ASEN 6337 Remote Sensing Data Analysis

Lecture: T/TH 12:30-1:45pm, ECCR 151 (Lab: ECCR 239)
Webpage: Desire2Learn (https://learn.colorado.edu/)
Instructor: Prof. Tomoko Matsuo
Office Hour: T/TH 1:45-2:45pm or by appointment, ECOT 614

Course Description

With an explosive increase in the availability of high-resolution terrestrial remote sensing data, analyzing it has become a big data problem. Increasingly, machine learning is being recognized as a powerful tool for addressing this challenge. This course covers some of the most commonly used machine learning techniques in remote sensing data analysis, specifically for clustering, classification, feature extraction and dimensionality reduction. The course also covers inverse methods used to retrieve geophysical information from atmospheric remote sensing data. The course materials are organized into five sections: (1) Introduction, (2) Feature Extraction and Selection, (3) Clustering, (4) Classification, and (5) Inverse Methods for Atmospheric Remote Sensing Data. Hands-on computational homework (in Matlab or/and Python) and group and individual projects provide opportunities to apply classroom curricula to real remote sensing data.

Class Learning Goals

The goal of this course is to introduce commonly used machine learning techniques and inverse methods in remote sensing data analysis, equipping students with the knowledge and skills to apply modern data analysis techniques to remotely sensed data on their own. Students will: (1) develop a deeper understanding of machine learning and inverse methods in the context of remote sensing data analysis; (2) actively apply their own understanding of the fundamentals and tradeoffs of different approaches in critiquing current remote sensing data analysis research; and (3) develop the skills, confidence and creativity to design and solve a remote sensing data analysis problem of their choice.

Prerequisites

Some basic understanding of

- **Section 4: Classification (Week 8-10)**
  Bayesian classification
  Neural Networks
  Support Vector Machines
  Tree Structured Classifier
  Bragging and Random Forest

- **Section 5: Inversion Methods for Atmospheric Remote Sensing Data (Week 11-14)**
  Abel Transform and Inversion
  Review of Radiative Transfer, Weighting Functions, Averaging Kernels
  Bayesian and Variational Methods
  Temperature Profile Inversion

- **Final project presentations (Week 15)**

Texts

All the reading material required for the course will be provided through the D2L course webpage. Suggested (not required) text books on the topics covered in this course include:

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Disabilities

If you qualify for accommodations because of a disability, please submit a letter to me from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322 or http://www.Colorado.EDU/disabilityservices

Religious Observances

misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303