

# Geospatial Modeling Crash Course

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A bit of a kitchen sink

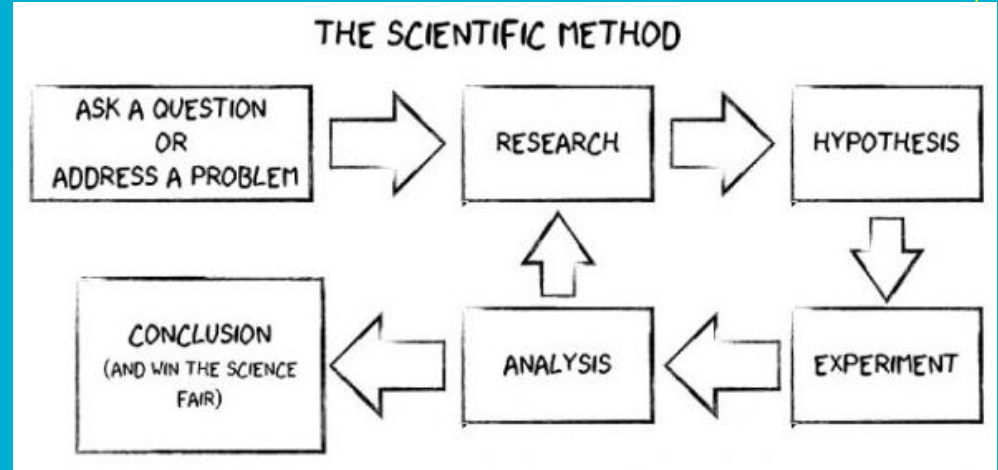


# How to do this well

*Personal Note on doing good science*

- Collaboration
- Reproducibility
- Always learn
- Engaging in peer review process

This should look old and outdated...



# Goal

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*Provide a training that exposes individuals to the framework and components of a common geospatial modeling process so they can more quickly engage with the material in their own work.*

- Drive into the deep end
- Understand potential and follow the process
- Have a resource to look back on

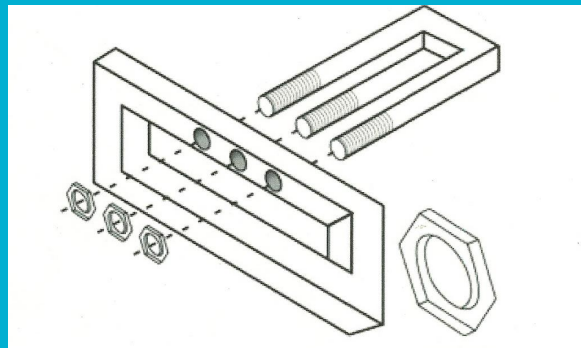
## Please Ask Questions



# Outline

## Part 1: Google Earth Engine (GEE)

- 4 sections
- A bit more straightforward
- You don't need to know GEE



## Part 2: R

- 2 sections
- A bit less straightforward
- You don't need to know R (hopefully)



# Introduction (Part 1)

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GEE: Resources

[https://drive.google.com/open?id=1W4TZS9eGWq\\_Sbd-2nmgeq48FbY3t-JxF](https://drive.google.com/open?id=1W4TZS9eGWq_Sbd-2nmgeq48FbY3t-JxF)

# Introduction (Part 1)

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GEE Presentation

[https://docs.google.com/presentation/d/191dsyRePGyPruiH-fQ1nhx0jx7oJrJ2wa2pTP4NhK3E/edit#slide=id.g3556a9360b\\_0\\_25](https://docs.google.com/presentation/d/191dsyRePGyPruiH-fQ1nhx0jx7oJrJ2wa2pTP4NhK3E/edit#slide=id.g3556a9360b_0_25)

# Interact with GEE Drop Points (Part 2)

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Generate potential training data in GEE

