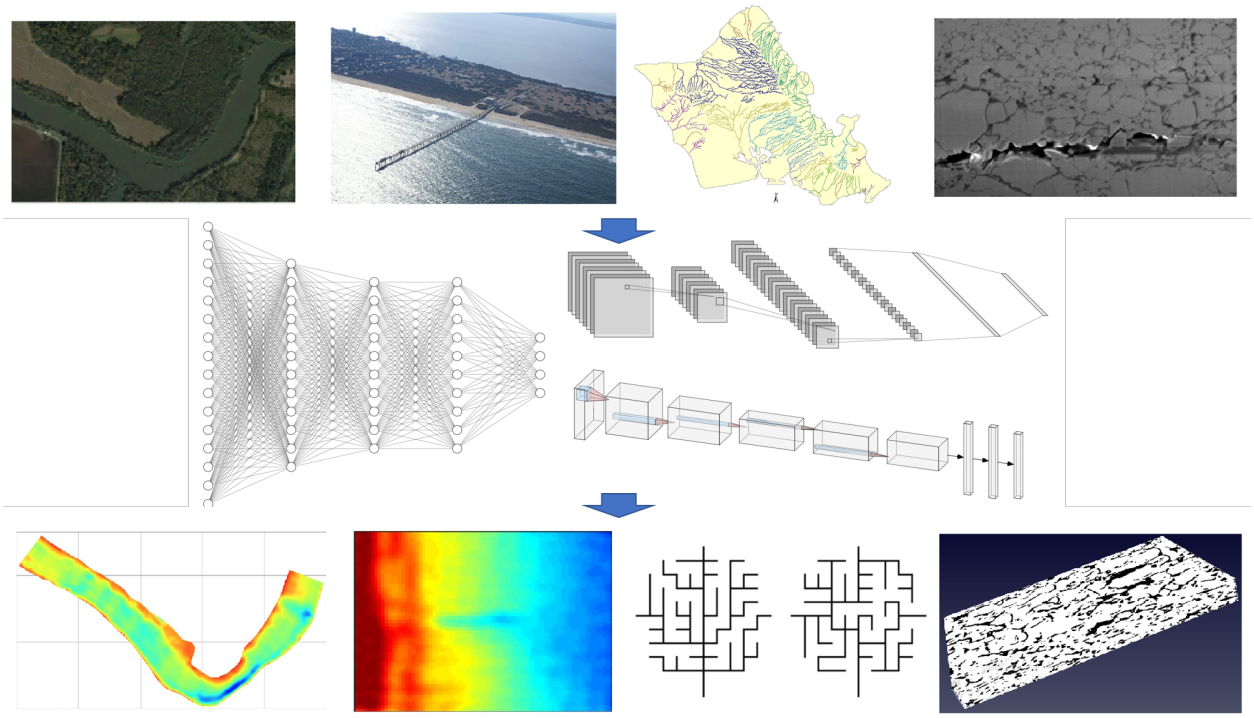
CEE 696-007

Deep Learning in Civil and Environmental Engineering and Earth Science



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

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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. 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: 89049

Website: `https://www2.hawaii.edu/~jonghyun/classes/F19/CEE696/`

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

Class Meetings: Tuesdays and Thursdays, 1:30 to 2:45 PM, Room: Holms Hall 247

Prerequisites: Python Programming, calculus, linear algebra, probability & statistics, Latex

Assignments: Homework is assigned once a week or every two weeks through Overleaf (online Latex tool).

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/S18/CEE696/final.html`)

Lecture topics:

1. Feed-Forward Neural Networks
2. TensorFlow/Keras
3. GPU hardware
4. Convolutional Neural Networks
5. Recurrent Neural Networks
6. Generative Adversarial Networks
7. Variational Autoencoder
8. Physics-informed Learning
9. Other topics such as Self Organizing Map/Reinforcement Learning/Active Learning/Transfer Learning