Handong Graduate of International Development and Entrepreneurship

Techno-Entrepreneurship Competency Based on EE & ICT Convergence

Introduction to Machine Learning - GTCA0892

Course Descriptions and General Information

Class Meeting Information

Section	Days	Time	Lecture Room	Language used in class
01	Tue Fri	9:00 ~ 10:40 14:30 ~ 16:10	NTH414	English

Instructor

Name	Youngsup Kim
Office & Office Hours	NTH 407, Friday 16:10~17:30 or with an appointment. Ask your questions on the discussion group available from Piazza.com
Email	idebtor@gmail.com → preferred or desirable way of contact for personal matters
Phones	(054) 260 – 1171, 010-4939-2819 is available; KakaoTalk available
TA	None officially, but we may have some volunteers in our class

Catalog Description – 2 credit hours

This course is designed students to introduce the core of machine learning, which is a building block of today's 4th Industrial Revolution. Students will acquire mathematical skills and logical reasoning skills that are essential for the sciences through Python programming and the basics of machine learning. The course begins with an artificial neuron and ends with a deep neural network which is a core engine for deep learning. Students will learn how to build a core engine of machine learning system in Python from the scratch instead of using many open machine learning libraries. After finishing this course, students will have a confidence to jump into studying and using the machine learning platforms such as TensorFlow, Keras and Pytorch.

Prerequisites

Introductory level of Python programming,
High-school level of mathematics including derivatives and matrix

Objectives

1. Learning Machine Learning Principles and Algorithms
2. Building up a neural network system for machine learning
3. Experiencing practical machine learning system.
4. Be ready to use the machine learning open platforms

Program Outcomes

PO1 - an ability to think computationally through machine learning principles and algorithms
PO2 - an ability to implement computational thinking in Python programming language

My Own Personal Objectives

Give a fish, and you feed him for a day; teach a man to fish and you feed him for a lifetime.

Texts, Materials, and Resources

Textbook

1. Lecture Notes: Machine Learning with Python by Youngsup Kim
   www.kmooc.kr
2. **Textbook:** "Make your own neural network" by Tariq Rashid.

This book is available in e-book form from amazon.com. It may cost you a few bucks. It is a good introduction to machine learning. Since we all know Python coding, it would not be difficult to read and follow the coding. I strongly recommend this book.

At the last chapter of this book has a project called MNIST number recognition project which is our final goal that you must achieve. – **This is one of this course requirement.**

MOOC Lectures

- "Machine Learning with Python" by Prof. Youngsup Kim is available from: www.kmooc.kr
- Many "Machine Learning" courses available through MOOC such as coursera and edX.
- We will go through following two courses from coursera.org.

1. [Mandatory] **AI For Everyone**
   A. What is AI?
   B. Building AI Projects
   C. Building AI In Your Company,
   D. AI and Society

   You may get a certificate when you finish this course and pay about $50 for it.

2. [Optional] **Deep Learning Specialization**: Four courses available as a specialization
   A. Course 1: Neural Networks and Deep Learning
   B. Course 2: Improving Deep Neural Networks
   C. Course 3: Structuring Machine Learning Projects
   D. Course 4: Convolutional Neural Networks

   Optionally "Deep Learning Specialization", Course 1 – Neural Networks and Deep Learning is recommended those who are good at Python coding and some Math.

Joining Piazza Discussion Group is required.

To join Piazza, go the www.piazza.com and follow the instruction to register. If you are not allowed, you will be enrolled by the instructor.

- School: Handong Global University
- Course: HGDE – Introduction to Machine Learning

Most of our communication between us will go through this SNS. Your questions should be posted here. Then your peers, TA or I will answer them.

Installing Anaconda

Anaconda is a Python and R distribution package. It aims to provide everything you need (python wise) for data science "out of the box". It includes:

- The core python language
- 200+ python "packages" (libraries)
- Spyder (IDE/editor) and Jupyter Notebook
- conda, Anaconda's own package manager, used for updating Anaconda and packages

How about using IDE Tool?

- Jupyter notebook

Exams, Projects and Grading

Quizzes and Exams

There will be one final project, and frequent pop quizzes. You may expect to have at least one quiz, programming assignment whenever every chapter is completed. The final exam may be comprehensive.

Class Participation, Teamwork, and Q/A's on Piazza

Proactive class interaction and teamwork are expected. You are encouraged to post your questions such as homework questions, debugging, errors, anything that other students may also be concerned as well. You may post some recommended resources you have found and share with your colleagues such as websites, tips, video lectures. Also you are encouraged to help your peers by answering questions on Piazza.