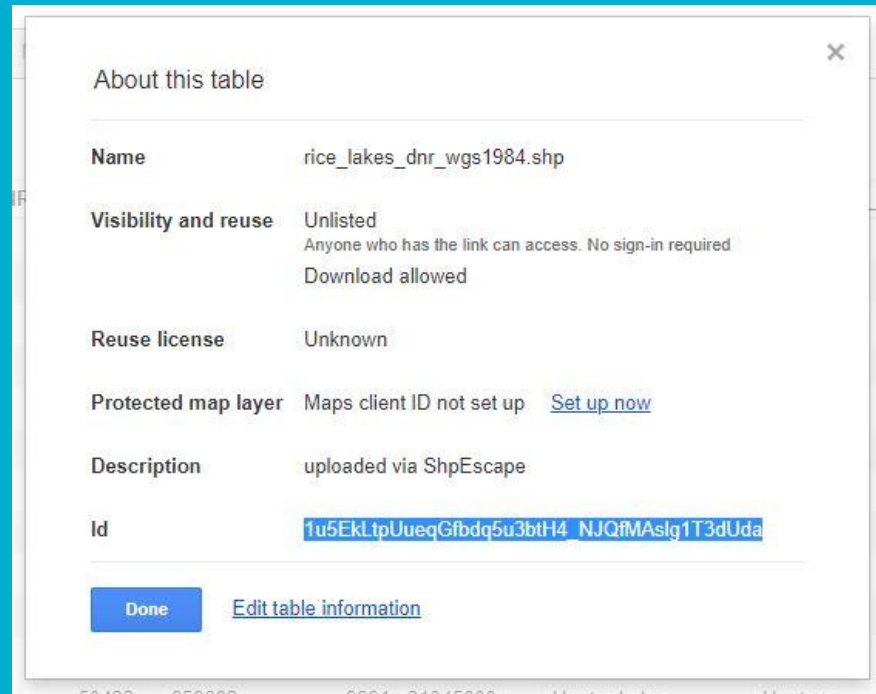
- NAIP imagery
- GEE basic functions



# Import features in GEE (Part 3)

Learn how to import existing datasets into GEE

- Interoperability challenges

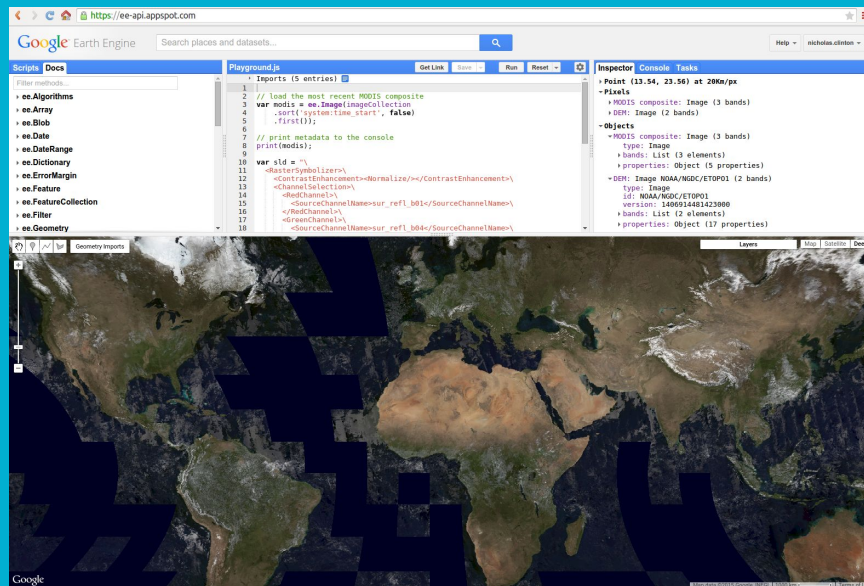




# Modeling In GEE (Part 4)

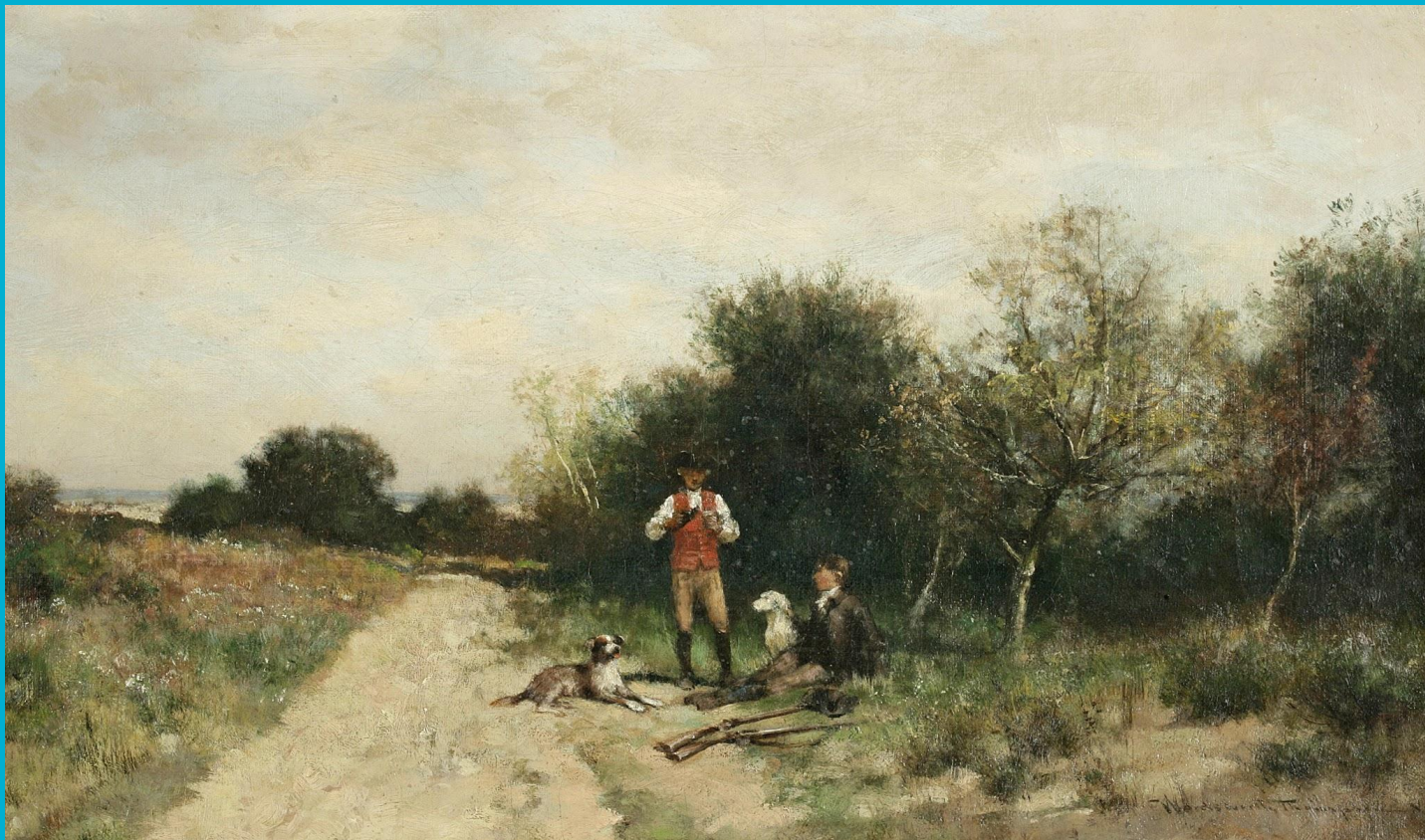
## Produce a geospatial model in GEE

- Apply advanced functions
- Generate Indices
- Visualize results



# Break

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# R

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Programming Language that allows for quick access to dataframes

