# Kinds of analysis

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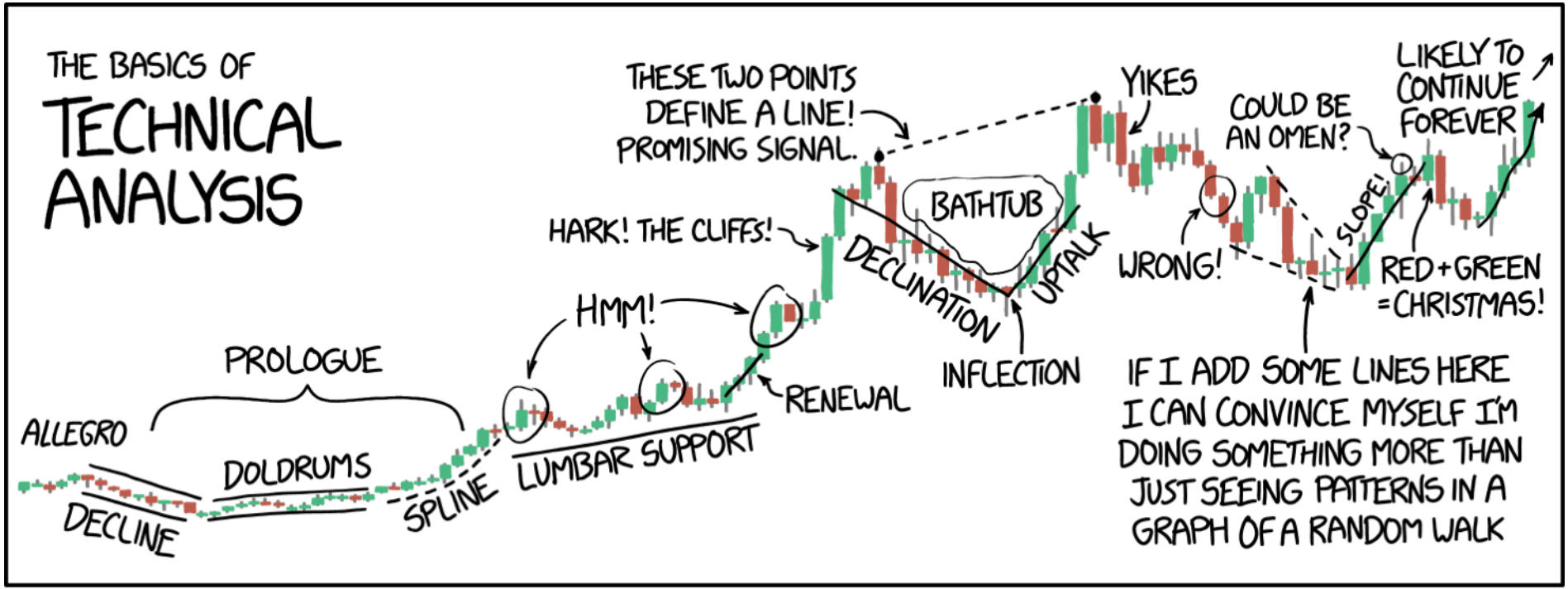
Slides in this presentation stolen shamelessly from Kyle Shannon and Shannon Ellis


THE BASICS OF
TECHNICAL ANALYSIS
THESE TWO POINTS DEFINE A LINE! PROMISING SIGNAL.
YIKES
COULD BE AN OMEN?
LIKELY TO CONTINUE FOREVER
HARK! THE CLIFFS!
BATHTUB
SLOPE!
HMM!
DECLINATION
UPTALK
WRONG!
RED + GREEN = CHRISTMAS!
PROLOGUE
ALLEGRO
DOLDRUMS
SPLINE
LUMBAR SUPPORT
RENEWAL
INFLECTION
DECLINE
IF I ADD SOME LINES HERE I CAN CONVINCE MYSELF I'M DOING SOMETHING MORE THAN JUST SEEING PATTERNS IN A GRAPH OF A RANDOM WALK

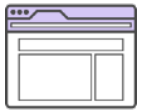
Data

# How?

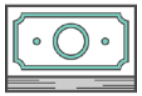
let me show you

A Model!

