Course Syllabus

STAT 467

Applied Multivariate Analysis

Spring 2022

Instructors: Sijian Wang, Ph.D.

Associate Professor, Departments of Statistics

Email: **sijian.wang@stat.rutgers.edu (mailto:sijian.wang@stat.rutgers.edu)**

Office hour: 2-3pm EST on Wednesday

Office hour Zoom link: same as the lecture Zoom link

TA: Mr. Yuanhao Liu

Email: **yl1398@stat.rutgers.edu (mailto:yl1398@stat.rutgers.edu)**

Office hour: 2-3pm EST on Monday

Office hour Zoom link: **https://rutgers.zoom.us/my/yl1398?pwd=eVY0aE9oeDU0NlBESlVPRlVRLy9sZz09 (https://rutgers.zoom.us/my/yl1398?pwd=eVY0aE9oeDU0NlBESlVPRlVRLy9sZz09)**

Meeting ID: 792 073 8652 Password: 086636

Prerequisite: Level II Statistics or permission of instructor.

Textbooks: [Recommended Text] *Deep Learning with Python, Second Edition,* by Francois Chollet. Github page: **https://github.com/fchollet/deep-learning-with-python-notebooks (https://github.com/fchollet/deep-learning-with-python-notebooks)**

[Recommended Text (more mathematical)] *Deep Learning,* by Ian Goodfellow, Yoshua Bengio and Aaron Courville.

[Supplemental Text (if you are not familiar with Python)] Part I of *Python Crash Course: A Hands-On, Project-Based Introduction to Programming*, by Eric Matthes

Lectures: Tuesday 5:40-8:40pm EST

Lecture Zoom link: **https://rutgers.zoom.us/j/91619927719?pwd=ZEhmK2Vpb2pySWhSS1VaVlUrUnlPZz09** **(https://rutgers.zoom.us/j/91619927719?pwd=ZEhmK2Vpb2pySWhSS1VaVlUrUnlPZz09)** (you need to login using your Rutgers Zoom account to join)

Meeting ID: 916 1992 7719 Password: 320504

All lectures will be recorded and made available in Canvas.

Grading: Homework: 30%; Midterm: 30%; Final: 40%.

Homework: Homework will be assigned and collected on Canvas. **Late homework will NOT be accepted**. The homework with lowest score will be dropped when calculating your final score. **DO NOT COPY from other sources**. Computer generated output without detailed explanations and remarks will NOT receive any credit.

Course outline (tentative):

This course introduces state-of-art deep learning models with application to computer vision (CV), natural language prcessing (NLP), graph/network problems and other selected scientific problems. Each model is illustrated and demonstrated by analyzing a real dataset. The Python (and Keras library) will be used for all implementations. The online platform colab (https://colab.research.google.com/?utm_source=scs-index) will be used to run all codes.

1. Introduction
2. Single layer perceptron, multilayer perceptron (generic deep learning models)
3. Optimization for deep learning: deed-forward, backpropagation, gradient descent,

momentum, regularization, dropout.

3. Convolutional Neural Network (CNN), Graph Convolutional Network (GCN)
4. Word embedding, document embedding, graph/network embedding
5. Recurrent Neural Network (RNN), Long short-term memory (LSTM), Attention based

model, machine translation (sequence-to-sequence model)

6. Generative deep learning models: variational autoencoder, generative adversarial

network (GAN)

7. Deep reinforcement learning (if time permitting)

Course Summary:

Date	Details	Due