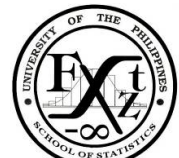




UNIVERSITY OF THE PHILIPPINES DILIMAN
SCHOOL OF STATISTICS
TM KALAW STREET, UP DILIMAN
QUEZON CITY PHILIPPINES



STAT 280: SPECIAL TOPICS IN STATISTICS (DEEP LEARNING)

COURSE SYLLABUS

Instructor:	Assoc Prof Peter Julian Cayton, PhD	Consultation Hours via Email:	MTWThF (1:00 pm – 4:00 pm)
Mobile:	+63-998-304-4713	Faculty Office:	(UPD) Faculty Room 417, 4 th Floor,
Email:	pacayton@up.edu.ph		UP School of Statistics, UP Diliman
			[not available for face-to-face consultation]

COURSE GOALS

The course unboxes deep learning algorithms with a focus on the statistical aspects. The discussions start with the introduction and review of previous topics and followed by basic perceptron algorithms. Next topics are in convolutional and recurrent neural networks (CNNs, RNNs). The course will show example applications in general classification and regression problems.

At the end of the course, the student is expected to be able to:

1. Recognize issues resolved in deep learning.
2. Understand theories and statistics underlying deep learning algorithms.
3. Discuss applications of deep learning for data science.
4. Execute various deep learning algorithms in a software and interpret results.
5. Solve data science problems by applying appropriate deep learning algorithms.

COURSE PREREQUISITE: General background in regression analysis and computer programming

GRADING FORMULA: Final Grade = 50 + Total Points in working at least 2 requirements

GRADING SCALE

[92.00, ∞)	1.00	[60.00, 66.00)	2.00
[84.00, 92.00)	1.25	[55.00, 60.00)	2.25
[76.00, 84.00)	1.50	[50.00, 55.00)	2.50
[66.00, 76.00)	1.75	Not working on at least 2 req'ts	INC

CLASS RULES AND POLICIES

1. Cellphones and other electronic devices should be turned off or silent during class sessions. Classroom decorum should always be observed. You are free to mute and stop your camera to settle your personal or emergency businesses. The instructor reserves the right to send students that disturb a class out of the session.
2. If students are caught cheating in any form concerning the requirements of the course, they will receive a grade of 5.00 and their case will be sent to the Student Disciplinary Tribunal for further action by the University.
3. The instructor will be creating online facilities for our class on UVLE (<https://uvle.upd.edu.ph>). Please wait for announcements on the coming days for the details of these group pages.
4. Any communication about the course can only be conducted during consultation hours by sending communications through email, the UVLE messaging facility, or provided mobile number. Instructors will not be communicated through social media nor other means not mentioned.
5. Our main programming language of instruction will be R and our integrated development environment will be RStudio. Download R at <https://cran.r-project.org/> and RStudio at <https://www.rstudio.com/>.
6. The course pack contains the following materials:
 - 1) the course syllabus and schedule of activities;
 - 2) the main readings of discussion
 - 3) exercises guidelines

- 4) sample R codes and datasets
7. Additional materials will be available in UVLE.