Results!



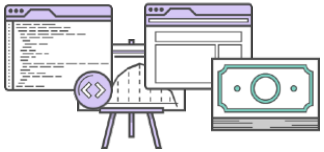
Product!



Revenue!

Data

The Analytic Approach
Your Tool Box



The Goods

Descriptive Analysis ✓

Exploratory Analysis ✓

?

Inferential Analysis ✓

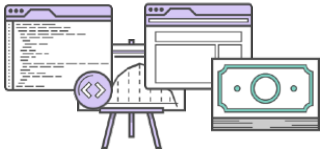
Predictive Analysis ✓

Causal Analysis ✗

Mechanistic Analysis ✗

Data

The Analytic Approach
Your Tool Box



The Goods

Descriptive Analysis ✓

Exploratory Analysis ✓

?

Inferential Analysis ✓

- Classic Statistics (parametric & nonparametric)
- Frequentist & Bayesian
- Text & Geospatial Analysis

Predictive Analysis ✓

- Statistical learning/ML
  - Supervised
  - Unsupervised
- Monte Carlo simulations

Causal Analysis ✓ ✗

variable X ⬆ causes variable Y ⬇

e.x. effects of new medication on some illness by randomized trial

Mechanistic Analysis ✗

variable X ⬆ 3.2 units results in variable Y ⬇ 1.1 units

e.x. electric current governed by wire size

# Summary: Analytical Approaches

*Typically Less Effort* → *Typically More Effort*

## Descriptive Analysis

- 1st thing you do on new data
- Summarize the data
- univariate plots of variables

## Exploratory Analysis

- Exploring relationships
- Asking/definning questions
- univariate/bivariate/multivariate analysis and plotting
- formulate hypothesis

## Inferential Analysis

- Estimating uncertainty
- test theories (infer) about the population (data gen. process)
- Building inference models

## Predictive Analysis

- Building predictive models
- Use historical knowledge to predict future events
- Finding patterns

## Mechanistic Analysis

- Understand precise changes one variable has on another
- typically modeled using deterministic equations
- break down complex systems into constituent parts

## Causal Analysis

- Determine the average change in one variable when you alter another
- typically requires experiments (e.g. randomized studies)
- manipulate one variable observe effect on other

# Exploring Analyses

General question: What impacts politics in America?

Data Science question: Is there a relationship between the sentiment of political words in South Park and America's presidential approval rating?

