.

2-PCA (Principal Component Analysis): is a method used to dimensionality reduction that represent data in a lower dimension to facilitate work with and make it easy to be visualized

PCA used when our input features are very high to compress them into a lower dimension and if our features are high correlated

3-Classification and Regression are methods of machine learning but each one has a different use,

In classification we need to predict classes (just discrete values that represents class numbers) like class number 0 or 1, or another example like working on project to detect photos that related to cats’ class or dogs class.

In regress we need to predict numeric continuous values like if we work on project to hire employees and we need to predict the new employee salary based on many features.

4-training set used to train our model to predict new values, but testing set used to evaluate our model if it works well or not, testing set must not be included into the training set.

5- In data mining we care about the data patterns that already exists in our hand to extract information about this data but machine learning care about what will be happened based on our previous knowledge that we trained our model on.

6-to enhance our model we need to make hyperparameter tuning to select the best parameters that returns the best result, in the hyperparameter tuning process we try some of hyperparameters and every time we need to evaluate our model when using different values for these hyperparameters, we need our evaluation not be exist in our training set be cause the model already trained on them and also if we used test set our model will overfit because he used testing set in hyperparameter tuning, so we need a data that not include in testing and current the training data to evaluate our model. There is a solve for this problem called cross-validation, it split our training set into training set and validation set then train our model on training set and make hyperparameter tuning with validation and evaluate all tuning to select the best of our hyperparameters then finally we evaluate our model on our new data that will be the testing set.

Cross validation will divide the training set into many folds as example 10 folds , and will make hyperparameter tuning 10 times, each time we will use 9 folds in training and the final fold for testing and each time we will use different fold for the testing and so on.