# Applying Spatial Analysis Techniques to Make Better Decisions

Esri Pacific User Conference

October 13 – 14, 2014 | Sacramento

# Agenda

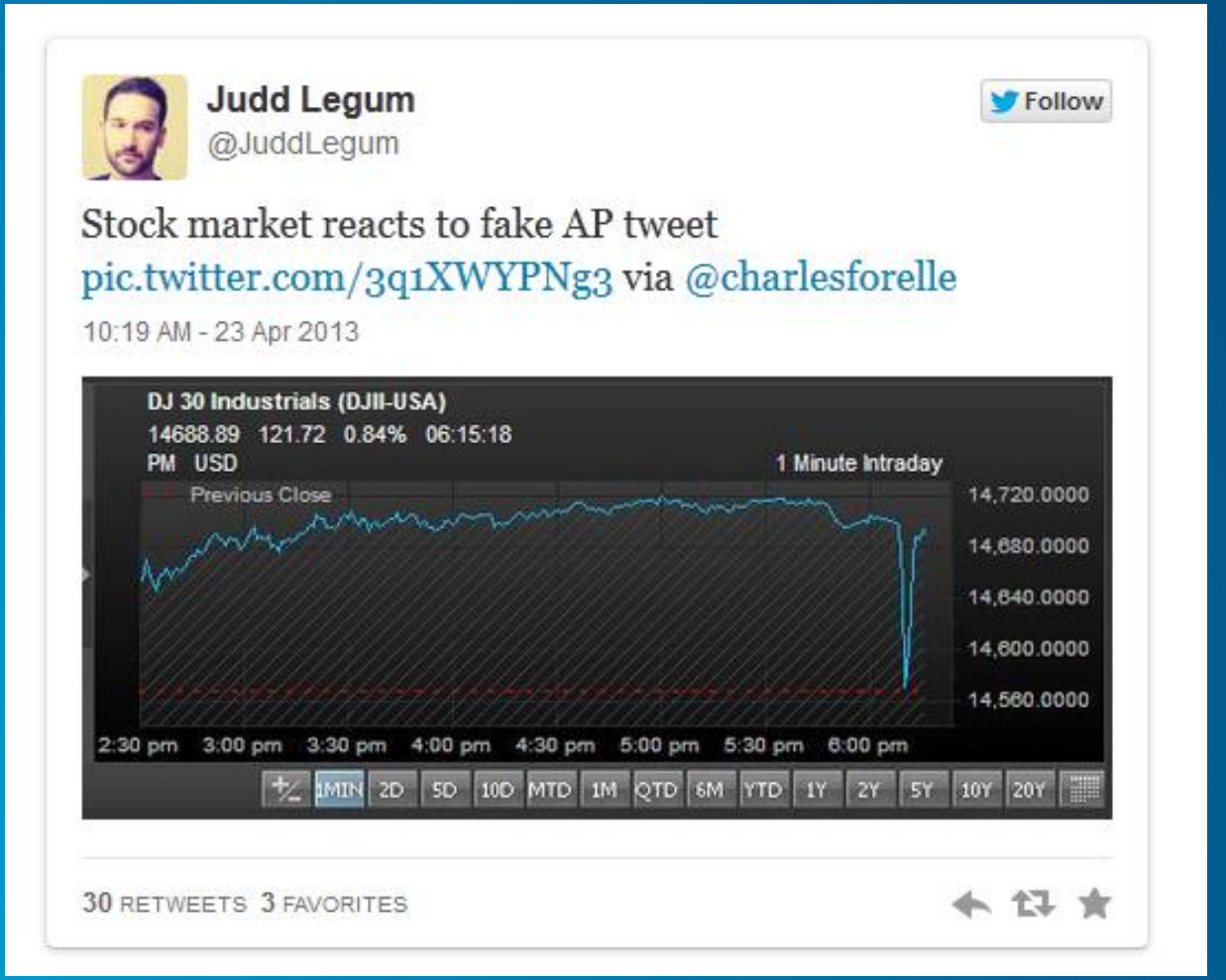
- What is Analysis
- Types of Spatial Analysis
  - Examples
- Pitfalls of Analysis
  - Examples
- Resources

**Analysis** is systematic examination of a problem in order to provide new information from what is already known.

- Esri Dictionary

# Twitter Jitter

## Results of poor analysis workflow

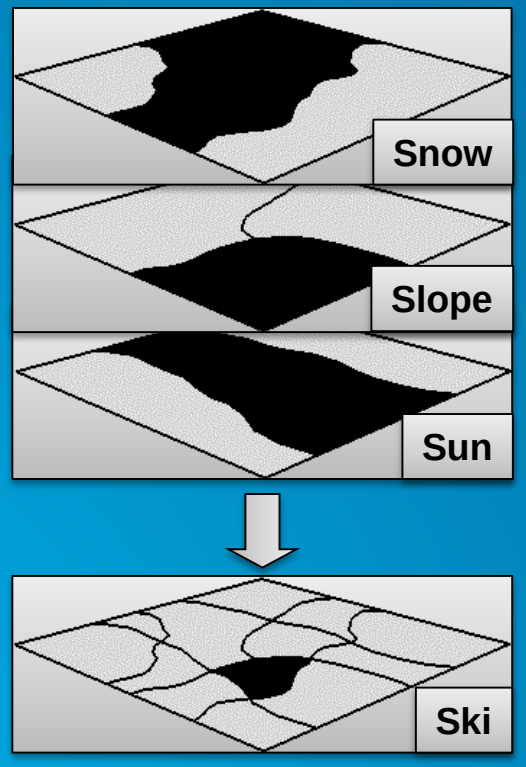


All models are wrong…but some are useful.