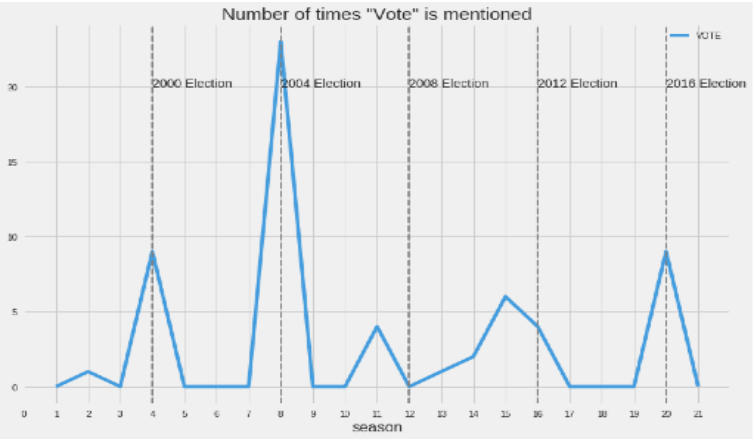
**Descriptive**

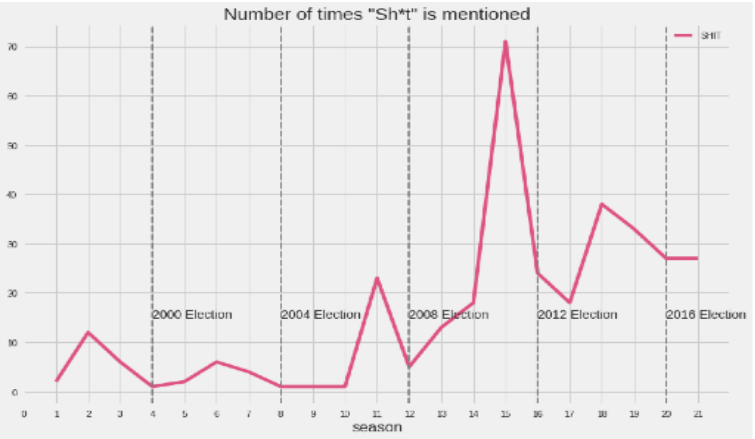
**Exploratory**

**Inferential**

Text Analysis

Classic Statistics (parametric & nonparametric)




https://github.com/COGS108/FinalProjects-Wi18/blob/master/071-FinalProject.ipynb

General question: How has COVID-19 impacted students?

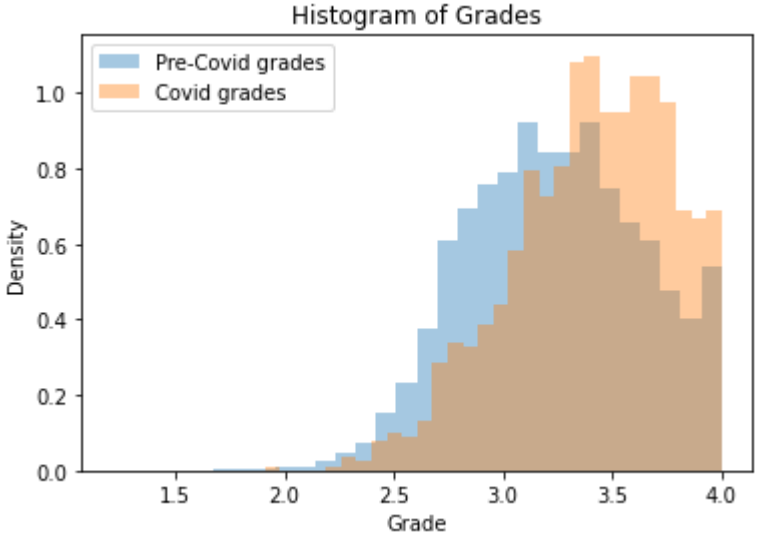
Data Science question: At UCSD, is there a difference between students' grades and how they rate their classes before COVID-19 and during remote learning, due to COVID-19?

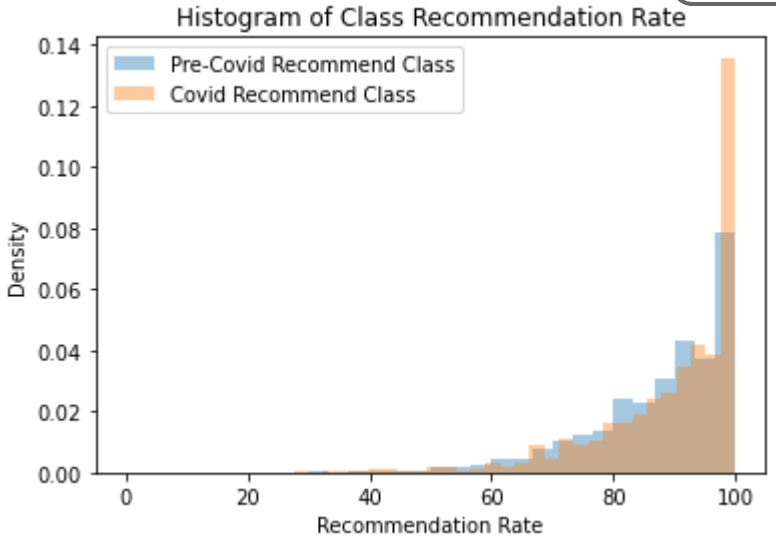
**Descriptive**

**Exploratory**

**Inferential**

Classic Statistics (parametric & nonparametric)