- Developed for statistical purposes so it kinda stand out relative to other computer science languages
- `thisIsAThing <- "Why would <- mean =?"`
- Call a function on a object `object$function`
- Case sensitive
- Paths `<- "need\\double\\backslash\\on\\windows"`

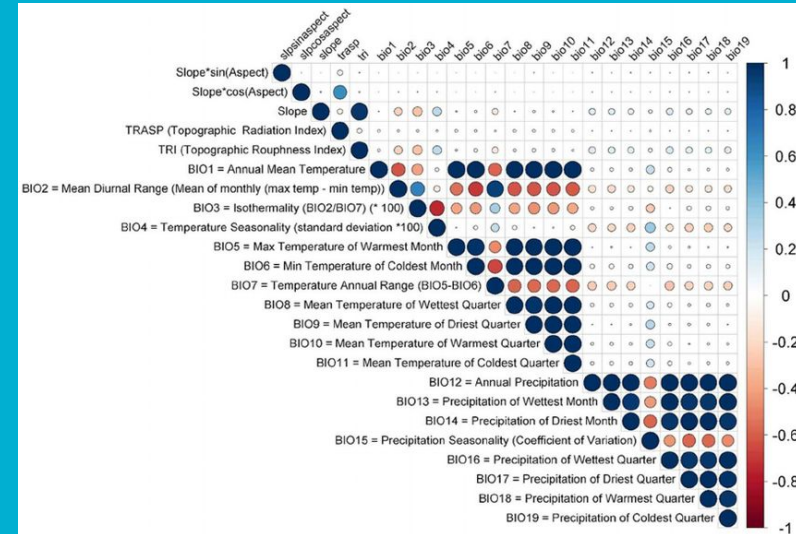
There is a lot more, we just can't cover it here



# Variable Selection in R (Part 5)

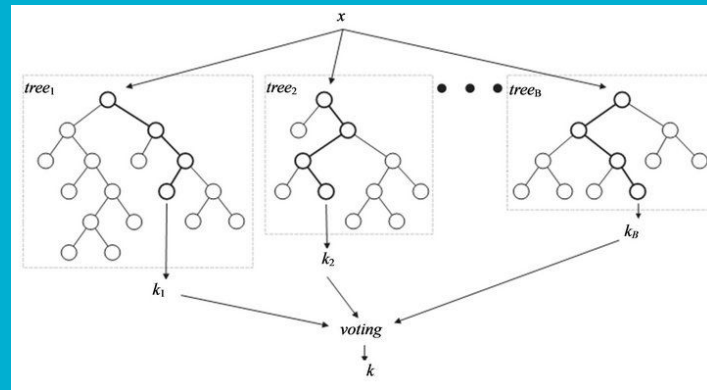
Engage with R packages to inform which predictors are important