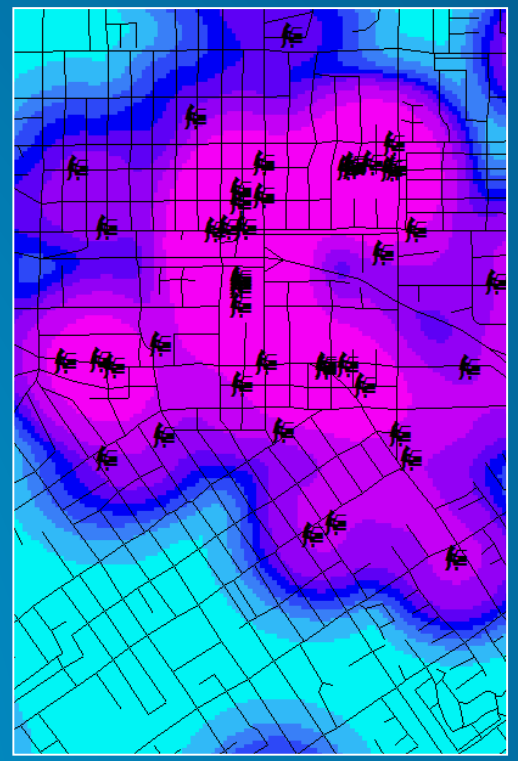
- George P. E. Box

# What Does *Analysis* Mean To Our Community?

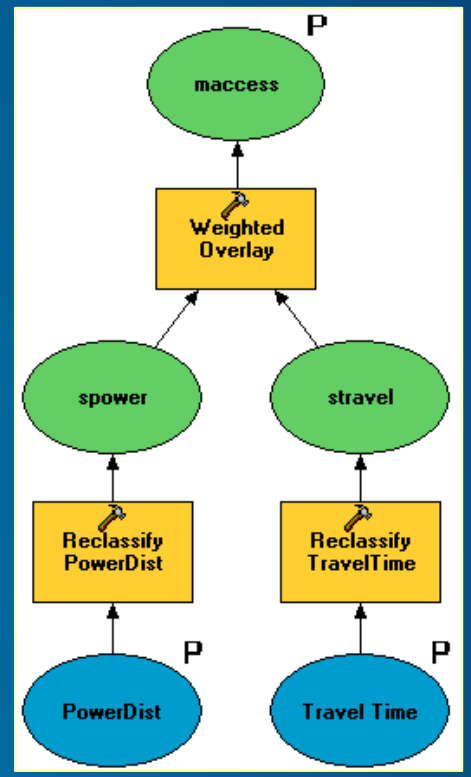
## Overlay




## Density



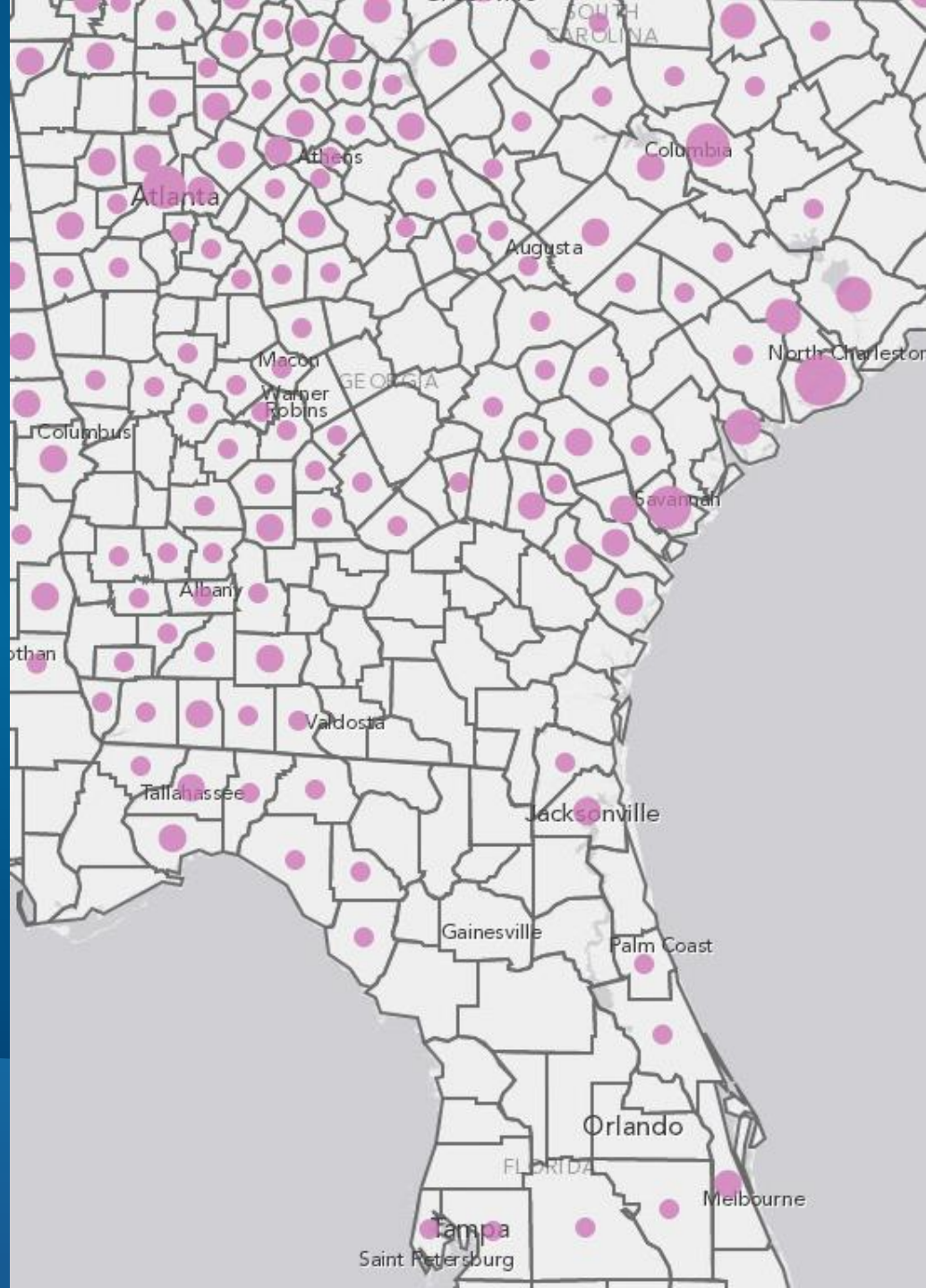
## ModelBuilder



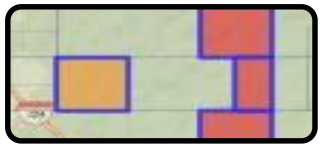
Demo

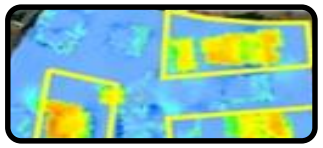
# Finding quantity by area

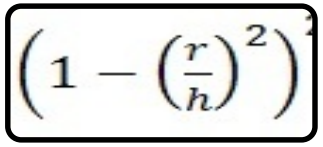
Summarizing by area



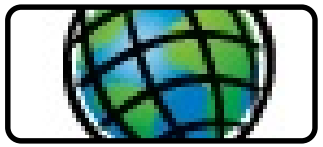
# How Our Platform Supports Analysis

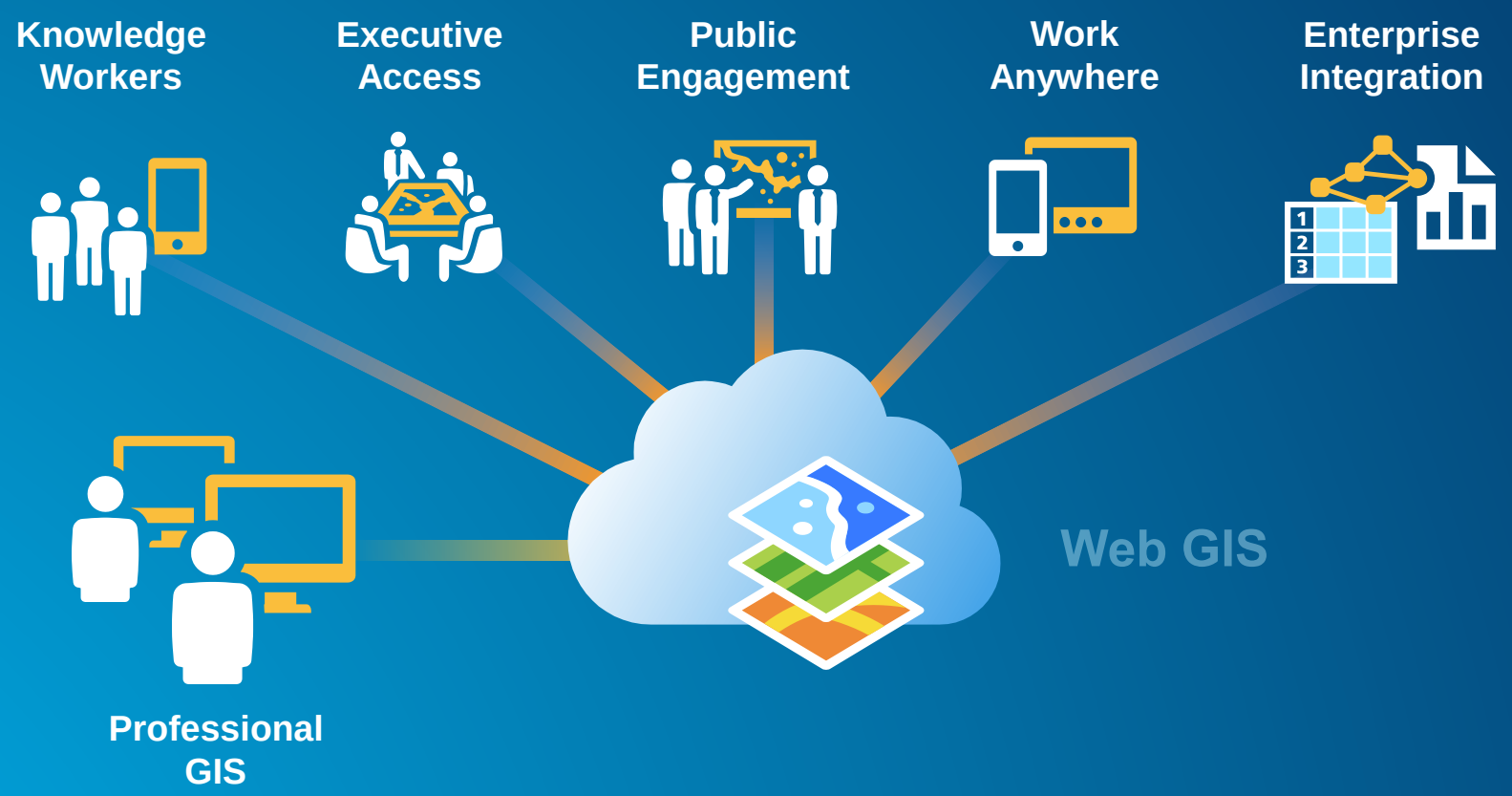

Visualization


Spatial Analysis



Statistical Analysis

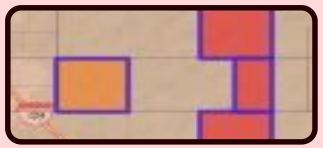