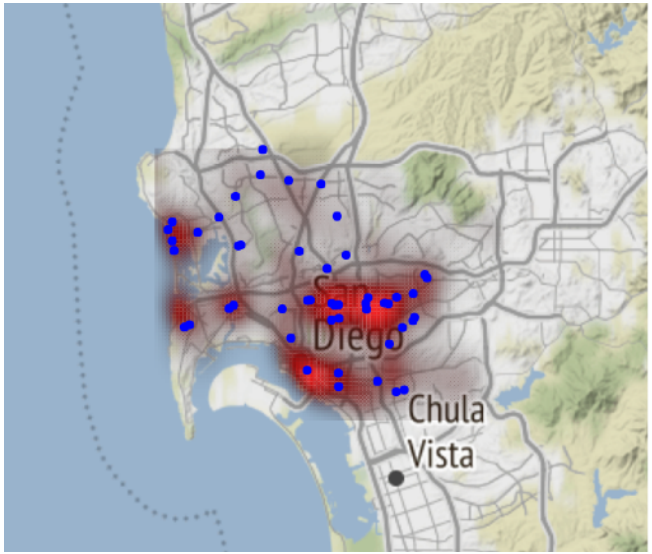


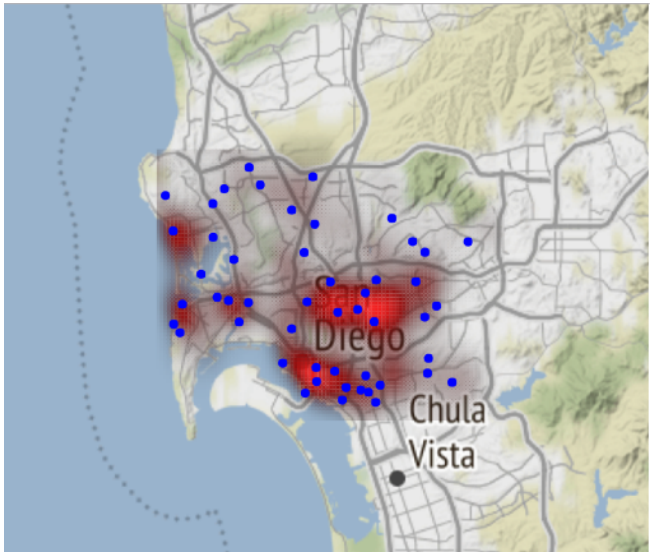




https://github.com/COGS108/FinalProjects-Wi21/blob/main/FinalProject_group084.ipynb

General question: Why isn't police response time always the same?

Data Science question: Where should police cars be stationed, accounting for crime levels and time of day, to make police response times equitable throughout San Diego?




