NTUST, CSIE
Machine Learning (CS5087701), Fall 2016
Exam

Total: <u>110 pts</u>

Name:_____

Student ID #_____

Question	Score
1 (10%)	
2 (15%)	
3 (15%)	
4 (15%)	
5 (15%)	
6 (40%)	
Total	

Many of the questions below may not have a single and clear answer. However, you should try to answer the questions because they are very practical ones when you need machine learning algorithms for real-world applications. Use your own words to answer the questions based on your background knowledge and the materials you learned from the classes. A full credit will be given if your answer is clear and reasonable.

1. **[10%]** Explain overfitting and how to deal with overfitting in principle.
   10=5+5

2. **[15%]** Some problems could be too easy or too difficult to solve by machine learning algorithms. Can you give one example for each of those cases? (Hint: A problem could be too easy for machine learning if the answer can be somehow reconstructed from the input with an easy closed-form function.)
   15=7+7+1

3. **[15%]** Name one machine learning method that needs to be solved by an iterative algorithm and one needs no iterative algorithm. When should an iterative algorithm be used in general?
   15=5+5+5

4. **[15%]** We may choose between the probabilistic learning methods and non-probabilistic learning methods for different situations. Can you tell the difference between them? When we can argue that one could be more appropriate to use than the other? Using examples to illustrate your point is encouraged.

5. **[15%]** What are the reasons for a machine learning scientist to choose between linear models and non-linear models? Why one could be better than the other and in what occasions?

6. **[40%]** You have already learned a few machine learning algorithms.
   (a) Name one that can perform better than k-nearest neighbors, and in what occasions?
   (b) Describe a situation that we should not use naïve Bayes.
   (c) Decision trees can learn all kinds of concept when used for binary classification given a large enough tree, yes or no? Why?
   (d) Adding some nodes to the hidden layer or removing some nodes from the hidden layer can both be possible to enhance the model prediction accuracy, yes or no? Why?