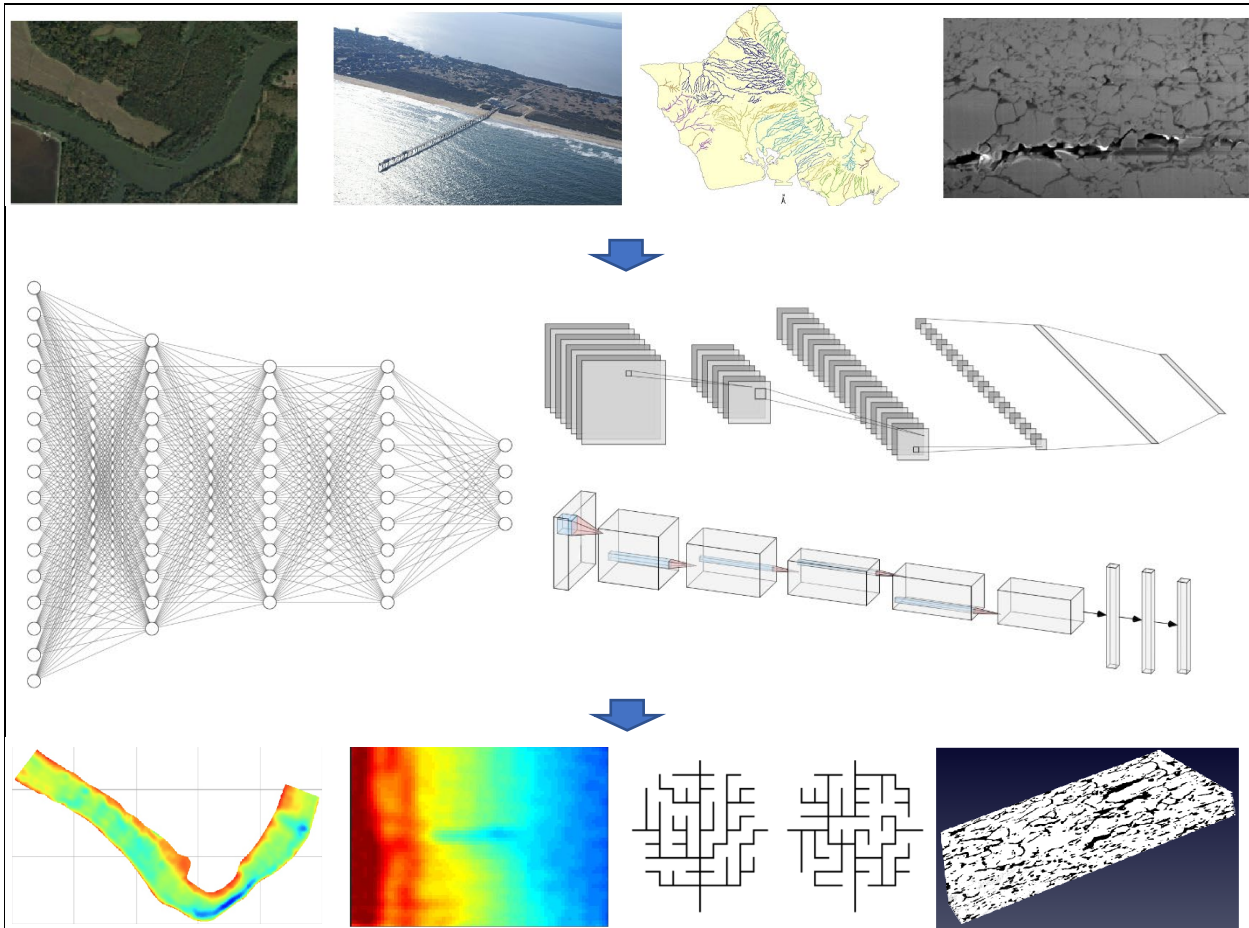


CEE 696-005 Deep Learning in Civil and Environmental Engineering and Earth Science
Fall 2020



Deep Learning application examples: riverine and surf-zone bathymetry identification; statistical reconstruction of river drainage network and porous media

Course Description: This course aims to introduce the basics of deep learning to graduate students in Civil and Environmental Engineering and Earth Science. Deep learning is a branch of machine learning dealing with the development and application of modern neural networks. Thanks to recent advances in data acquisition and computational power, deep learning algorithms can construct layered high-level representations of nature and engineered system in a way that maximizes performance on a given task, which has shown a great potential to complement traditionally established domain models. During the course, students will learn how to implement deep learning approaches using widely used tools such as Tensorflow and PyTorch. The class will also discuss how they perform domain-aware, interpretable, and robust research for deep learning-enhanced modeling & simulations and intelligent automation & decision support. Students can bring their own research data for their final project presentations/reports.

Course CRN: 80031

Instructor: Dr. Jonghyun Harry Lee (jonghyun.harry.lee@hawaii.edu)

Website: <https://www2.hawaii.edu/~jonghyun/classes/F20/CEE696/>

Textbook: Class notes, slides, and reference materials posted in the class website.

Previous class materials are available from <https://www2.hawaii.edu/~jonghyun/classes/F19/CEE696/>

Class Meetings: Tuesdays and Thursdays, 10:30 to 11:45 AM, Room: TBA

Prerequisites: **Python Programming**, Linear algebra, Probability & Statistics, Calculus

Assignments: homework is assigned once a week or every two weeks using Google Colab.

Grading: 60% assignments, 40% final project presentation (students are required to upload their presentations in a public domain website/repository, example:

<https://www2.hawaii.edu/~jonghyun/classes/F19/CEE696/final.html>)

Tentative outline of lecture topics:

1. Feed-Forward Neural Networks
2. TensorFlow/PyTorch
3. Linear Algebra/Optimization/Probability Theory
4. Convolutional Neural Networks
5. GPU hardware
6. Recurrent Neural Networks
7. Variational Autoencoder
8. Generative Adversarial Networks
9. Physics-informed Learning
10. Brief Intro to Reinforcement Learning/Active Learning/Transfer Learning