- Manipulate dataframes
- Apply algorithms
- View statistical results



# Random Forest Modeling in R (Part 6)

Apply a machine learning algorithm to predict



# Bad Science

Process not Products



# General Notes on Geospatial Modeling

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Modeling is full of assumptions, know them

Understanding what it does poorly is equally as important as what it does well

Ideally your model provides more information than was previously available

Understand where the largest uncertainty is and use that to limit the specificity of your output



<https://github.com/fortCollinDev>

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Contains a series of rmd doc that will be used for half day course on geospatial modeling with google earth engine and R

3 commits 1 branch 0 releases 1 contributor

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unknown and unknown simplified necessary libraries and added imagery for map production

testdocs simplified necessary libraries and added imagery for map production

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<https://github.com/fortCollinDev/modelin>

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	drawPolygon	4/9/2018 10:34 AM	PNG File	81 KB
	drawPolygon2	4/9/2018 10:35 AM	PNG File	230 KB
	geometryImport	4/9/2018 10:41 AM	PNG File	6 KB
	points	4/9/2018 11:25 AM	PNG File	2,322 KB
	points1	5/28/2018 4:28 PM	PNG File	774 KB
	pointsFalse	5/28/2018 4:35 PM	PNG File	842 KB
	presencePoints	4/9/2018 11:15 AM	PNG File	84 KB
	samplingInGEE	5/28/2018 4:39 PM	Chrome HTML Do...	4,501 KB
	samplingInGEE.rmd	5/28/2018 4:39 PM	RMD File	7 KB
	sideBySide	4/9/2018 11:10 AM	PNG File	1,634 KB
	trueColor	5/28/2018 4:25 PM	PNG File	882 KB

# Ocular Sampling in Google Earth Engine

Dan Carver

05/28/2018

- 1 Google Earth Engine
  - 1.1 Goal
  - 1.2 Setting up Sampling Interface
  - 1.3 Define Region of Interest
  - 1.4 Loading In NAIP Imagery
  - 1.5 Adding images to the map
  - 1.6 Adding Presence and Absence Locations
  - 1.7 Exporting points

## 1 Google Earth Engine

This resource has changed our methods for working with remotely sensed data. Google Earth Engine is a web based analysis platform that provides access to large libraries of geospatial data. For the most part the available data is raster based. What is nice about the resource is that it takes away the downloading and preprocessing aspects of the working with these datasets. This allows you to move into asking your question and develop methodology very rapidly. GEE does require registration to a google account. You can sign up and read more at this link: [sign up](#)

### 1.1 Goal

In this document we will show how to use high resolution NAIP imagery to visually sample for a specific land cover class. This is a method that allows you to add to existing presence and absence locations.

### 1.2 Setting up Sampling Interface

Depending on your location and time frame, NAIP imagery is collected in 4 bands, blue, green, red, and near infrared. The near infrared band is helpful in distinguishing between different types of vegetation. In this example we will sample deciduous forests in Iowa for 2015. We will load both true color and false color NAIP imagery to allow for the best distinction.

### 1.3 Define Region of Interest

Creating geometries in earth engine is as simple as pressing the geometry button.

The screenshot displays the Google Earth Engine web interface. The top navigation bar includes the Google Earth Engine logo and a search bar. Below the navigation bar, there are tabs for Scripts, Docs, and Assets. The Scripts tab is active, showing a script titled 'Link 915fe2784a09fa68ac2cdc4a9c2afab4'. The script is written in JavaScript and includes comments and code for loading Sentinel-1 imagery, filtering by date and instrument mode, and creating a composite image. The script is organized into sections: Imports, Owner, users, crashCours, extractV, part1, sampling, wildRice, cleanRF2, 34\_32\_2016, AZ\_NMmou, AZ\_NMmou, Arizona Ne, RO\_validation, Sentinel1\_E, Sonoran Ba, UntitledFile, calibration, extract\_valu, and makeComposite. The script is executed, and the results are displayed in the Inspector panel on the right. The Inspector panel shows a table with columns for Name, Type, and Size. The table contains three rows: Image (12 bands), Object (1 property), and Feature 1. The Feature 1 row has a value of 0.47105561861521. The bottom panel shows a map view of the data, with a 'Geometry Imports' button and a 'Layers' panel.

# Ask questions

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