

Kinds of analysis

Jason G. Fleischer, Ph.D.

Asst. Teaching Professor

Department of Cognitive Science, UC San Diego

jfleischer@ucsd.edu

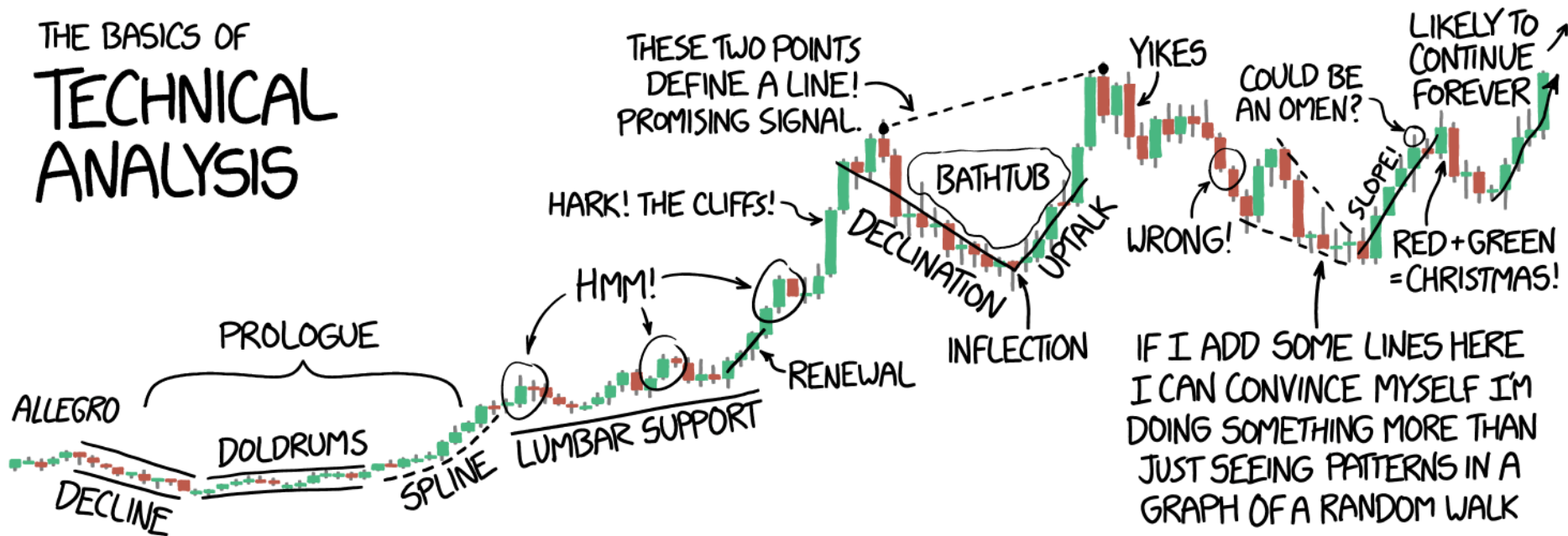


@jasongfleischer

<https://jgfleischer.com>

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

THE BASICS OF TECHNICAL ANALYSIS





Data

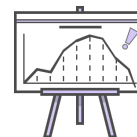
How?



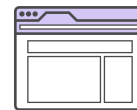
let me show you



A Model!



Results!



Product!



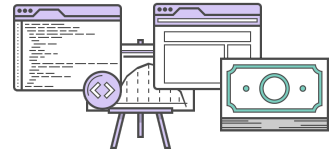
Revenue!



Data



The Analytic Approach
Your Tool Box



The Goods

Descriptive Analysis

Exploratory Analysis

Inferential Analysis

Predictive Analysis

Causal Analysis

Mechanistic Analysis

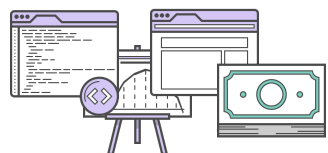
?