Integration Capabilities



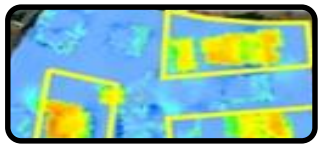

# GIS is a Platform

Making mapping and location available across an organization

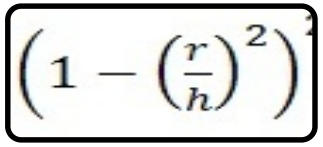
# How Our Platform Supports Analysis



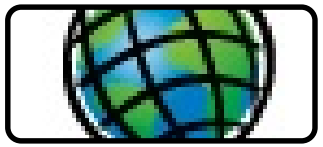
Visualization



Spatial Analysis



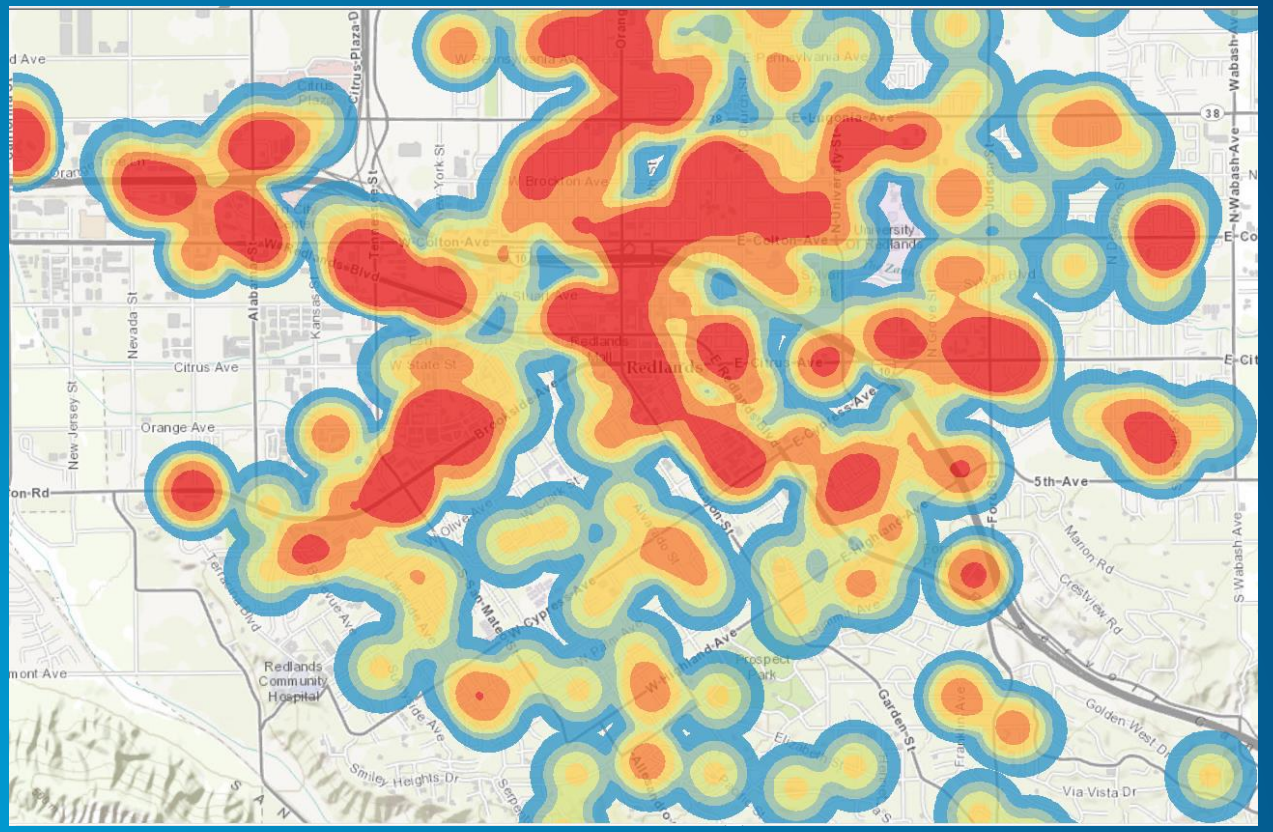

Statistical Analysis



Integration Capabilities

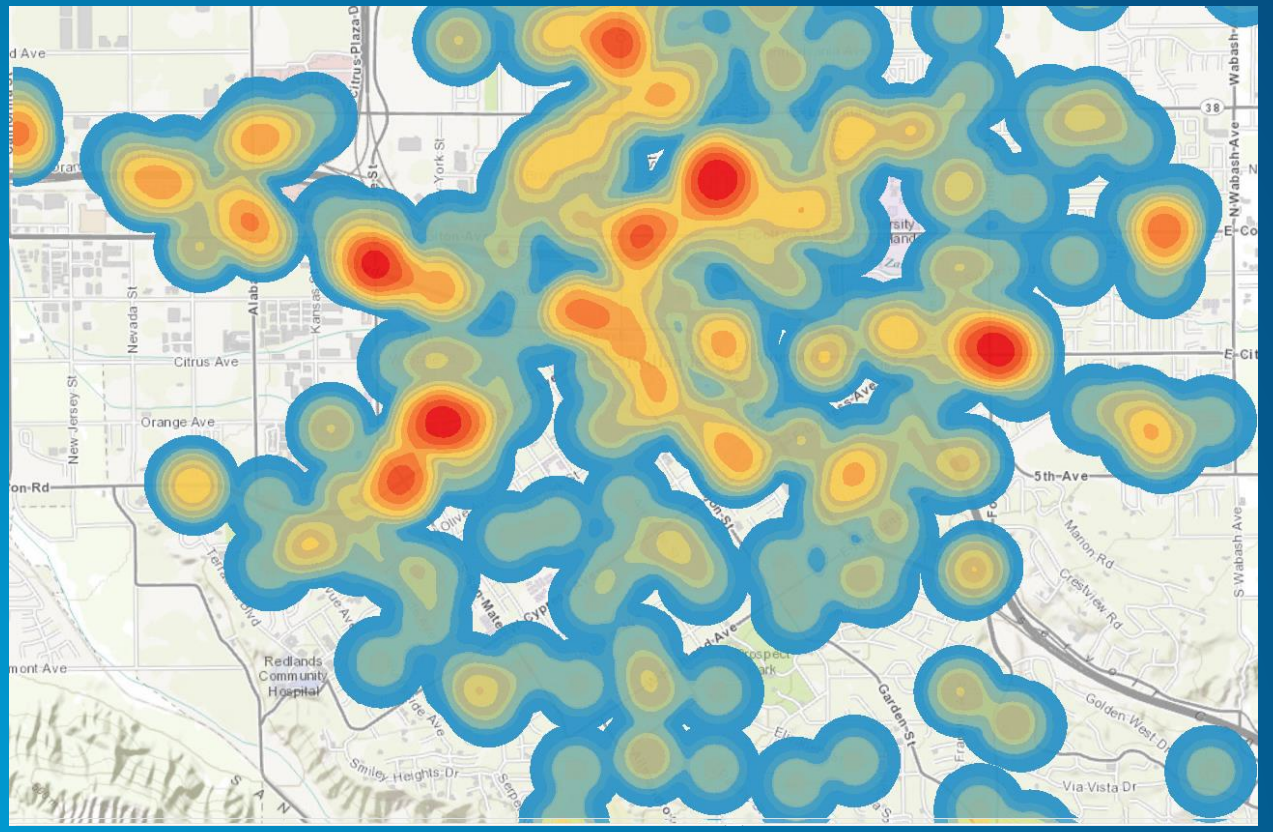
# Crime in Redlands, California

## Oh, the humanity!

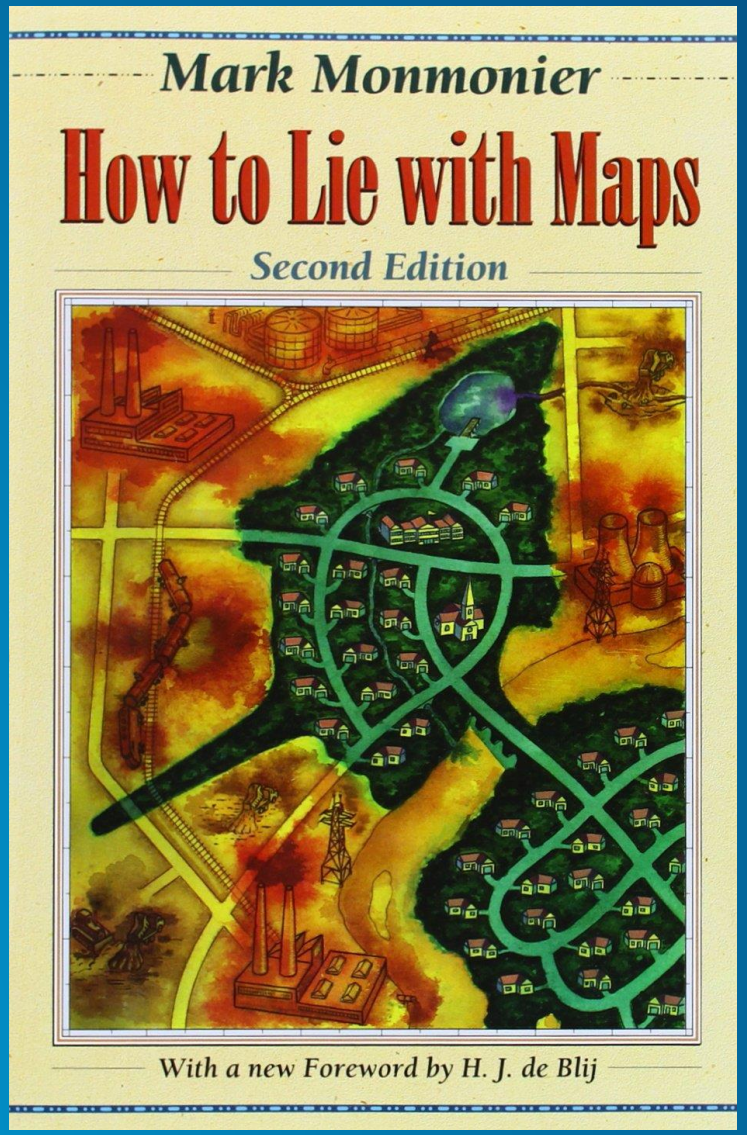


# Crime in Redlands, California

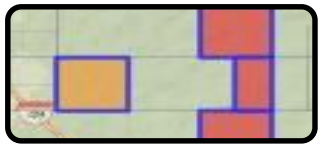
