ECE 580C3
AI for Radar and Remote Sensing

***Credits**:* 3

Teaching Modality: Hybrid (Online and face-to-face, also depending on the University's guidelines)

Class Hours and Place: 9:30-10:45AM, Tuesday/Thursday (online via zoom)
https://zoom.us/j/94669489480?pwd=a1BCckFKTVoyT1hSMWNIVzZ1UHhKdz09
Meeting ID: 946 6948 9480
Passcode: ECE580C3

Office Hours: 11AM-12PM, Tuesday/Thursday (available on Teams)

Instructor: Dr. Haonan Chen
Electrical & Computer Engineering
B116, Engineering Building
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970-402-870 (cell)

Textbooks and Course Materials:

1. Goodfellow, I., Y. Bengio, and A. Courville, Deep Learning. MIT Press, 2016.
2. Bringi, V. N., and V. Chandrasekar, Polarimetric Doppler Weather Radar: Principles and Applications. Cambridge University Press, 2001.
3. Notes and reading materials will be distributed by the instructor.

Objectives:

The objective of this course is to familiarize students with mathematical and conceptual background of artificial intelligence (AI) through introducing a broad range of machine learning models. Students successfully completing this course will be able to interpret radar and satellite data, and get familiar with their multidisciplinary applications. Particular emphasis will be placed on using AI to tackle these applications, such as precipitation identification, classification, estimation, and prediction. This course will also immerse students into advanced deep learning techniques including convolutional neural network (CNN), recurrent neural network (RNN), long short-term memory network (LSTM), and generative adversarial network (GAN).

Course Outline:

1. Fundamentals of AI and machine learning.
2. Radar and remote sensing technologies: Modern systems, observations, data interpretation, and multidisciplinary applications.
3. Machine learning algorithms: Decision tree and random forest; artificial neural network; support vector machine; self-organizing map; neuro-fuzzy algorithm and *K*-means clustering.
4. Deep learning approaches: CNN, RNN, GAN, LSTM, and transfer learning

***Assessment Components**:*

Homework and Computer Assignments 35%
Mid-term 30%
Final Project* 35%

**The topic of the final project must be approved by the instructor. A final report (75%) and an oral presentation (25%) must be delivered by the last week of the semester.*