MACHINE LEARNING IN PYTHON FOR ENVIRONMENTAL SCIENCE PROBLEMS: ADVANCED TOPICS IN MACHINE LEARNING

Short Course Organizers
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AMS COMMITTEE ON ARTIFICIAL INTELLIGENCE APPLICATIONS TO ENVIRONMENTAL SCIENCE

SUNDAY, JANUARY 12, 2020

Time	Topic	Speaker
8:30 AM	OPENING, INTRODUCTION, COMPUTER SETUP	Ben Toms, Colorado State University, Fort Collins, CO
8:45 AM	UNSUPERVISED LEARNING OVERVIEW*	
10:30 AM	COFFEE BREAK	
10:45 AM	MACHINE LEARNING MODEL INTERPRETATION	Ryan Lagerquist, University of Oklahoma, Norman, OK
12:00 PM	LUNCH (INCLUDED)	
12:45 PM	MODEL INTERPRETATION EXERCISE*	Ryan Lagerquist, University of Oklahoma, Norman, OK
1:30 PM	PHYSICS AWARE MACHINE LEARNING*	Karthik Kashinath, Lawrence Berkeley National Laboratory, Berkeley, CA
3:30 PM	SUMMARY, EVALUATIONS	
3:45 PM	COURSE END	

*Includes an interactive exercise

UNSUPERVISED LEARNING OVERVIEW

For real-world problems that do have large observational datasets, unsupervised learning can be used to uncover previously unknown patterns in data. We will explore different unsupervised methods such as clustering, matrix decomposition, and unsupervised neural nets. In addition, participants will have a chance to solidify the unsupervised learning concepts through an interactive exercise using a real-world dataset.

MACHINE LEARNING MODEL INTERPRETATION

Model interpretation techniques can be applied throughout the machine learning process, to discover errors in model development or provide insight into what a model is learning. Some of the interpretation methods we will cover are feature optimization, novelty detection, saliency maps, and UpConvNets.

MODEL INTERPRETATION EXERCISE

In continuation of the machine learning model interpretation lecture, participants will implement interpretation methods on machine learning and deep learning models in an interactive exercise.

PHYSICS AWARE MACHINE LEARNING

As incorporating machine learning models in physical models has become popular within the environmental sciences, we will explore generative modeling and other methods for integration. Following the lecture on integrating machine learning models within physical models, participants will be able to implement their own physics-aware machine learning model.