## A *slightly* different view

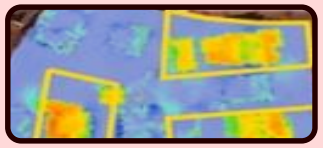


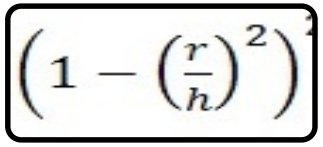
# How to Lie with Maps



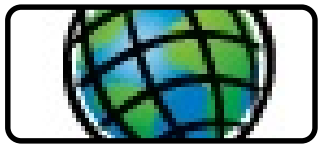
# How Our Platform Supports Analysis


Visualization


Spatial Analysis

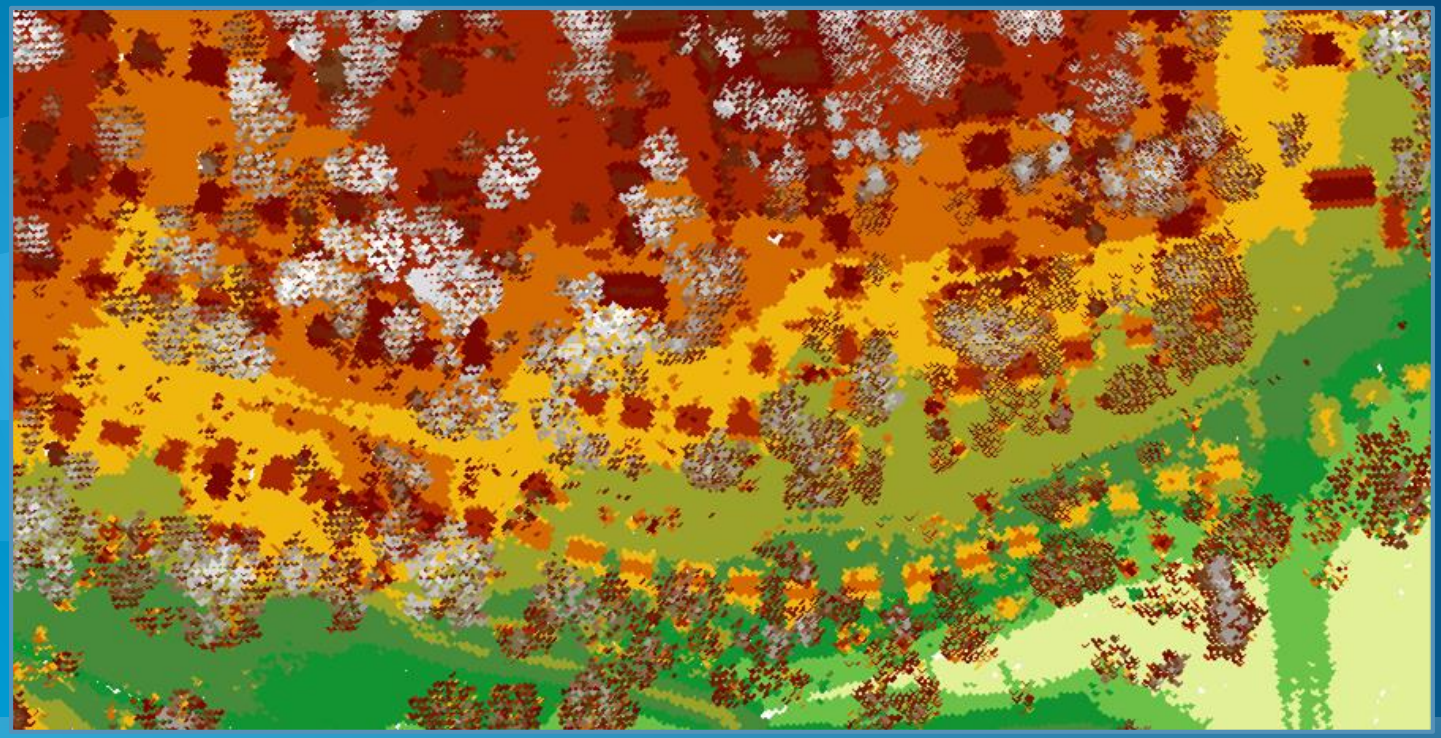


Statistical Analysis


Integration Capabilities

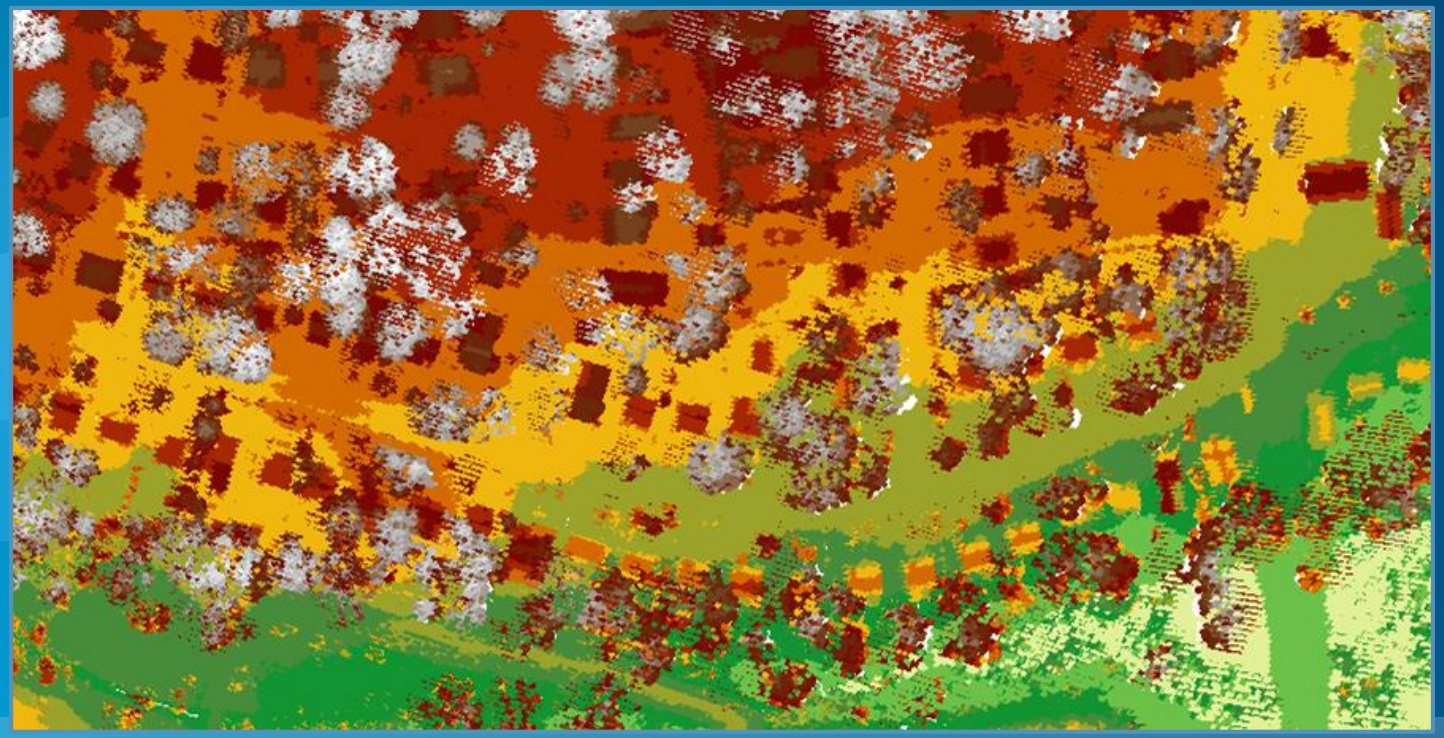
# Spatial Analysis in ArcGIS Platform

## 2008 LiDAR Data



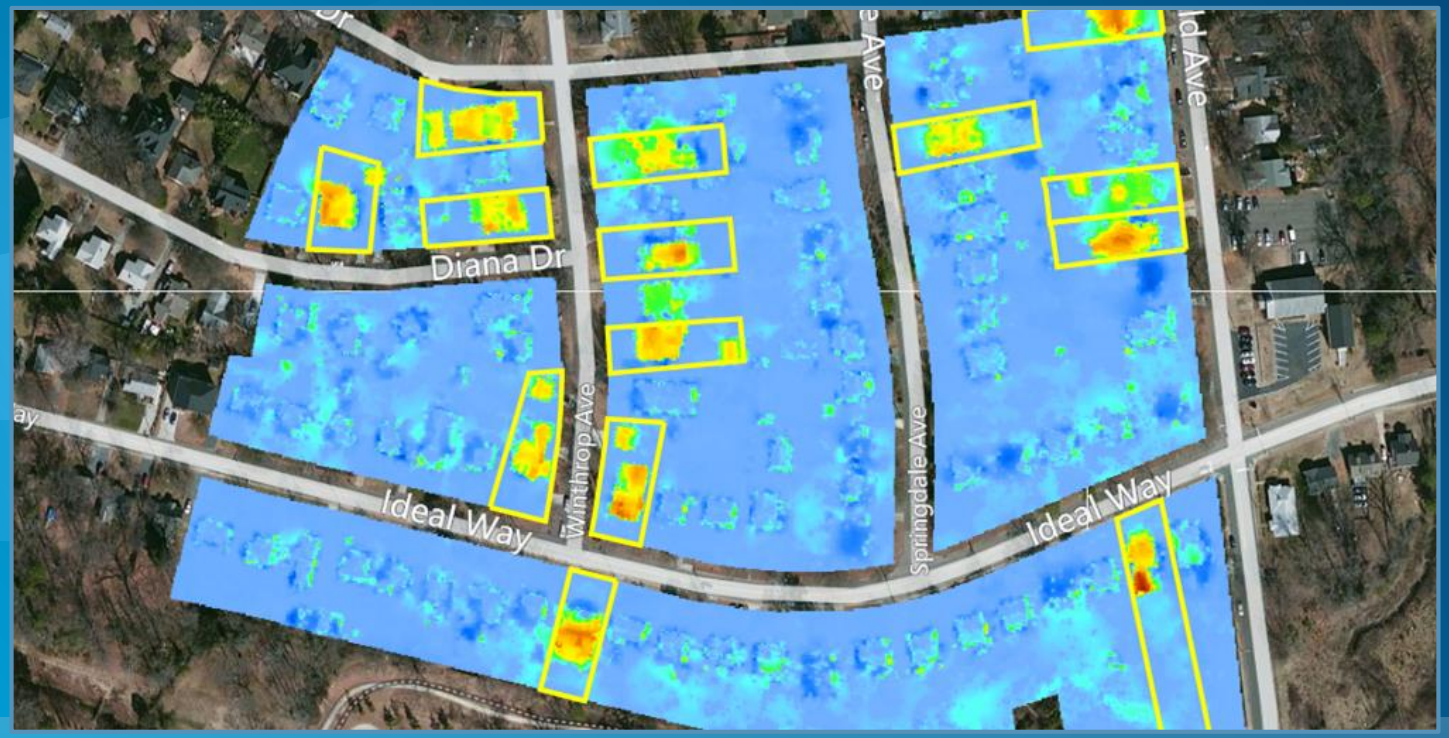
# Spatial Analysis in ArcGIS Platform

## 2012 LiDAR Data



# Spatial Analysis in ArcGIS Platform

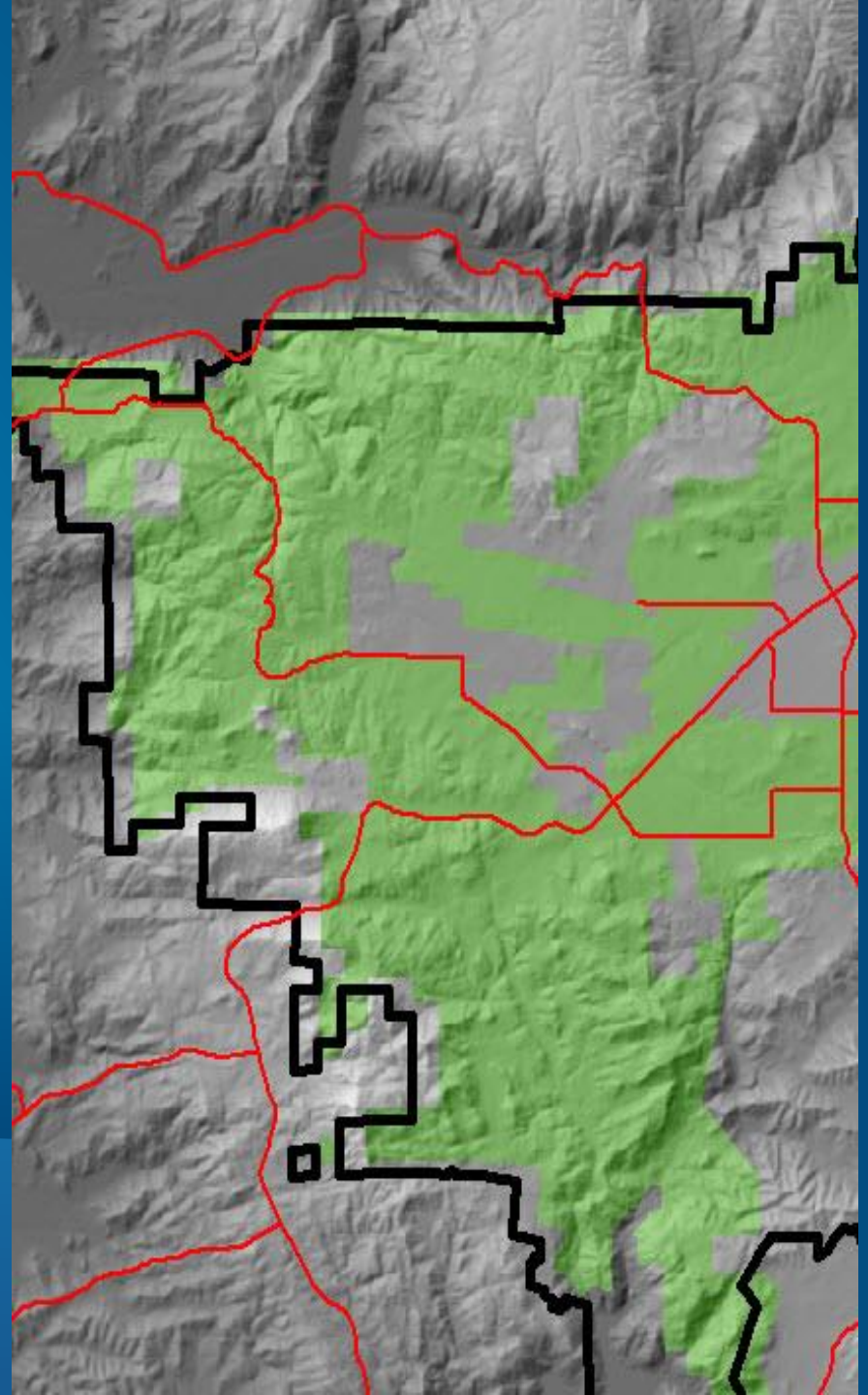
## Difference between 2008 and 2012 datasets



