

# Data and Environment

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# Introduction

## Cohort

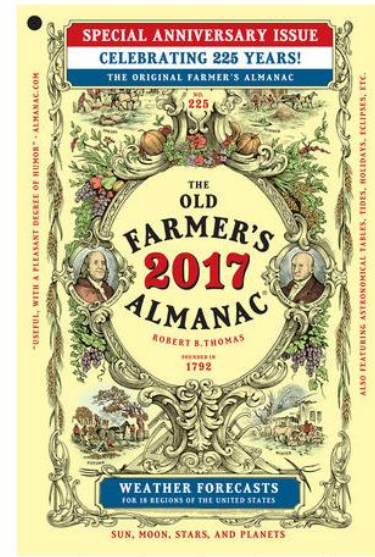
- Focus: Developing proactive **programs** and scholarly **approaches** to support desirable **changes** in **Florida** communities regarding the resilient and efficient use of **natural resources**

## Myself

- Purpose: **Data-driven** decision making, quantitative **analysis** and evaluation of actions regarding the use of resources.
- Engineer with background in optimization and data sciences
- Enthusiastic about protection of the environment

# Data is Important

- Data driven decision making is **not new** for agriculture and landscaping.
- Smart Irrigation: When and How to irrigate?
- Data **changes** the way we do things



# New World for Data

- Collecting
- Exploring
- Integrating
- Processing
- Delivering

# Example 1

## USDA, Economic Research Services

USDA United States Department of Agriculture  
Economic Research Service

ERS Home Topics Data Products Publications Newsroom Calendar Amber Waves Magazine

Home / Data Products / County-level Data Sets / Population

### County-level Data Sets

- Overview
- Documentation
- County-Level Data Sets Download Data

Choose:

State:

1 of 1 Find | Next

Percent change in population, 2010-15: Florida

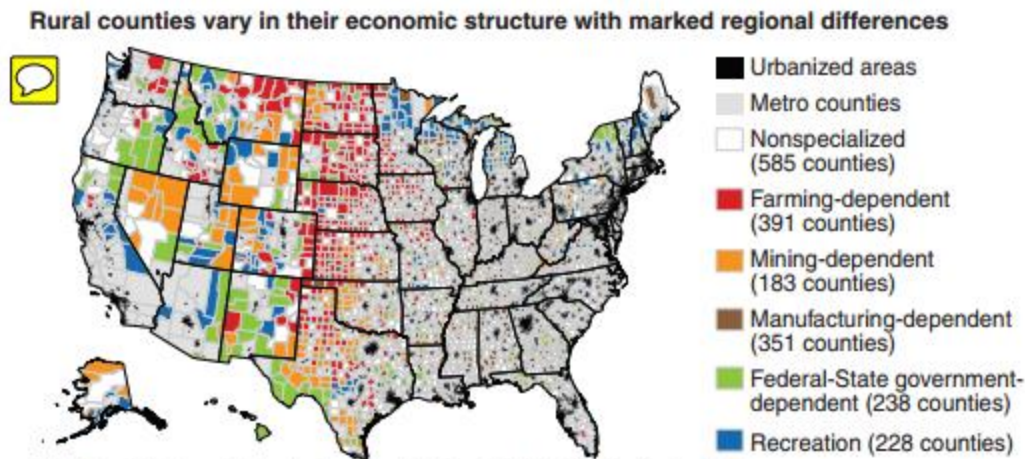
| FIPS* | County name    | RUC code | Pop. 1990  | Pop. 2000  | Pop. 2010  | Pop. 2015  | Change 2010-15 |
|-------|----------------|----------|------------|------------|------------|------------|----------------|
| 12000 | Florida        |          | 12,938,071 | 15,982,571 | 18,804,623 | 20,271,272 | 7.8%           |
| 12001 | Alachua County | 2        | 181,596    | 217,964    | 247,335    | 259,964    | 5.1%           |
| 12003 | Baker County   | 1        | 18,486     | 22,255     | 27,115     | 27,420     | 1.1%           |

Taken From: <https://www.ers.usda.gov>

USDA, Economic Research Service,

Has data products about:

- Crops (Corn, Cotton, Fruits...)
- Economy and Population (Economic Specializations, Jobs and Income,...)



Note: The 2015 county typologies use data from 2010-2012. See footnote 1.

Source: USDA, Economic Research Service using data from the Bureau of Economic Analysis.

Taken From: <https://www.ers.usda.gov>

# Example 2

## Water Quality Institute



**National Water Quality Monitoring Council**  
Working together for clean water

### Water Quality Data

[WQP Home](#) [Download Data](#) [How to use the WQP](#) [National Results Coverage](#) [About the WQP](#)

#### LOCATION

Place:

Country:  ?

