**CIS XXX/MAT XXX: Introduction to Artificial Intelligence and Machine Learning**

Spelman College

Fall 20XX

Machine learning technology has become an increasingly important area of research in many of the disciplines on Spelman’s campus including Economics, Psychology, Sociology, Biology,

Chemistry, Computer and Information Science, Math, Physics, Health Sciences, Foreign

Language, Music, Political Science and others. This multidisciplinary elective course is designed to promote experiential learning in artificial intelligence and machine learning (AI/ML) and provide an infrastructure to support basic and applied research in AI/ML.

**Prerequisites:**

* CIS 111 or CIS 113
* MAT 205, MAT 355 or MAT 456

**Course Objectives:**

The primary objective of this course is to introduce the basic principles, techniques, and applications of AI/ML. Emphasis will be placed on the teaching of these fundamentals, not on providing a mastery of specific software tools or programming environments. Assigned projects promote a ‘hands-on’ approach for understanding, as well as a challenging avenue for exploration and creativity.

Specifically:

1. Gain a historical perspective of AI/ML and its foundations.
2. Become familiar with basic principles of AI/ML toward problem solving, inference, perception, knowledge representation, and learning.
3. Investigate applications of AI/ML techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Explore the current scope, potential, limitations, and implications of intelligent systems.

**Instructors:**

Co-taught by CIS and MAT faculty (TBD)

**Required Text:**

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. **An Introduction to Statistical Learning**: with Applications in R. New York :Springer, 2013. Available free online at: <http://faculty.marshall.usc.edu/gareth-james/ISL/ISLR%20Seventh%20Printing.pdf>

**Course Topics:**

1. Introduction
2. Philosophy of Artificial Intelligence & Machine Learning
   1. What is machine learning?
   2. Applications of machine learning
   3. Assessing Model Accuracy
   4. Review of R
3. Supervised Learning
   1. Linear Regression
      1. Simple Linear Regression
      2. Multiple Linear Regression
      3. Other Considerations in the Regression Model
   2. Classification
      1. An Overview of Classification
      2. Why Not Linear Regression?
      3. Logistic Regression
      4. Linear Discriminant Analysis
      5. k-nearest neighbors
   3. Tree-Based Methods
      1. The Basics of Decision Trees
      2. Bagging, Random Forests, Boosting
4. Unsupervised Learning
   1. The Challenge of Unsupervised Learning
   2. Principal Components Analysis
   3. Clustering Methods
      1. K-Means
      2. Hierarchical Clustering
5. Model Selection and Regularization\*
   1. Classical Algorithms
      1. Forward selection
      2. Backward elimination
      3. Stepwise regression
   2. Global Algorithms
      1. LASSO
      2. Ridge Regression
      3. Elastic Net

\* Advanced topics which will be covered if time permits.