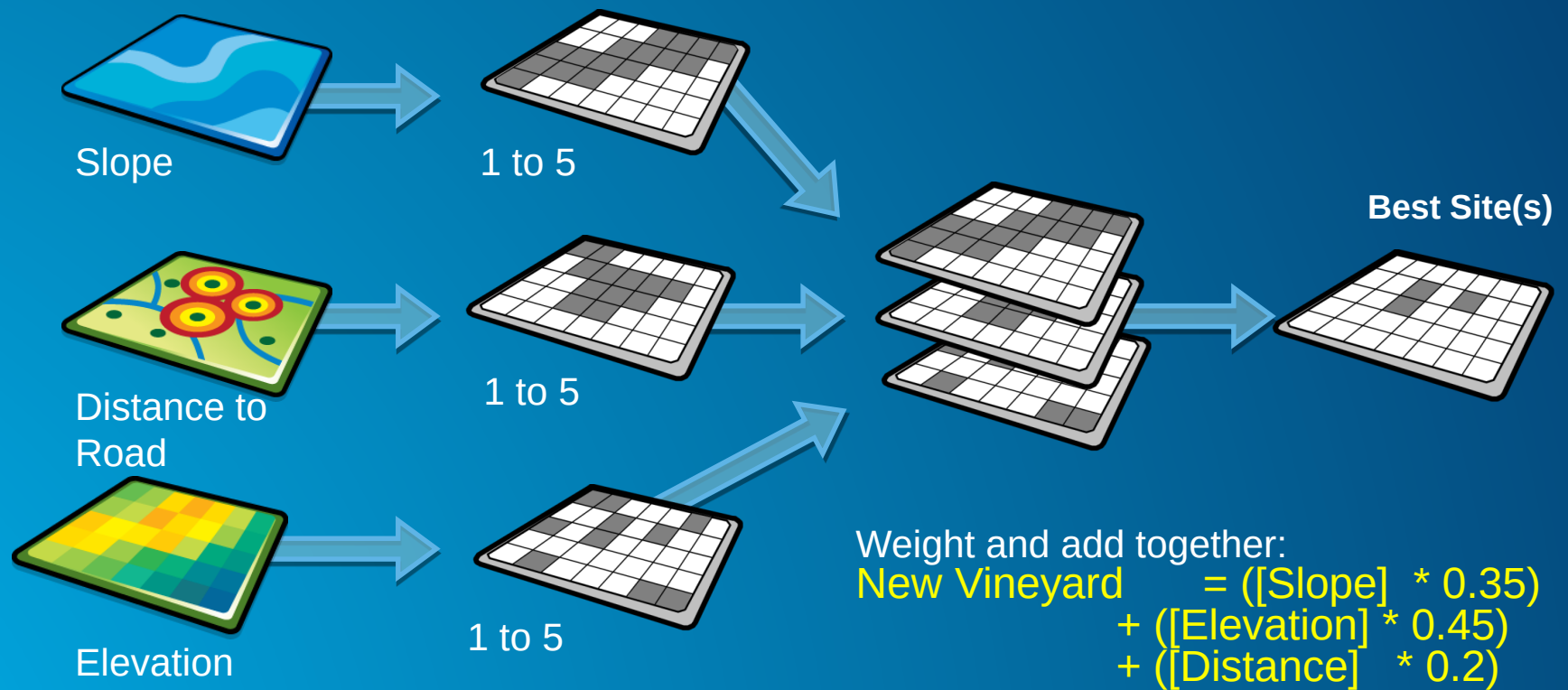
Demo

# What is the best place for …?

Suitability analysis

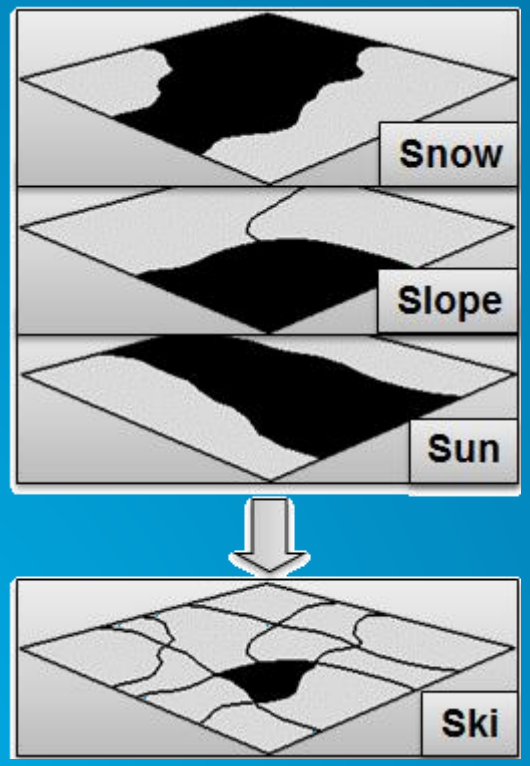


# Where is the best place to have a new vineyard?

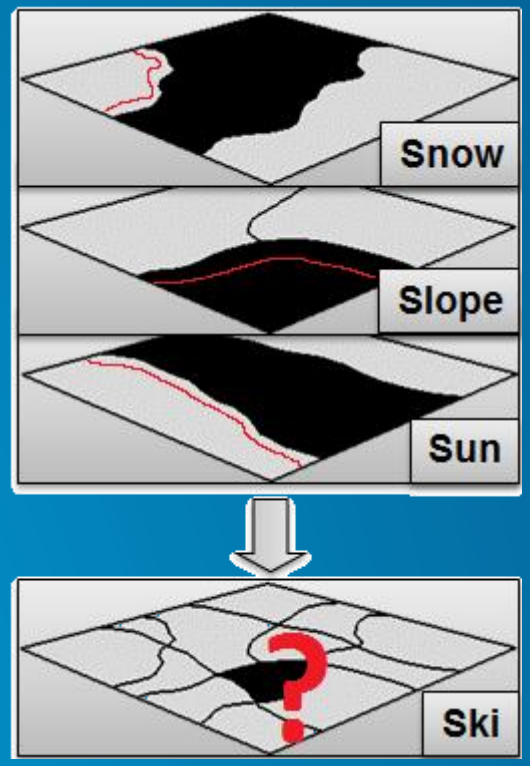


# Uncertainty in the Data

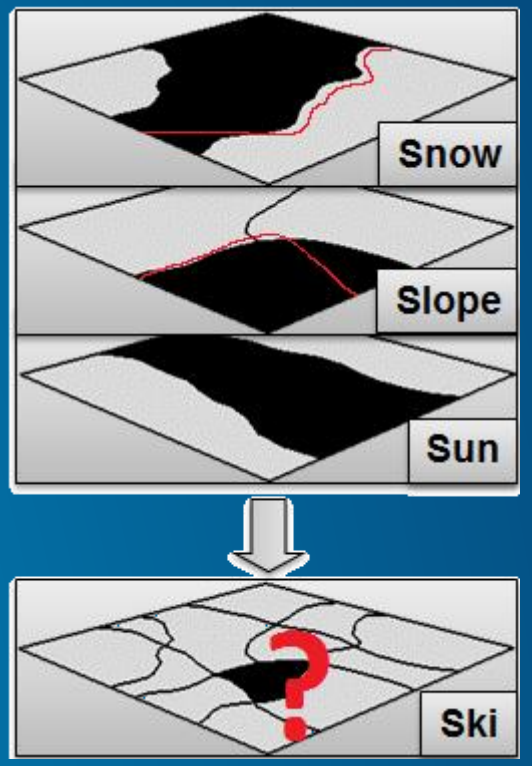
**What our input data look like:**



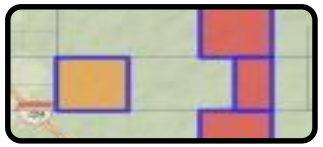

**Or maybe they look like this:**

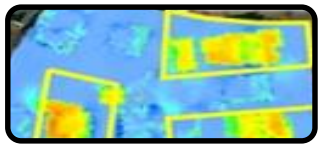



**Or like this:**



# How Our Platform Supports Analysis


Visualization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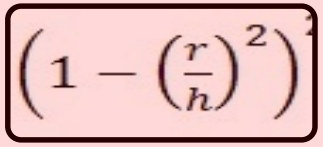
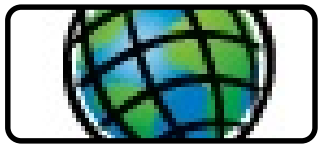


Statistical Analysis


Integration Capabilities

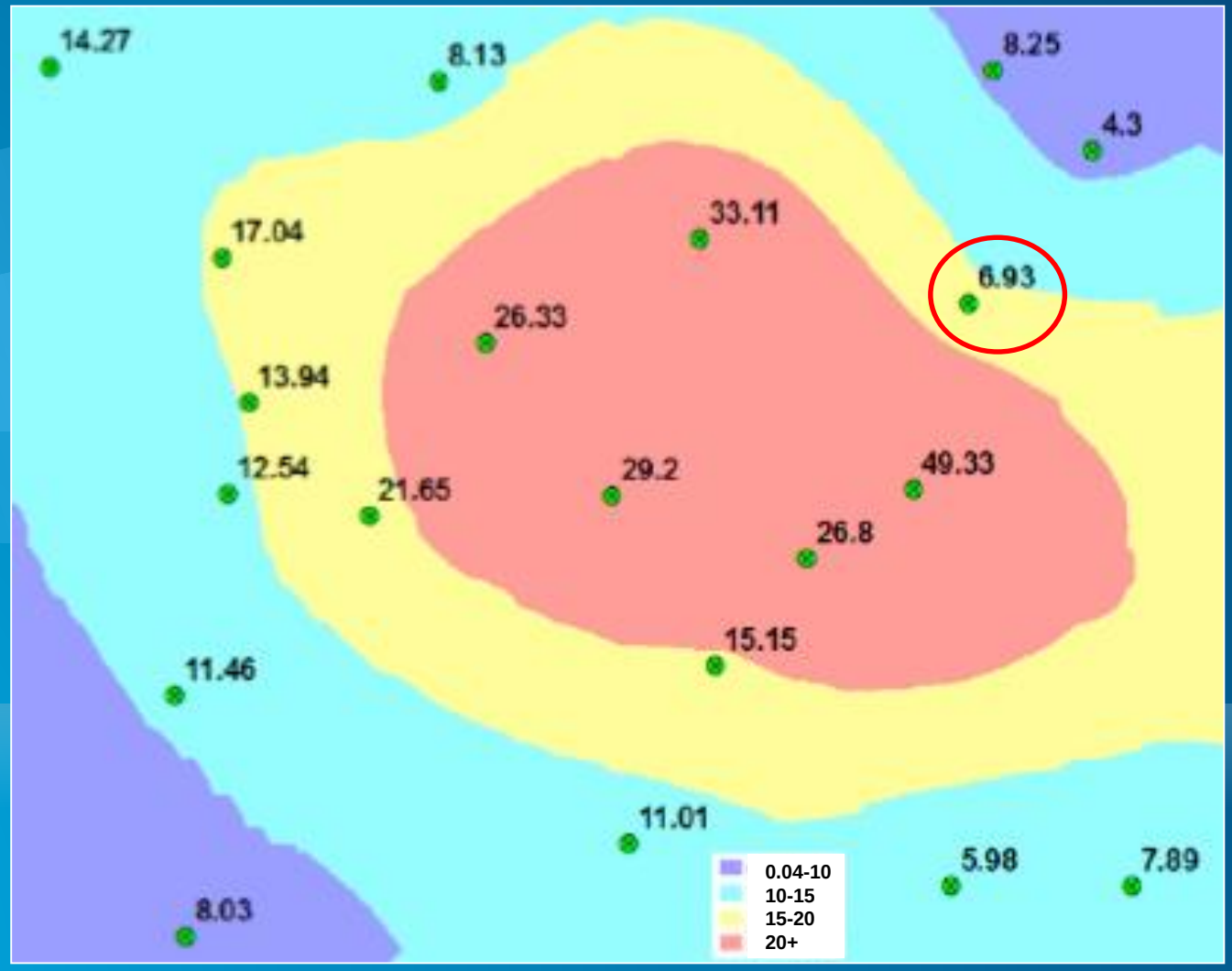
**Statistics** is the science of learning from data, and of measuring, controlling, and communicating *uncertainty.*

