Keely Roth, Senior Remote Sensing Scientist, The Climate Corp.

Topic: vegetation, agriculture, data fusion, machine learning

Country: USA

Email: keely.roth@climate.com

Vegetation Characterization with Multi-source Remote Sensing Data

One of the most powerful applications of Earth observation remote sensing is vegetation characterization. Whether focused on the presence/absence of vegetation, its seasonal signal, or biochemical, biophysical and structural characteristics, maps and measurements derived from remote sensing data provide valuable insights into ecosystem health and functionality, agricultural activity and productivity, and highlight global patterns of the terrestrial biosphere. While different sensor systems and platforms offer their own unique data capture abilities, they also come with different challenges and drawbacks. Beyond data collection, there exist an incredible number of approaches and algorithms for measuring and mapping vegetation attributes. These applications often benefit from combining sensor data across temporal, spatial, and spectral scales. The most cutting edge of these approaches often fuse data from multiple platforms, or even incorporate non-remote sensing data. In this seminar, we will discuss 1) sensor selection and tradeoffs to consider, 2) common methods for characterizing vegetation, and 3) opportunities for sensor and data fusion to leverage the strengths of multiple systems across scales. Examples and use cases will include unsupervised and supervised problems, applications of machine learning/deep learning, and best practices for different fusion approaches.

Deriving Actionable Insights from Remote Sensing Data in Agriculture

Several decades of research have demonstrated the high potential of remote sensing for agricultural applications, but there remain significant challenges in deriving and combining data layers that support timely, relevant, and actionable management decisions. Meanwhile, the number and diversity of platforms available for collecting agronomic imagery continues to rapidly increase, including ground-

based imagers, unmanned aerial vehicles/systems (UAV/UAS), and satellites. Agtech start-ups have exploded in recent years, all promising precision solutions that rely upon remote sensing in some manner. In this seminar, we will cover a few of the major areas of application for remote sensing-based solutions in precision farming, as well as the challenges each of these pose. We will look at several examples of industry-based solutions and their implementations in different regions of the world. We will also discuss cutting-edge, newly-developed imaging technologies and how they might be used to advance agricultural applications of remote sensing in the coming years.

Dr. Keely Roth is a Senior Remote Sensing Scientist and Science Lead for Horticulture on the Geospatial Sciences team of The Climate Corporation. She is based in San Francisco, CA, and has 10+ years experience in remote sensing research and geospatial analysis. In her role at The Climate Corporation, she designs and leads research projects aimed at improving our ability to measure and map crop health during the growing season using field data and remotely sensed imagery from UAVs, planes, and satellites. She also leads the research program for Horticulture, including fruits, vegetables, and specialty crops. In her work, she is especially focused on and committed to applying the best remote sensing scientific principles to developing models and generating valuable data layers for her scientific colleagues as well as for farmers within the Climate FieldView platform. She is passionate about helping farmers use their data to make faster, easier, and more informed decisions, and she is optimistic that the data revolution in agriculture, especially the continued improvement and integration of remote sensing data, will have positive impacts for both farmers and the environment.

Prior to joining The Climate Corporation, Keely was a postdoctoral research scientist in the Center for Spatial Technologies and Remote Sensing Lab at UC Davis. Her research was part of the NASA HyspIRI campaign to evaluate the capabilities of a spaceborne imaging spectrometer mission for characterizing plant functional traits across ecosystems. In her graduate research, she worked on projects related to measuring forest biomass, mapping ecosystem species composition and phenology, and tracking post-fire vegetation recovery. While in academia, she worked extensively with multispectral, hyperspectral, and lidar remote sensing data and led 100+ field data collection campaigns to design, develop, and validate remote sensing models. During this time, she gained a deep understanding of statistical models, machine learning, and image processing techniques. She specializes in imaging spectroscopy and has experience with physical process models.

Keely holds a BA in Geography and International Studies from the University of Miami, and earned her master's and Ph.D. from the University of California, Santa Barbara in Geography with a focus in Remote Sensing and Plant Ecology/Physiology. She has authored/co-authored over 14 peer-reviewed publications related to the development and application of new remote sensing techniques.