Learning and Computational Finance and Economics
Test 2009-10

Answer ALL Questions

Question 1:   Machine Learning [40%]
   (a) In classification, what do the following terms mean? [12%]
       * Accuracy
       * Precision
       * Recall
   (b) What is the best way to measure the performance of a Boolean classifier? Justify your answer carefully. [10%]
   (c) Use an example to illustrate what the following terms mean in genetic programming, [12%]
       * Function set
       * Terminal set
       * Crossover operator
   (d) In a tree, a leaf is of depth n if there are n−1 nodes between this leaf node and the root node. Suppose you have decided to enumerate all possible trees with maximum depth 3 under your function set and terminal set that you described in (c). How many possible trees do you have to evaluate? (You only need to give he mathematical expression; there is no need to calculate the number.) [6%]

Question 2: Automated Bargaining [40%]
   (a) Briefly describe the bargaining model studied by Rubenstein 1982. [5%]
   (b) What is meant by subgame equilibrium? Explain briefly how subgame equilibrium was derived by Rubenstein in his 1982 model. Clearly state any assumptions that Rubenstein made. [10%]
   (b) How could genetic programming be used to approximate subgame equilibrium in the Rubenstein 1982 model? (You only need to describe the general principle. There is no need to go into the constrained fitness function used by Jin and Tsang.) Why is it an attractive approach? [15%]
   (c) Suppose you are the first player to make an offer under the Rubenstein 1982 model. Instead of using genetic programming to find a strategy, is it feasible to evaluate all possible offers 0.01, 0.02, 0.03, ..., up to 0.99? How would you evaluate the quality of an offer (e.g. 0.75)? Justify your answer carefully. [10%]

Question 3: Application in Forecasting [20%]
   Suppose you are working in the loans department. Your job is to approve or reject loan applications. You would like to assess the possibility of introducing supervised learning to your decision making. Explain carefully what you need to do. For example, what would your considerations be? What information you need to collect? What would you ask your programs to learn? Is this a feasible task?