- American Statistical Association

**“The Most Important Law of Political Economy.”** | – Karl Marx

# Why Care About Uncertainty?

## To Evacuate or Not to Evacuate

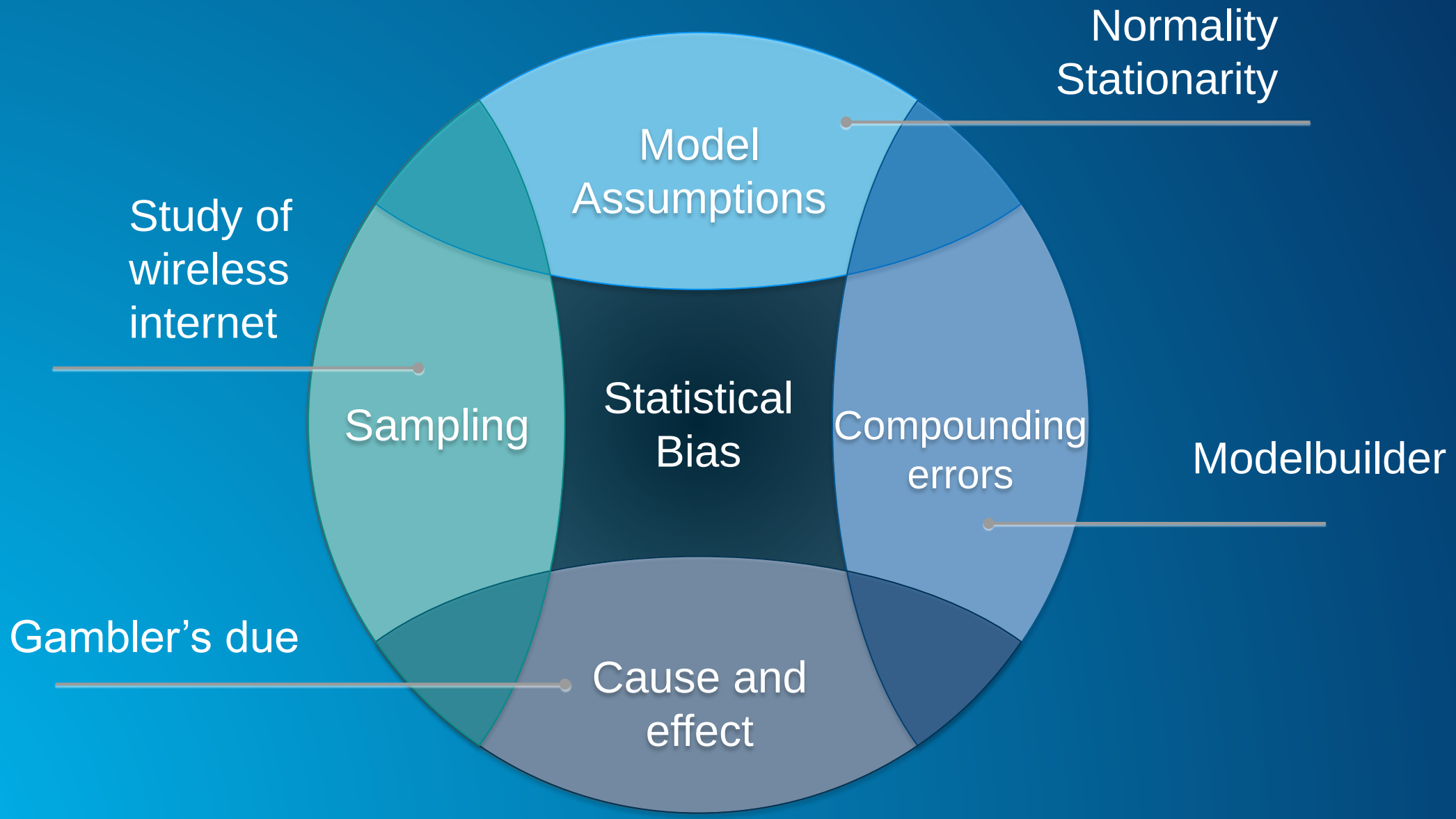


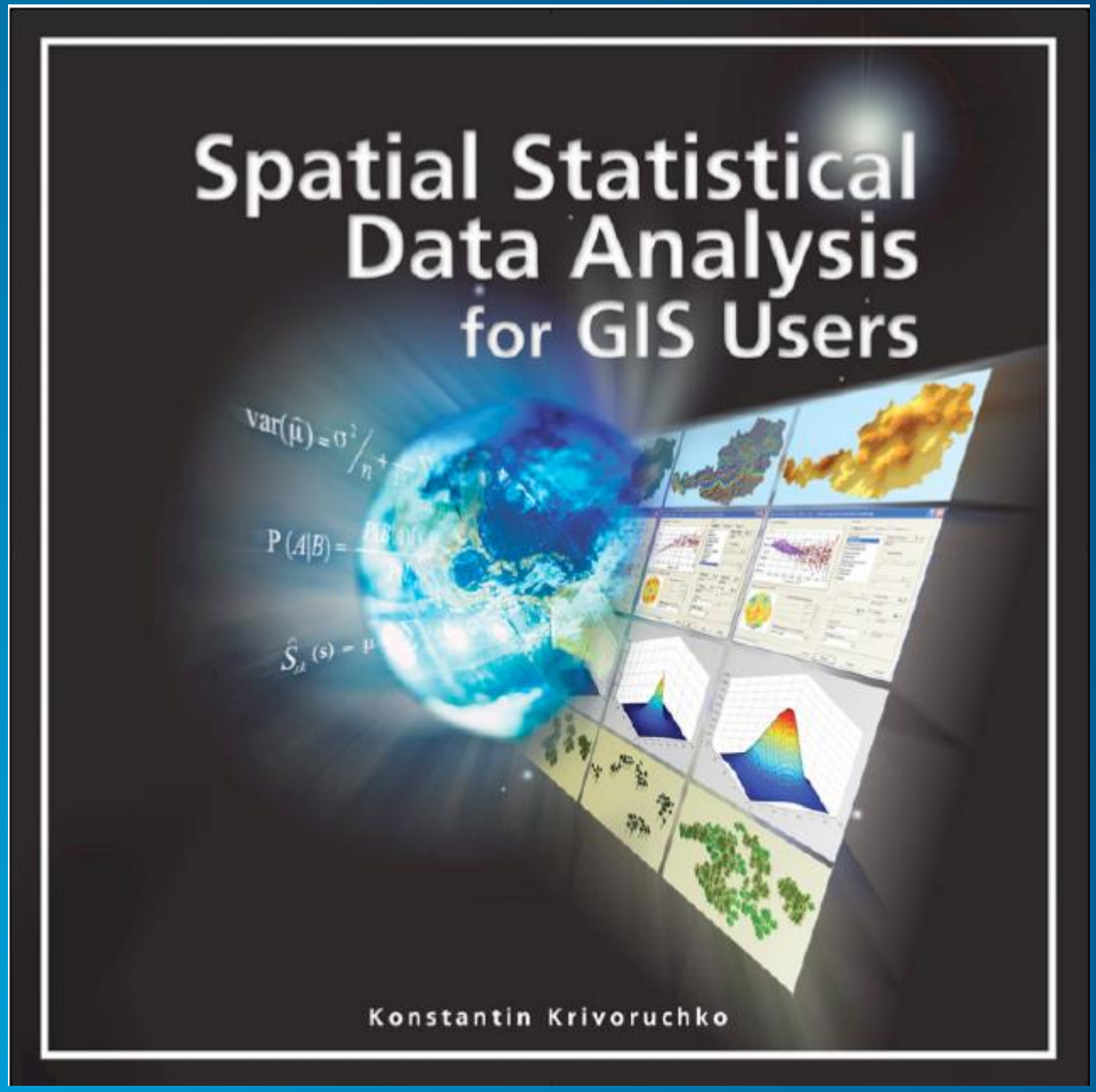
# Pitfalls of Analysis

There are three kinds of lies:
lies, damned lies, and statistics.

