

Climate Data Science

Course Coordinator: Manmeet Singh

Course Faculty: Manmeet Singh, Dr Bipin Kumar, Dr Rajib Chattopadhyay

Course Description

Machine Learning and its sub-branches such as deep learning, reinforcement learning, non-linear methods have led to important advances in various fields of climate science. In this course, we cover all the basic aspects of machine learning which can be useful for Earth System Science.

Component	Hours
Supervised Learning	1
Unsupervised Learning	1
Reinforcement Learning	2
Neural Networks and Deep Learning	1
Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization	1
Structuring Machine Learning Projects	1
Convolutional Neural Networks	1
Deep learning for tabular data	2
Sequence Models	2
Complex Networks	1
Non linear time series analysis & recurrence networks	1
Bayesian Methods for Machine Learning	1
Graph Neural Networks	1
Deep Learning for downscaling	2
Natural Language Processing	2
Image Segmentation	2
Object Detection	2
Google Earth Engine	1
Digital Earth Sandbox	1
Transformers for time series	2
Transformers for vision problems	2
Self-Organizing Maps	1
Data Visualization	1
Generative Deep Learning	2
MLOps	2
Explainable AI	2
Causality and deep learning	2

Evaluation

The evaluation would be carried out by a term paper which is allocated 100% of the overall course grade: (i) 60% is for the written paper submitted, and (ii) 40% is for your presentation and in-class participation during student presentations.

About the term paper

The term paper will be an individual project. The maximum length of your paper is 6 pages (single-column) or 3 pages (double-column) using a font size of 11 pt. If you choose the double-column format, it is recommended that you use an ACM or IEEE template. Each student must write their term paper with their sentences, analytical thinking, and ideas. Copying and pasting from someone else's paper, published or not, will constitute plagiarism. The use of someone else's phrases or sentences should be attributed and shown within quotation marks.

Choose any component from the course description and start working on the term project from the start of the semester. The deadline for submitting the first draft of the term paper is 30 April 2022. Final submissions would be due on 30 June 2022.

Softwares that would be covered

Tensorflow, PyTorch, Keras, HuggingFace, Weights & Biases, FastAI, Optuna, Google Earth Engine, Digital Earth Sandbox