State:  ?

County:  ?

Point Location: ?

Bounding Box: ?

Within  miles of

North:

South:

East:

West:

Lat:

Long:

#### SITE PARAMETERS

Site Type:  ?

Organization ID:  ?

Site ID:  ?

HUC:  ?

[Search Upstream and Downstream \(BETA\)](#) ?



Leaflet | Powered by Esri | HERE, DeLorme, MapmyIndia, © OpenStreet...

#### SAMPLING PARAMETERS

Sample Media:  ?

Characteristic Group:  ?

Characteristics:  ?

Project ID:  ?

Parameter Code: (MMS ONLY)  ?

Minimum results per site:  ?

Date range - from:  to:

Biological sampling parameters: ?

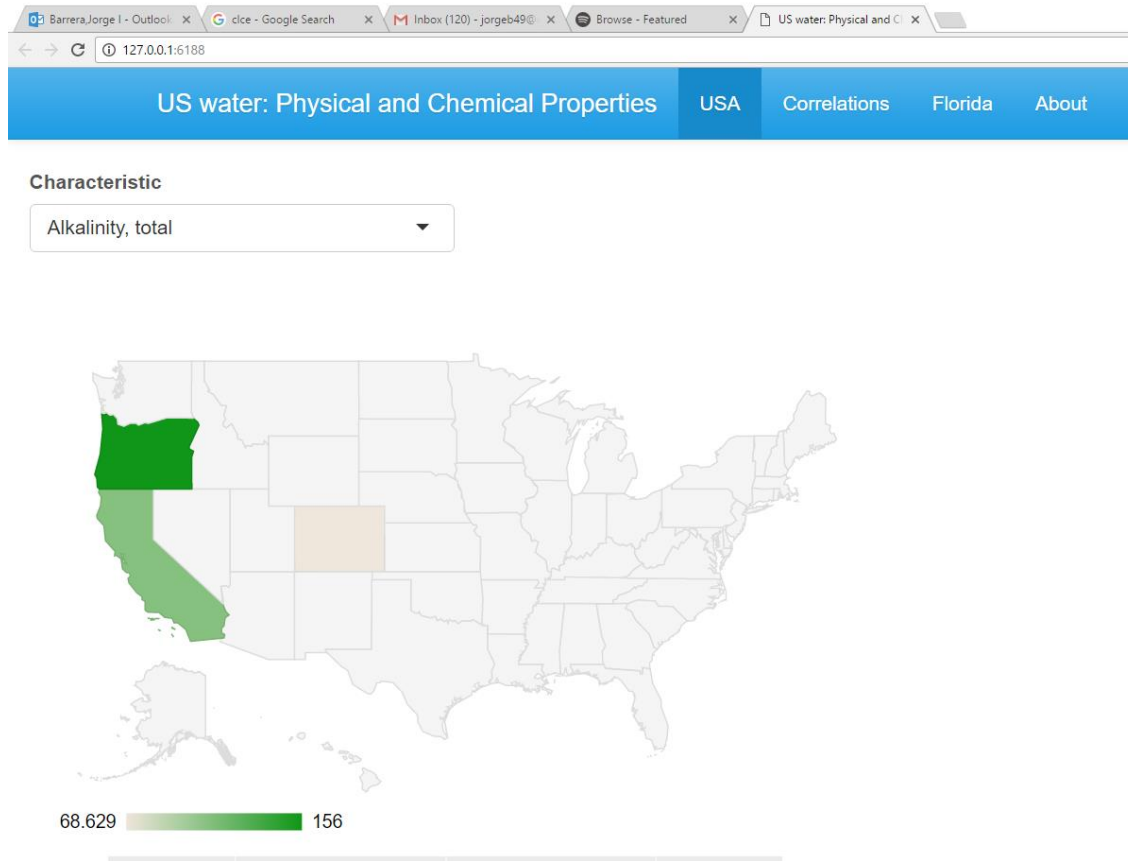
Assemblage:  ?

Taxonomic Name:  ?