Attributed to either M. Twain or B. Disraeli

# Sources of Bias

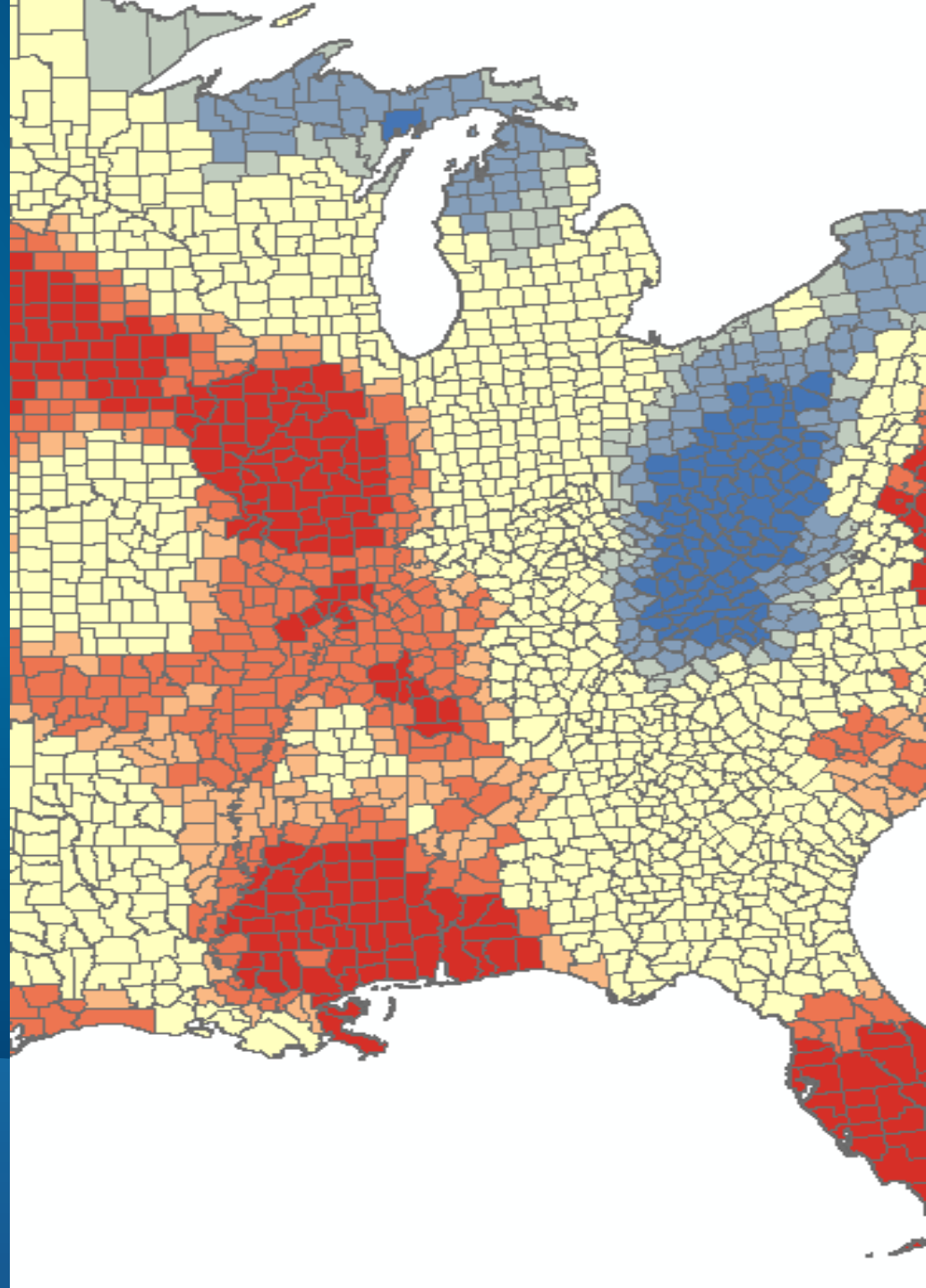



Spatial Statistical
Data Analysis
for GIS Users
Konstantin Krivoruchko

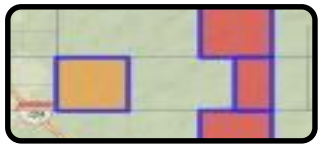
Demo

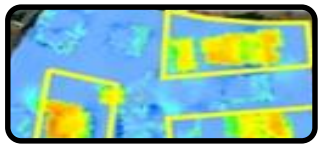
# Identifying Clusters

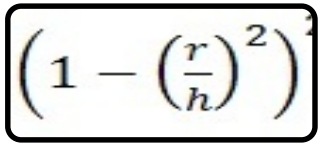
Hotspot analysis



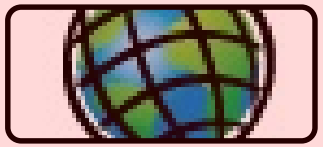
## How Our Platform Supports Analysis


Visualization


Spatial Analysis



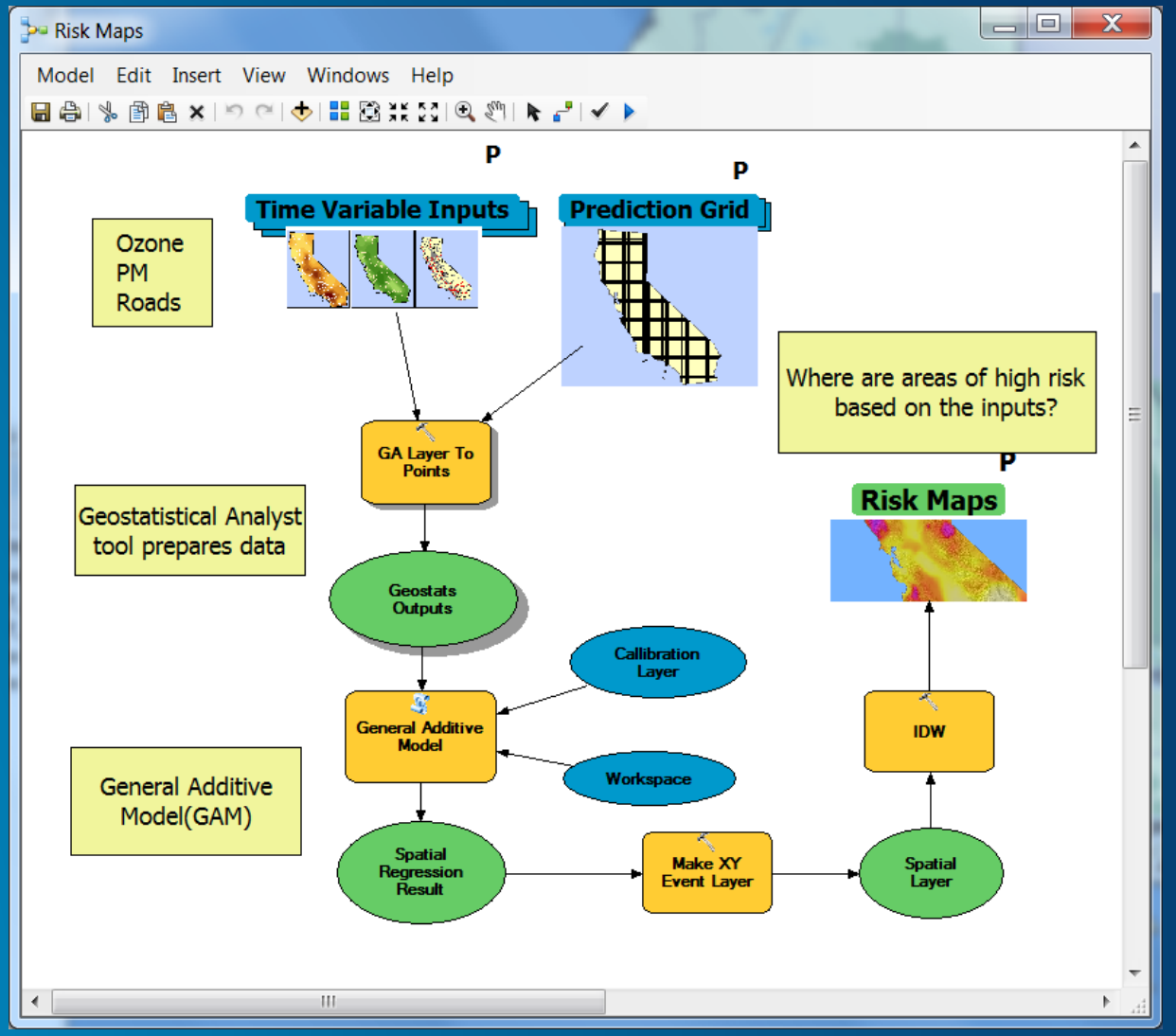
Statistical Analysis


Integration Capabilities

# Using ArcGIS Platform to Perform Analysis

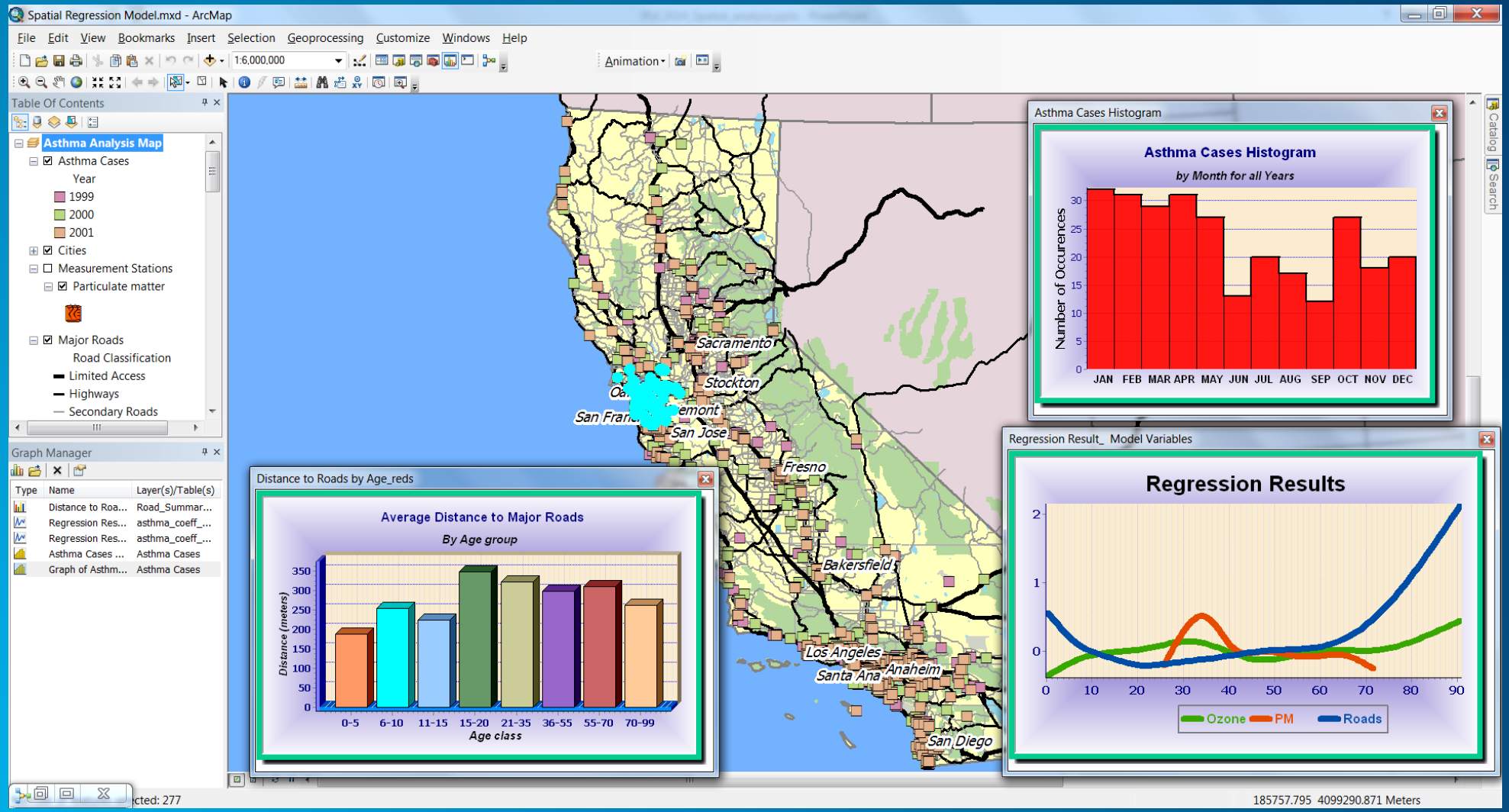
## Asthma deaths in California

- **Find environmental factors that explain asthma deaths**
- **Predict risk of asthma based on the environment**