Descriptive

Exploratory

Predictive

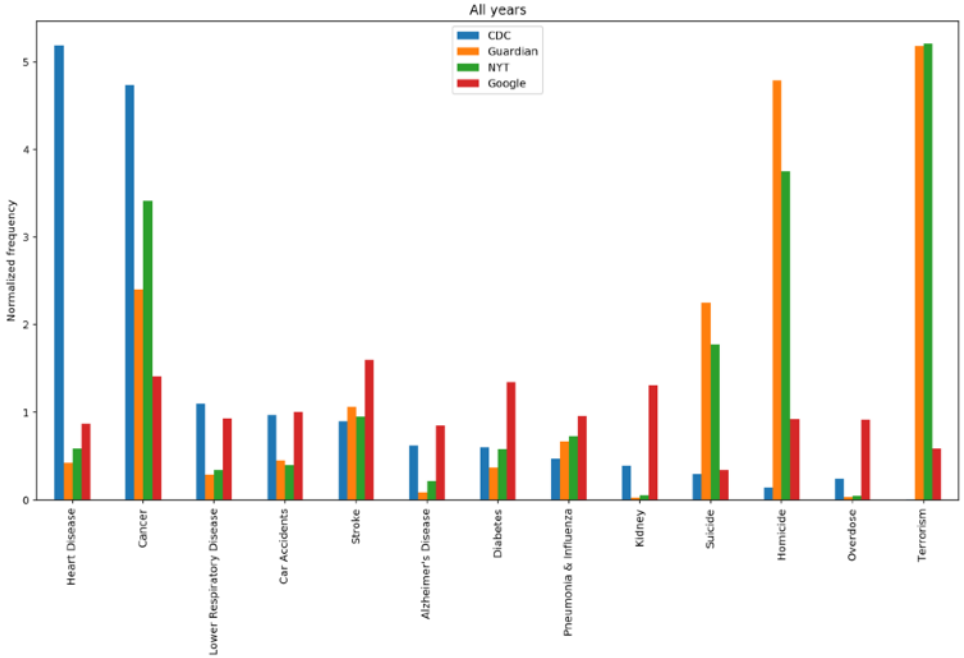
Inferential

Geospatial Analysis

https://github.com/COGS108/FinalProjects-Sp17/blob/master/029-FinalProject.ipynb

General question: What gets too much attention in the news?

Data Science Question: Is there a relationship over time between cause of death terms in the *NYT*, The Guardian, and Google trends data relative to data from the CDC?




https://github.com/COGS108/FinalProjects-Wi18/blob/master/010-FinalProject.ipynb

Descriptive

Exploratory

Inferential

Text Analysis

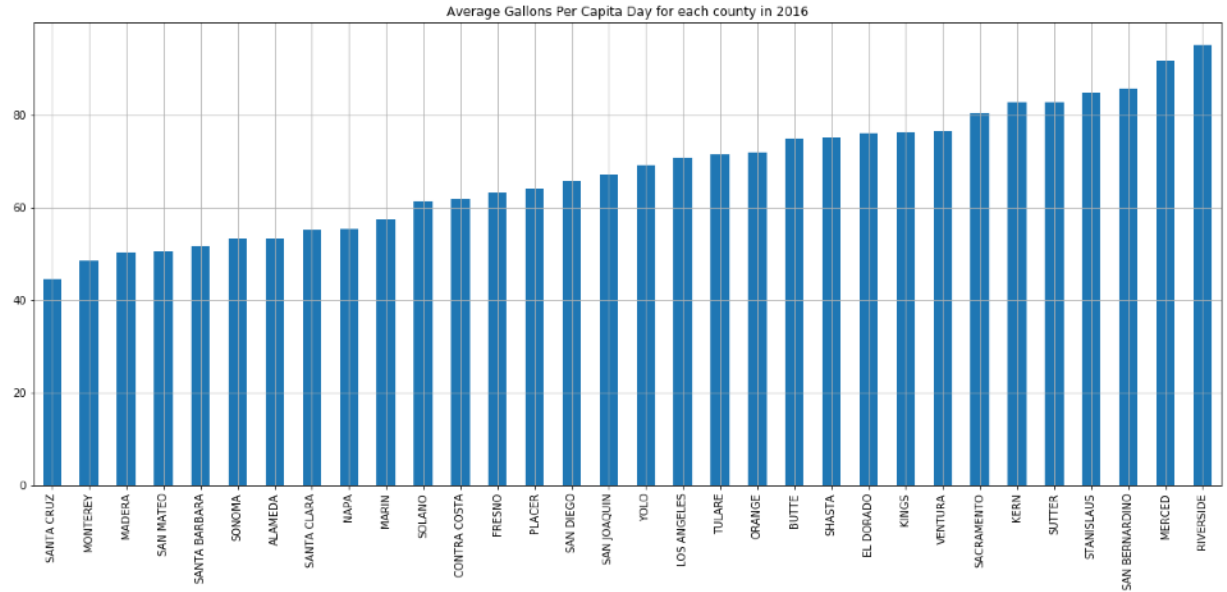
Classic Statistics (parametric & nonparametric)

*In case of the total drought in California, how many desalination plant projects we need to supply residential use water for population who live in urban areas in California?*

**Descriptive**

**Exploratory**

**Predictive**




https://github.com/COGS108/FinalProjects-Sp17/blob/master/018-FinalProject.ipynb