COURSE OUTLINE AND SCHEDULE OF ACTIVITIES

Topics	Reference	Activities
PART I: Introduction and Review		
Week 1: Introduction to Machine Learning and Deep Learning	DLRCA: Ch. 1 DLRG: Ch. 1 HODLR: Chs. 1 & 2 sample R programs	1. Read DLRCA_Chapter1.pdf and follow through the programming examples 2. Read DLRG_Chapter1.pdf 3. Discussion session with video recording available later. 4. Sample R program [HODLR_Chapter01 folder] on XGBoost Modeling from HODLR 5. R Program [HODLR_Chapter02 folder] for installing and exploring deep learning packages from HODLR
Week 2: Neural Networks Architectures and Mathematics of Deep Learning	DLRCA: Ch. 2 DLRG: Ch. 2 HODLR: Ch. 3 sample R programs	1. Read DLRCA_Chapter2.pdf and follow through the programming examples 2. Read DLRG_Chapter2.pdf 3. Discussion session with video recording available later. 4. R Program [HODLR_Chapter03 folder] on some basic neural networks and activation functions
PART II: Deep Neural Networks		
Week 3: Getting Started with Neural Networks	DLRCA: Ch. 3 HODLR: Ch. 5 sample R programs	1. Read DLRCA_Chapter3.pdf and follow through the programming examples 2. Sample R Program [HODLR_Chapter05 folder] on multilayer perceptron models 3. Discussion session with video recording available later.
EXERCISE 1: Solve programming problems based on lessons from Week 3.		
Week 4: Fundamentals of Machine Learning	DLRCA: Ch. 4	1. Read DLRCA_Chapter4.pdf and follow through the programming examples 2. Discussion session with video recording available later.
EXERCISE 2: Solve programming problems based on lessons from Week 4.		
Week 5: Model Agnostic Approaches in Interpretable Machine Learning	IML: Chs. 2 & 5	1. Read IML online, Chapter 2: "Interpretability" 2. Read IML online, Chapter 5: "Model Agnostic Methods" 3. Programming and Discussion video on Interpretable Deep Learning with recording available later. 4. Sample program and syntax in the PDF files in iml_R_packages folder.
EXERCISE 3: Solve programming problems based on lessons from Week 5.		
Week 6: Deep Learning for Computer Vision	DLRCA: Ch. 5 HODLR: Ch. 4 sample R programs	1. Read DLRCA_Chapter5.pdf and follow through the programming examples 2. Sample R Program [HODLR_Chapter04 folder] on ConvNets for Image Recognition 3. Discussion session with video recording available later.
EXERCISE 4: Develop a CONVNET for image classification problems.		
Week 7: Deep Learning for Texts and Sequences	DLRCA: Ch. 6 HODLR: Ch. 8 sample R programs	1. Read DLRCA_Chapter6.pdf and follow through the programming examples 2. Sample R Program [HODLR_Chapter08 folder] on stocks forecasting 3. Discussion session with video recording available later.
EXERCISE 5: Develop an RNN model for a given dataset.		
PART III: Data and AI Ethics		
Week 8: Data and AI Ethics	AIDE BDE EDS	1. Read AIDE (Bogroff_Guegan_Artificial Intelligence_Data_Ethics.pdf) 2. Read EDS (IFoA_RSS_A Guide for Ethical Data Science.pdf) 3. Read BDE (Zwitter_Big_Data_ethics.pdf) 4. Discussion session with video recording available later.
EXERCISE 6: Write a 3-page reaction and reflection paper on the matter of Data and AI Ethics.		
Week 9: Wrap-up	DLRCA: Ch 9	1. Discussion session with video recording available later.

Main References for the Course:

- (AIDE):** Bogroff, A, & Guegan, D (2019) Artificial Intelligence, Data, Ethics: An Holistic Approach for Risks and Regulation. halshs-02181597. Accessed last August 31, 2020 at <https://halshs.archives-ouvertes.fr/halshs-02181597/document>
- (DLRCA):** Chollet, F, and Allaire, J.J. (2017) **Deep Learning with R**, Manning Publications, Co.
- (DLRG):** Ghatak, A (2019) **Deep Learning with R**, Singapore: Springer Nature Singapore Pte Ltd
- (EDS):** Institute and Faculty of Actuaries & Royal Statistical Society (2019). A Guide for Ethical Data Science.
- (IML):** Molnar, C (2019) **Interpretable Machine Learning**, Accessed last August 30, 2020, <https://christophm.github.io/interpretable-ml-book/>.
- (HODLR):** Pawlus, M., & Devine, R (2020) **Hands-On Deep Learning with R**, Packt Publishing.
[R programs of HODLR available at: <https://github.com/PacktPublishing/Hands-on-Deep-Learning-with-R>]
- (BDE):** Zwitter, A (2014). Commentary: Big Data ethics. Big Data & Society, July–December 2014: 1–6.