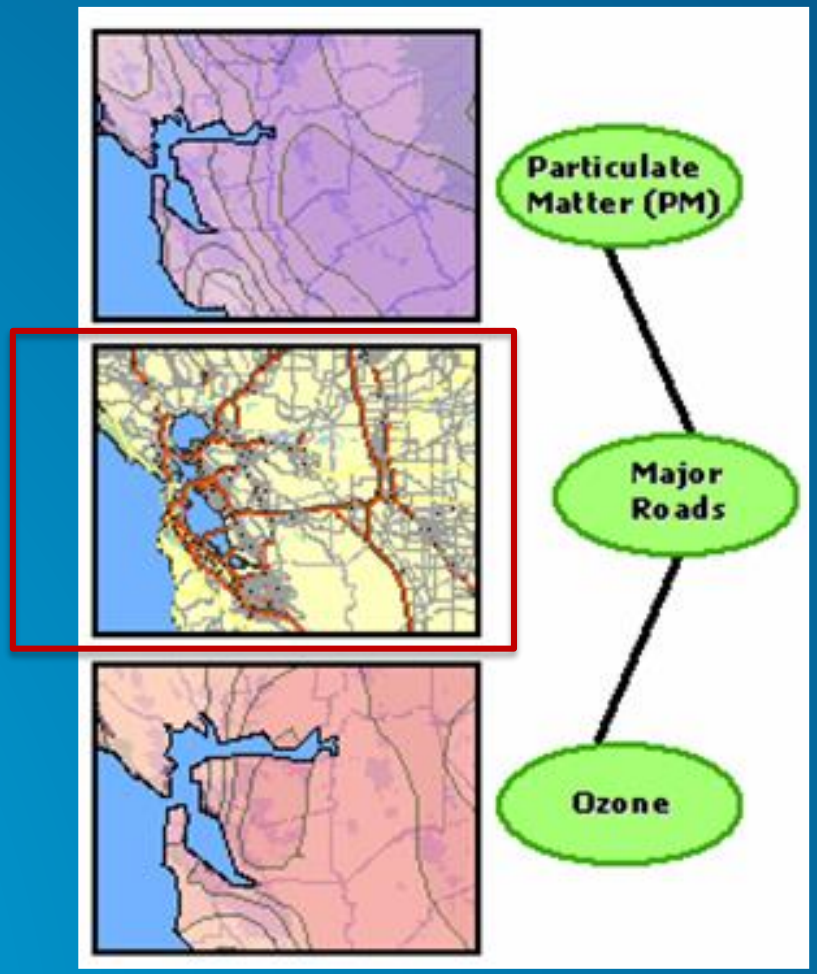
# Using ArcGIS Platform To Do Analysis

## Visualization



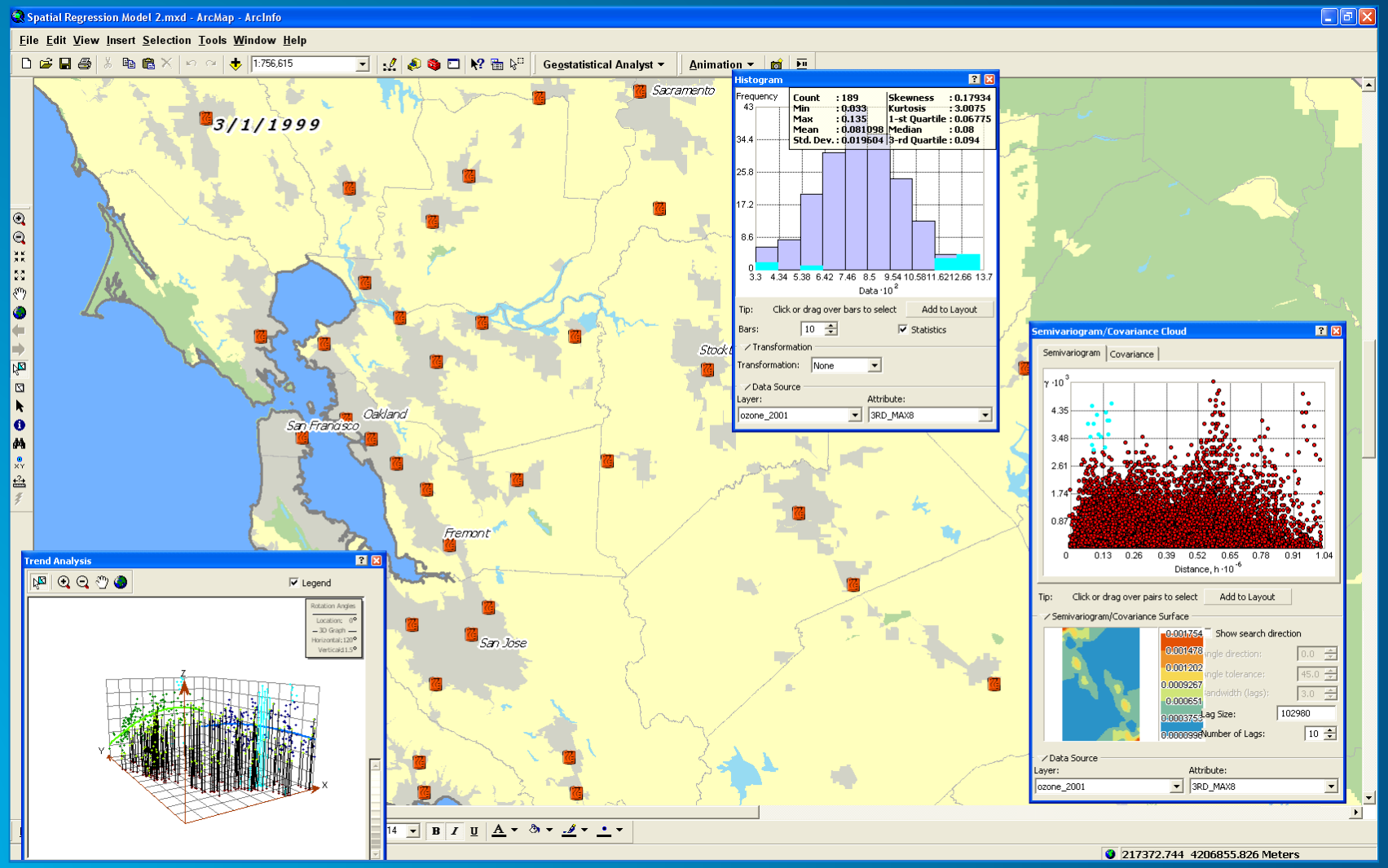
# Using ArcGIS Platform To Do Analysis

Spatial Analysis



# Using ArcGIS Platform To Do Analysis

## Spatial Statistical Analysis



# Using ArcGIS Platform To Do Analysis

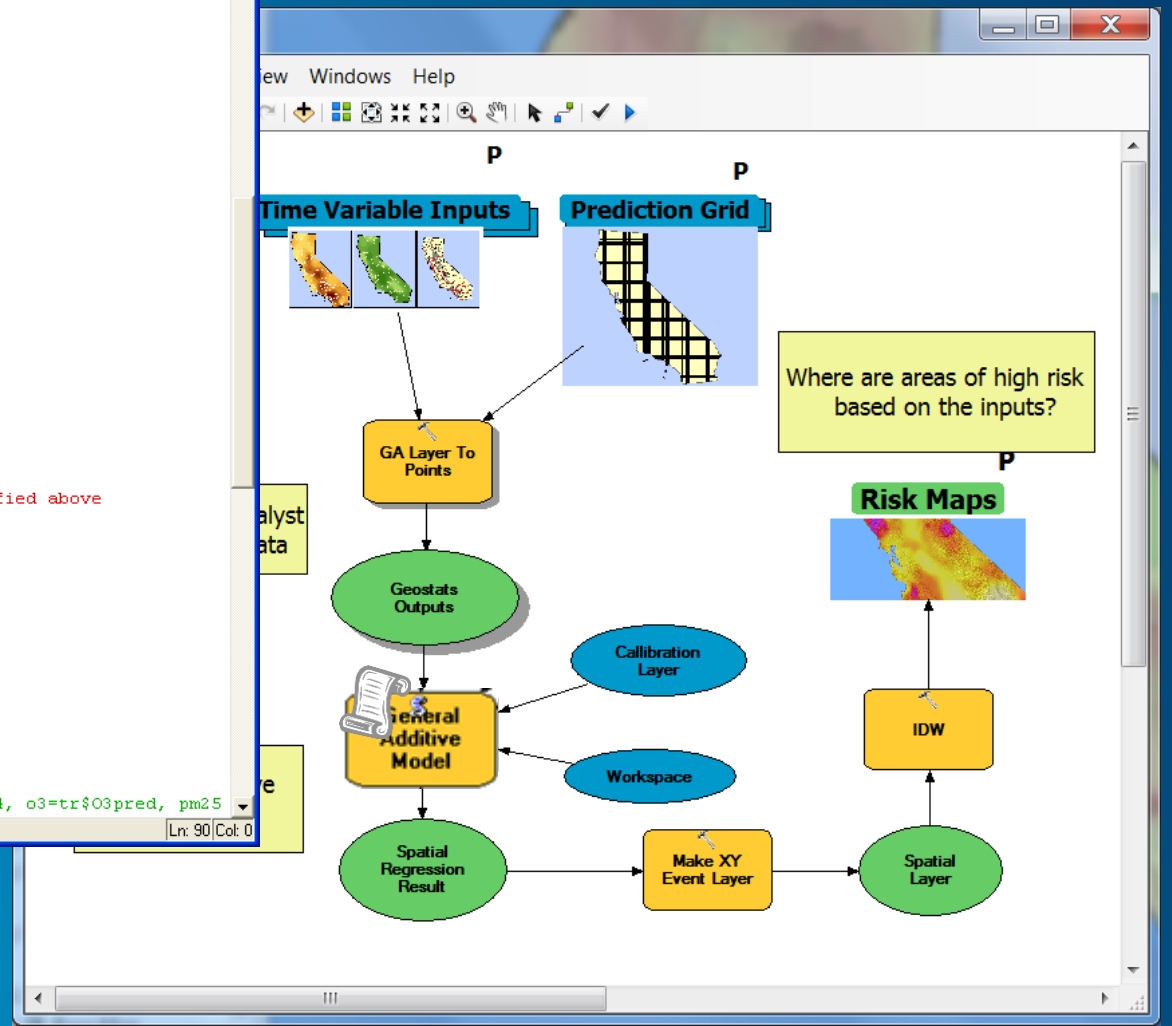
## Integration with 3rd Party Statistical Program

Rcom_gma.py - C:\Demos\EnvironmentalHealth\Asthma\AirPollutants\GAM\Rcom_gma.py

File Edit Format Run Options Windows Help

```
length = len(splitstring)
shp = splitstring[length-1]
inCallibration = shp.strip(".shp") + ".dbf"

gp = Dispatch("esriGeoprocessing.GpDispatch.1")
gp.overwriteoutput = 1

#Begin R

#Call R Com Server
r = Dispatch("StatConnectorSrv.StatConnector")
#Initialize an R session
r.Init("R")

#Set Workspace in R
workspace = workspace.replace("\\","/")
cmd = 'setwd("' + workspace + '")'
r.EvaluateNoReturn(cmd)

#Load the required libraries
cmd = "library(foreign)"
r.EvaluateNoReturn(cmd)
cmd = "library(mgcv)"
r.EvaluateNoReturn(cmd)

#Load the plot file (must be located in the workspace specified above
cmd = 'source("plot_gam.txt")'
r.EvaluateNoReturn(cmd)

#Load dbf files to be evaluated
cmd = 'tr <- read.dbf("' + inCallibration + '")'
r.EvaluateNoReturn(cmd)
cmd = 'names(tr)'
r.EvaluateNoReturn(cmd)
cmd = 'te <- read.dbf("' + inGrid + '")'
r.EvaluateNoReturn(cmd)
cmd = 'names(te)'

#Build variables from fields in dbf tables
cmd = 'm_tr <- data.frame(x=tr$x, y=tr$x, rate=tr$RESDRPOP04, o3=tr$O3pred, pm25
```

Ln: 90 Col: 0



# Summary

- Several types of spatial analysis
  - Visualization,
  - Spatial analysis
  - Statistical analysis
- Spatial analysis brings the true power of GIS. It is our core competence
  - Capabilities help users make better decisions

# Resources

- **Spatial Analysis Space on GeoNet**
  - https://geonet.esri.com/community/gis/analysis
- **Analysis and Geoprocessing Resource Center**
  - http://resources.arcgis.com/en/communities/analysis/
- **Performing Analysis in ArcGIS Online**
  - http://doc.arcgis.com/en/arcgis-online/use-maps/perform-analysis.htm
- **Esri Training**
  - http://training.esri.com


Understanding our world.