# Midterm Exam Study Guide

**MSE 2400 Evolution and Learning in Computational and Robotic Agents**
**Spring 2016**
**Dr. Tom Way**

**Midterm exam questions will be drawn from material covered through Tuesday, February 23 in class, from the assigned readings and from the labs. 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:

- Ada Lovelace
- agent
- Alan Turing
- Arthur Samuel
- Babbage's Difference Engine
- backpropagation
- Big Data
- Charles Babbage
- computational agent
- decision tree
- ELIZA
- Enigma machine
- entropy (physics)
- entropy (real world)
- evolution
- Game of Life
- goal-based agent
- ID3
- inductive learning task
- learning
- learning agent
- machine learning
- model-based reflex agent
- natural language processing
- neural network
- Occam's Razor
- over-fitting
- robotic agent
- sentiment
- sentiment analysis
- sentiment tracking
- simple reflex agent
- Turing Test
- utility-based agent
- word cloud

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

- List and explain the Four Paradigms of Science.
- What is the key question that Kevin Kelly asks in his TED talk that we viewed, and what is his answer?
- What makes the Fourth Paradigm of Science so new and important?
- List and briefly describe three forms of Natural Language Processing.
- List and briefly describe three forms of Machine Learning.
- Given the diagram, explain the parts of the Tripod of Sentiment Analysis.
- Explain what challenges make Sentiment Analysis difficult.
- State an approach that can be used for Sentiment Analysis and its pros and cons.
- List and explain three practical uses of Sentiment Analysis.
- List and explain three practical uses of Machine Learning.
- What caused the Artificial Intelligence "winter" and what ended it?
- Given the diagram, describe the workings of a Learning Agent (in general).
- List and briefly describe three types of Learning Agents.
- List and briefly describe three classes of Intelligent Agents.
- List and briefly describe three ways that Learning Agents acquire concepts.
- Given a simple experience table, draw a decision tree.
- Explain the importance of Choosing Attributes to the design of a good decision tree.
- Explain why Morse Code is a good example of a decision tree.
- Describe the process of constructing a decision tree.
- Describe the steps needed to perform Sentiment Analysis on Big Data, treating Sentiment Analysis as a Fourth Paradigm problem.
- When playing the Number Guessing Game, what are the minimum, maximum and average number of guesses required if the number being guessed is in the range 1 to N?
- Briefly describe a Machine Learning technique that shows promise for helping robot-driven cars to navigate.
- Briefly explain how a neural network learns and how that learning approach differs from decision trees.