HIRES 2021 Remote Sensing Syllabus

Dr Brian Vant-Hull *bvanthull@ccny.cuny.edu*

The basics of remote sensing will be covered in this section of the course. Visible and thermal infrared radiation are both part of the electromagnetic spectrum so follow the same rules of transmission, scattering and absorption. Mathematically manipulating the observed intensities from each scene lets us estimate vegetation, temperature, and other quantities beyond what we would just see with our eyes. You will learn how to take data from satellites to make such images and estimations.

2. **Venue:** The class will be held via the same zoom link for all other HIRES activities: https://ccny.zoom.us/s/82654313077

Documents: A drop box folder will be used in addition to blackboard in case blackboard doesn't work correctly.
https://www.dropbox.com/home/HIRES_RS2021

Assignment Submission: done via dropbox folders for each assignment.

Teaching Assistant: Abdou Ba will be grading and helping with classwork.
ABah@citytech.cuny.edu

Scoring: 3 classworks x 20 pts each
1 final project x 40 pts **100 pts total**

Wednesday July 7

Afternoon Topics (2 hours)
• Satellite Orbits
• Collimation
• The Electromagnetic Spectrum
• Units of Intensity
• Transmission, Absorption, Scattering
Classwork 1: Calculations with light (submit via Dropbox)

Thursday July 8

Afternoon Topics (4 hours)
• Color images with Octave
• Reading a text file
• Making an image from satellite data
• Changing Contrast
• the Normalized Difference Vegetation Index (NDVI)

Classwork 2: write a function that displays vegetation density

Monday July 12

Morning topics (2 hours)
- Thermal Radiation
- Calculating temperature from infrared

Classwork 3: write a function that calculates brightness temperature

Tuesday July 13

Afternoon Topics (1 hour)
- Histograms and scatter plots
- Selecting points by criteria
- Mapping colors

Final Project (2 hours**):** write a main program + functions that does the following:

1. Reads the landsat visible and thermal data into variables
2. Calculates and displays NDVI from the visible and Brightness temperature from thermal infrared
3. Makes a histogram of brightness temperature
4. Selects out cloud points based on histogram of temperature
5. Makes a map showing clouds in white and vegetation in green
6. Makes a scatter plot of cloud brightness versus temperature
7. Makes scatter plot of NDVI versus temperature for no clouds.

Included with the project, write an explanation of the following:

1. Why does the histogram in step 3 take the shape that it does?
2. Explain why the scatter plot of cloud brightness versus temperature slopes the way it does – this must have a physical explanation.
3. Explain why the scatter plot of NDVI versus temperature slopes the way it does – this must have a physical explanation.