

Final Exam Study Guide

MSE 2400 Evolution and Learning in Computational and Robotic Agents

Spring 2016

Dr. Tom Way

Final exam questions will be drawn from material covered in class from Tuesday, March 8 to Thursday, April 21 in class, and from the assigned homework, readings, videos, labs and discussions. Some topics from the first part of the semester may appear here if they were also covered in the second part of the semester. Test questions will only be drawn from the concepts and questions contained on this study guide. The test will be OPEN NOTE, but of course you MUST WORK ALONE to complete the exam.

1. Know Your Definitions - Be able to define, in a few words or a sentence:

- Alfred Russel Wallace
- algorithm
- backpropagation
- bayesian network
- binary numbers
- candidate representation
- Charles Darwin
- classification
- clustering
- crossover
- decision tree
- divide and conquer
- evolution
- fitness function
- genetic algorithm
- Gregor Mendel
- instance-based classifier
- John Holland
- John Koza
- k-nearest neighbor
- learning
- machine learning
- mutation
- Natural Selection
- neural network
- NLTK
- perceptron
- problem decomposition
- programming
- robot
- selection
- spam
- stopping criteria
- supervised learning
- support vector machine
- unsupervised learning

2. Know the Details - Be able to (do or briefly explain):

- Describe a situation where classification is used in the real world
- Given two sets of words, explain how you would use the words to create a classifier and then use this classifier to classify a list of statements into one of the two sets, providing a brief justification for each
- Briefly explain how human learning and machine learning are similar
- Briefly explain how human learning and machine learning differ
- Given a page of unlabeled pictures, classify them into two or more sets and explain the approach you used
- Given two small sets of pictures, classify a page of unlabeled into the two sets and explain the approach you used
- Explain how email can be classified as “spam” vs. “ham” including a description of a common approach that works well and how a clever spammer could try to defeat it
- Use problem decomposition to take a problem statement and break it down into simple steps that, if followed, would solve the problem
- Given a small Python program, explain what it is doing by adding comments to the code
- Given a binary number, calculate its decimal number value
- State Isaac Asimov’s 3 Laws of Robotics
- Briefly describe Gregor Mendel’s experiment with pea plants
- Briefly describe how Charles Darwin came up with his Theory of Natural Selection
- Describe how a genetic algorithm works