ESM 296-4f: Advanced GIS, Fall 2015

Ben Best & Lisa Wedding

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Contents

Logistics

- Instructors:
- Ben Best (bdbest@gmail.com), Bren Rm 4524
- Lisa Wedding (lwedding@stanford.edu)
- Meeting times and locations, from October 30th to December 4th, 2015.
  - Lecture & Lab: Fridays 8:30 - 11:30 in Bren Hall 3035 (GIS lab)
  - Office hours: TBA
- Required textbook: none. We will use online materials, help documentation and reference a few articles.

Overview

The Advanced GIS course applies advanced spatial analysis and programming techniques towards environmental problems. The course meets for 3 hours each week for 5 weeks. We will begin with automation of spatial analytical techniques in ArcGIS ModelBuilder and Python using drone derived aerial photography. Then we will develop models for species distributions and ecosystem services. Finally we'll publish spatial content to the web using R and ESRI StoryMaps.

Grading

(50 total points)

The **5 lab assignments** (10 points each) are due 8 am the Wednesday following the lab in which they were assigned. All homework will be posted to your GauchoSpace.

Course Outline

Week 1, Oct 30: Species Distribution Modeling, MGET Lab

- **Lecture**: introduction to species distribution modeling and applications with MGET (Marine Geospatial Ecology Tools)
- **Lab**: species distribution modeling with MGET. Students will choose a unique species of interest drawing observation data from the Global Biodiversity Information Facility (GBIF).

Week 2, Nov 6: Advanced Model Builder, Wind Energy Lab

- **Lecture**: course's weekly topics, grading, and setup for the following week's drone mapping
- **Lab**: variable assignment and iteration in ArcGIS ModelBuilder to loop over a time series of national wind energy data

Week 3, Nov 13: Python Programming, Drone Mapping Lab

- **Field**: collect aerial imagery around campus using a drone. Students will be strategically placed with GPS enabled smartphones to later use as georectification control points
- **Lecture**: introduction to Python programming with ArcGIS and open-source libraries, georectification
- **Lab**: georectification and classification of drone imagery. Students will georectify a unique image and use Python to load all student images into a photo mosaic.

Week 4, Nov 20: Ecosystem Services, InVEST Lab

- **Lecture**: introduction to ecosystem service evaluation theory and practice using InVEST (Integrated Valuation of Environmental Services and Tradeoffs)
- **Lab**: coastal vulnerability modeling with InVEST

Week 5, Dec 4: Publishing Maps Online, Leaflet and StoryMaps Lab

- **Lecture**: introduction to online mapping using Google Earth (KML), Javascript (Leaflet), and ArcGIS Online (StoryMaps)
- **Lab**: publishing spatial content using R leaflet package, and ESRI StoryMaps. Students will be able to choose spatial content from any of the prior labs.