Data



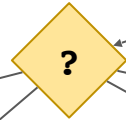
The Analytic Approach
Your Tool Box



The Goods

Descriptive Analysis ✓

Exploratory Analysis ✓



Inferential Analysis ✓

Predictive Analysis ✓

Causal Analysis ✓ ✗

Mechanistic Analysis ✗



Classic Statistics (parametric & nonparametric)

Frequentist & Bayesian



Text & Geospatial Analysis

Statistical learning/ML
- Supervised
- Unsupervised

Monte Carlo simulations

variable X 
causes
variable Y 

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

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 →

Descriptive Analysis

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

Exploratory Analysis

- Exploring relationships
- Asking/defining 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

→ *Typically More Effort*

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?

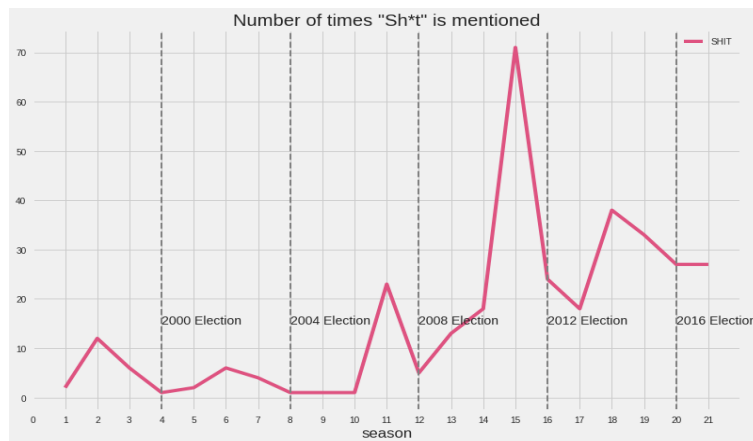
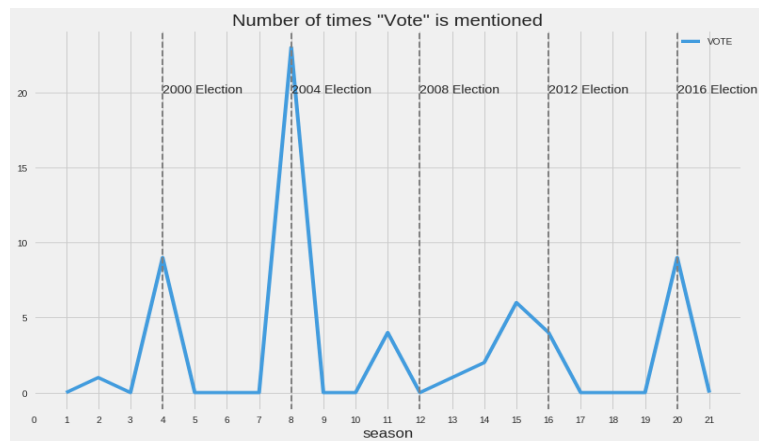
Descriptive

Exploratory

Inferential

Text Analysis

Classic Statistics
(parametric &
nonparametric)



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?