<https://www.waterqualitydata.us/portal/>

# Example 3

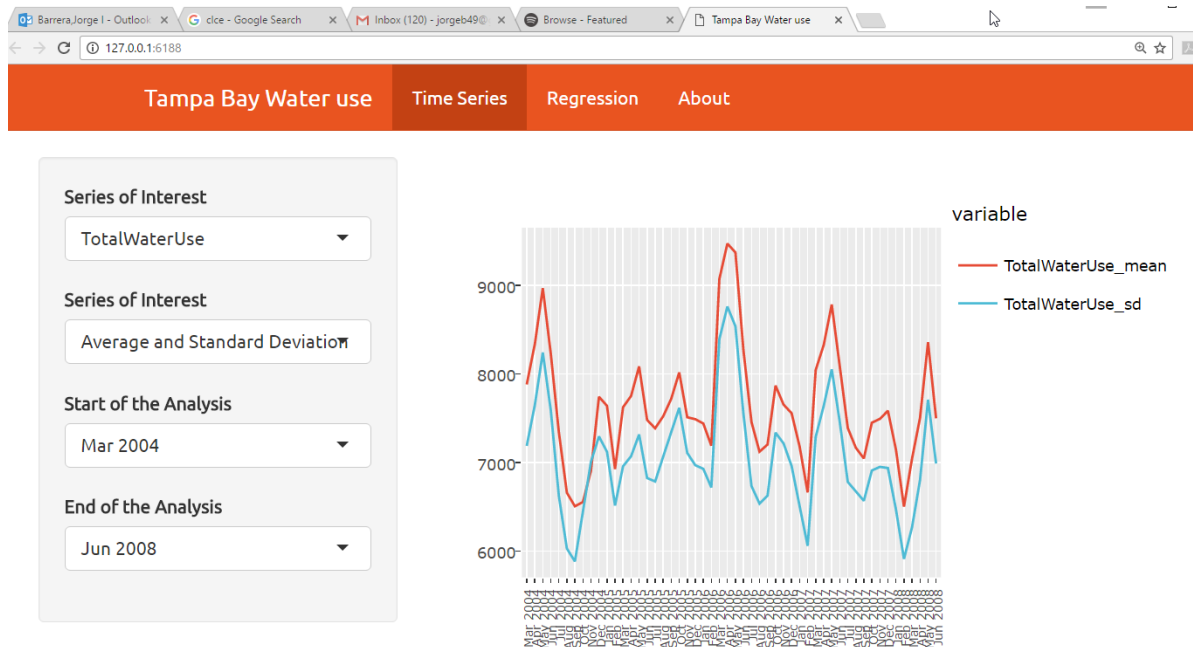
## Our Water Quality US and FL





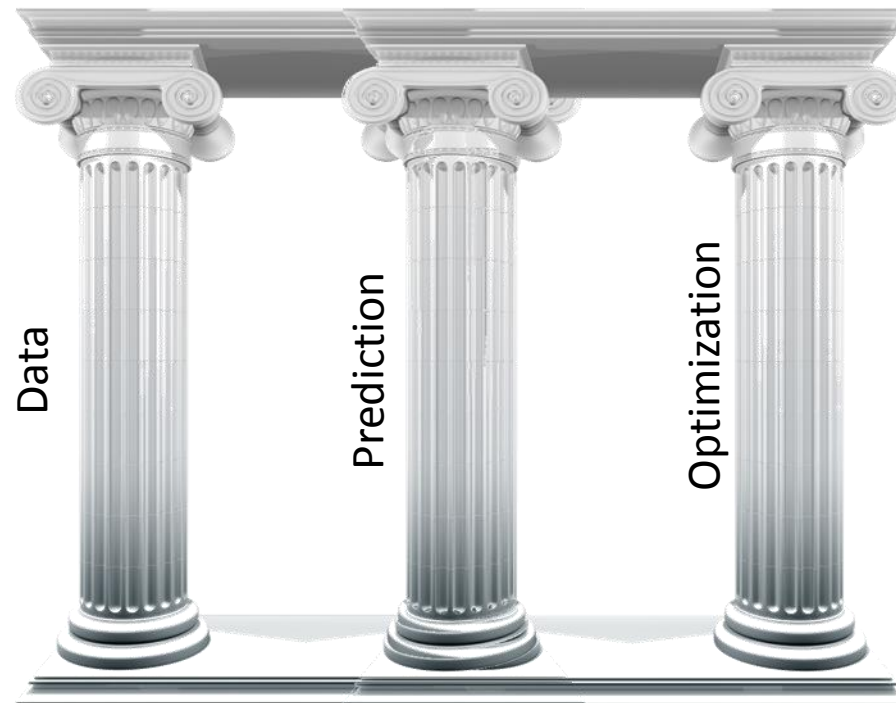
# Example 4

## Water Use Tampa Bay



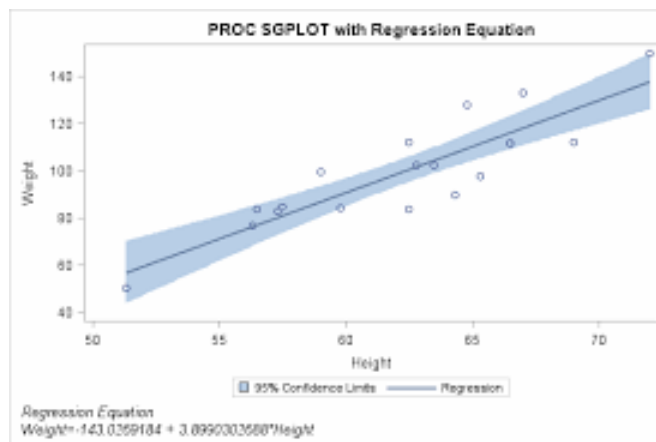
# UF Cyber-Infrastructure

# Optimal Decision Making

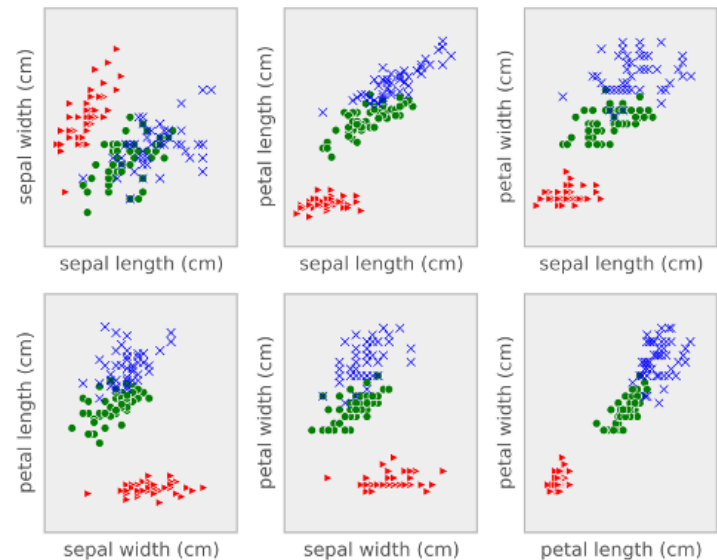


# Data solutions and Machine Learning are great

- Machine Learning
  - Regression

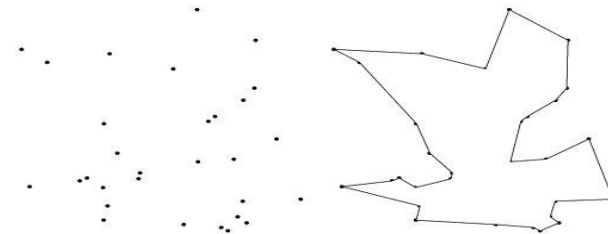
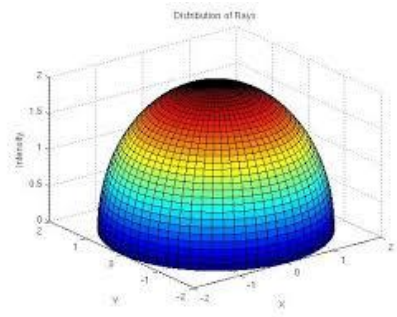


- Classification

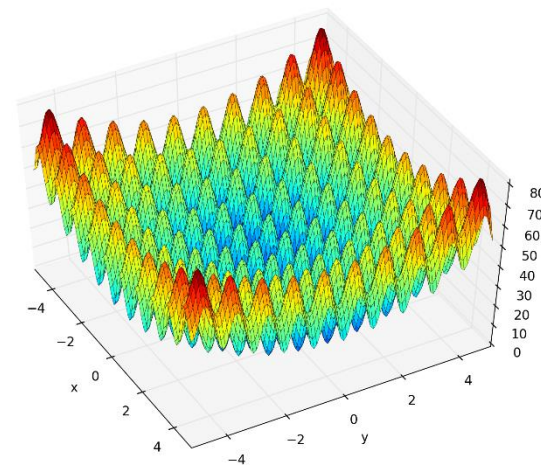


# But there are more tools for Optimal Decision Making:

- Traditional Optimization



- Metaheuristics



# Definitions (5)

- Convex Optimization
- Combinatorial Optimization
- Metaheuristics
  - Genetic Algorithms
  - Simulated Annealing
  - Particle Swarm Optimization
  - Tabu Search...

# Thank you!!!

- If you have a problem subject to optimization and related data, please contact me at [jorgeibarrera@ufl.edu](mailto:jorgeibarrera@ufl.edu)

# Data Products

- 20 mins,
  - 3 intro
  - 10 Data Portals
    - Big Examples of Data optimized decision making.
    - 5 USDA-ERS
      - <https://www.ers.usda.gov/data-products/data-visualizations/>
        - Ag and Food Stats: <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/>
        - <https://www.ers.usda.gov/data-products/agricultural-exchange-rate-data-set/>
        - Storet Public access:  
<http://prodenv.dep.state.fl.us/DearSpa/public/welcome#>
    - 5 UF:
      - HyperGator:
      - Own computing facilities, databases, own data production, portals.