Title: Machine Learning
Instructor: Oladunni, Timothy
Office Location: Bldg. 42, Room 112 E
Class Location: TBA
Instructor's Email: Timothy.oladunni@udc.edu
Class Hours: TBA
Office Hours: Monday and Wednesday 3:30pm to 5:30pm

A. Course Description

The veracity, velocity, volume and variety of data available since the early 90's has posed a major challenge to the traditional data analytical methodologies. Machine learning (ML) is a branch of artificial intelligence that studies the use of algorithm and statistical models that can 'sniff' through these large piles of data, learns its pattern and discovers hidden knowledge. The task is performed without explicit programming.

Application of ML crosses the traditional boundary of science. Its application includes; business intelligence, mechanical or electrical fault prediction, infectious disease prediction, autonomous vehicles and air crafts, speech recognition, image analysis etc. ML has been described among scientists as the new electricity.

We will familiarize ourselves with the main building blocks of ML with application to real world problems. Our approach will be based on statistics, linear algebra, calculus and computer science.

B. Prerequisites

Students are expected to have completed the following courses before registering for this class.

I. Linear algebra
II. Programming
III. Discrete mathematics
IV. Statistics
V. Calculus

C. Learning outcome:

At the end of this course, students are expected to have understood;

- Supervised and unsupervised learning
- Data analysis and exploration
- Feature extraction and reduction
- Application of ML to real world problems

Week	Topic	Home Work/Project
Week 1	• Machine Learning Basics	**Lab-HW** 1

Week 2	• Regression and Classification	
Week 3	• Parametric and Multivariate Methods	**Project 1**
Week 4	• Bayes theorem	**Lab-HW** 2
Week 5	• Dimensionality Reduction	**Project 2** **Project 1 is due**
Week 6	• Clustering and Nonparametric Methods	**Lab-HW** 3
Week 7	• Decision tree	**Project 3** **Project 2 is due**
Week 8	• Linear Discriminations	**Lab-HW** 4
Week 9	• Multiple-layer Perceptron	**Final Project** **Project 3 is due**
Week 10	• Local Models and Kernel Machine	**Final Project Proposal**
Week 11	• Combining Multiple Learners	**Lab-HW** 5
Week 12	• Design and Analysis of Machine Learning Experiments	
Week 13	• **Presentation/Demo**	**Final Project is due**
Week 14	• Final Exam	

D. Evaluation

Final grade will be based on the following:

Project 1 10%

Project 2 10%

Project 3 10%

Project 4 15%

Home-Work 10%

Mid-Term 20%

Final 25%

E. Text Book

1. Introduction to Machine Learning Third Edition by Ethem Alpaydın
2. Pattern Classification Richard O. Duda, Peter E. Hart, David G. Stork

F. **Format and Procedures**

This course will employ lectures, exercises, assignments, and examinations. Students are strongly encouraged to participate extensively, ask questions, express ideas and opinions, and challenge traditional ideas and concepts. Instructional methodologies will emphasize critical thinking, problem solving, and reasoning over simple memorization.

G. Assessment Procedures

All students need to finish any given programming assignments in a timely manner. Assignments, Mid-term exam, and Final exam will take place to measure their ability of understanding the concepts and techniques of big data analysis.