Projects or Programming Assignments

Technically, this course consists of two lectures per week and expecting many hours of programming --which simply means you'll work on your own. Programming assignments will be given quite often. Follow the following guidelines presented in Piazza.

Grading

Grades will be assigned based on the following weights:

Homework and Quizzes	20
1. MNIST number recognition 2. Own hand-written number recognition 3. **AI For Everyone** by Andrew Ng Earn a Certificate recommended, not required	15 05 20
Final "Case Study" Project and Presentation	30
-0.5 per tardiness, -1.0 per absence	10
Total	100

Letter grades will be assigned using the following scale:

Grade		+
A	90.0	95.0
B	80.0	85.0
C	70.0	75.0
D	60.0	65.0
F	Below 60	

- If you don't agree with my grading policy, you should let me know at the first week or day of registration such that I may suggest you an alternative or you should seriously think about options of changing the class or dropping the course. **At the discretion of the instructor, grades may NOT be "curved."**

Policies

Late Work

Late work will **not** be accepted for any reason **since the lowest grade of your quizzes and homework will be discarded or set them to perfect grades.** Please do not ask for extensions for homework and quizzes.

Absences

Attendance will be checked from time to time. There will be a penalty for a missing class or late class attendance. **one tardy and one absence are allowed without an excuse without penalty.** Absence with an excuse such as doctor's appointment and job interview are allowed without penalty. Oversleeping, hangover, birthday, cold, body ache, or mom's visit would not be considered as an excuse.

Collaboration and Cheating

All incidents of cheating will be reported to the Office of Student Affairs, who will maintain records of your academic misconduct.

1. Never have a copy of someone else's program in your possession either electronically or on paper and never give your program to someone else.

2. Discussing an assignment without sharing any code is generally acceptable. Helping someone to interpret a compiler error message is an example of permissible collaboration. However, if you get a significant idea from someone or internet sources, acknowledge them in your assignment.
3. These rules apply to homework and project. No cheatings whatsoever in exams and quizzes.
4. In group projects (if any), you share code freely within your team, but not between teams. Each individual in a team is responsible for the entire project, which means that you will be held responsible if your partner uses another team's solution to produce part of your team's solution.
5. Cheating on an exam, or cheating twice in any way, will earn you an F in the course. I reserve the right to assign an F in the course to anyone who cheats on a project, though I might not exercise it.
6. Never post a complete program on Piazza for help or question, but a line of code which causes an error. In that case, you don't forget posting the entire error message along with a line of code.
7. **You must include the following line at the top of your every source file with your name signed.**
   On my honor, I pledge that I have neither received nor provided improper assistance in the completion of this programming assignment. Signed: _____

Reservation of Rights

I reserve the right to change this syllabus, including without limitation, these policies, without prior notice.

Tentative Course Schedule & Prayer

Wk	Topic		Homework and Quiz
1	Introduction to Machine Learning Development Environment Matrix		
2	Function and Neuron Numpy Tutorial 1 & 2		
3	Artificial Neuron Principles Derivatives Activation Functions		
4	Perceptron Algorithm & Coding Machine Learning Workflow 1, 2 Object-Oriented Programming		
5	OOP Perceptron Implementation & Application Multi-layer Perceptron		
6	Feed Forward Neural Network & Example Adaline and Gradient Descent		
7	Final Exam, Final Project and Presentation		
8	Final Exam, Final Project and Presentation		
9	Adaline GD Implementation & Application Backpropagation 1, 2		
10	XOR Neural Network Modeling and Implementation		
11	Multi-layer Neural Network Modeling Logistic Regression 1, 2, 3		
12	MINIST Dataset Gradient Descent 1, 2		
13	Deep Neural Network 1, 2		

14	Open Framework for Machine Learning		
15	Final Exam		

NOTE for the first week:

1. Install Anaconda package. Have Python ready to run on your computer.
   NOTE: Don't forget to check 'PATH' option when you install Anaconda.
2. Run Jupyter notebook and try 'easybutpowerful.pdf' which is available from Piazza.
3. Let me know your 'real' email address such that I can invite you to join in Piazza. Then simply accept my invitation when you get an email from Piazza.
4. Register www.coursera.org and start taking five courses called "**Machine Learning**" Specialization they offer. It may cost you about 50 dollars per month. However, I recommend you to take coursera.org specialization to get a few certificates if you think it worthy.
5. Watch two videos for in-class quiz
   A. Fei Fei Li, How we're teaching computers to understand pictures, YouTube
   B. Jeremy Howard, The wonderful and terrifying implications of computers that can learn, YouTube