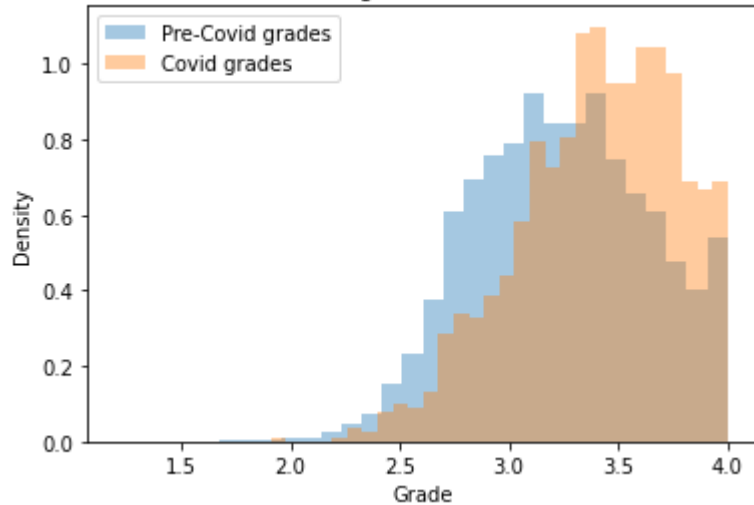
Descriptive

Exploratory

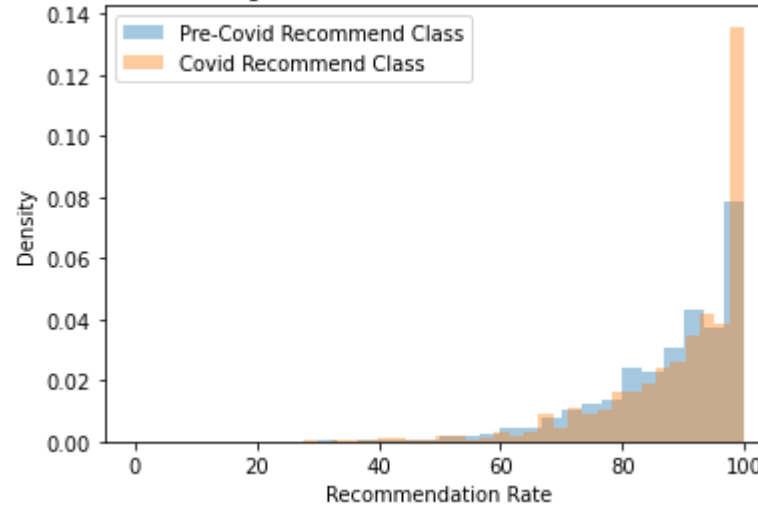
Inferential

Classic Statistics
(parametric &
nonparametric)

Histogram of Grades



Histogram of Class Recommendation Rate



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?

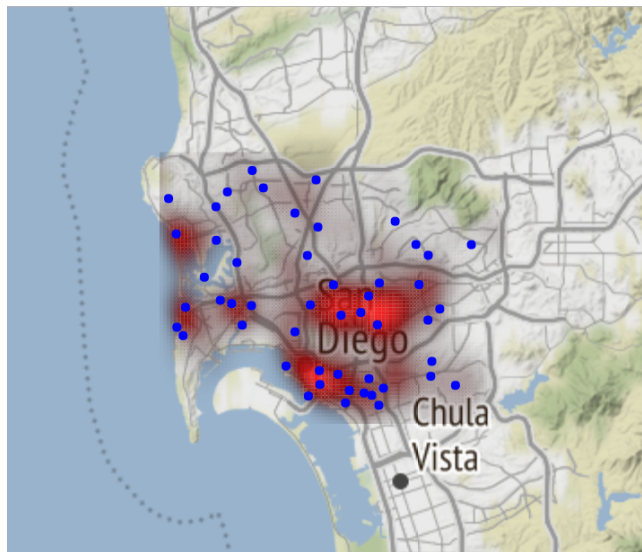
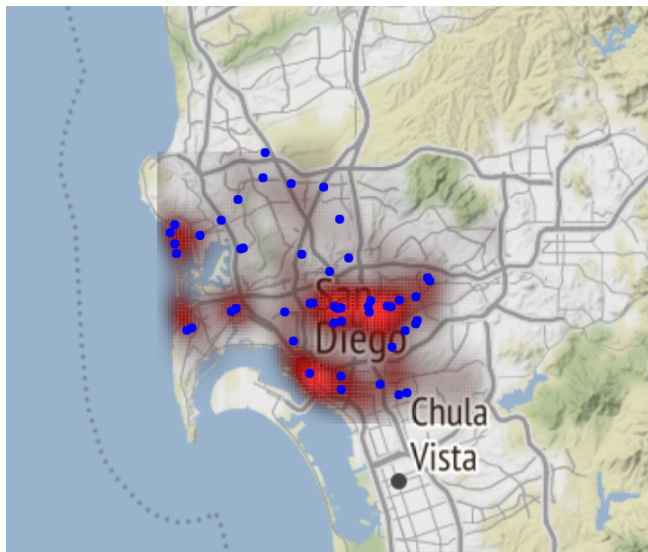
Descriptive

Exploratory

Predictive

Inferential

Geospatial Analysis



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?

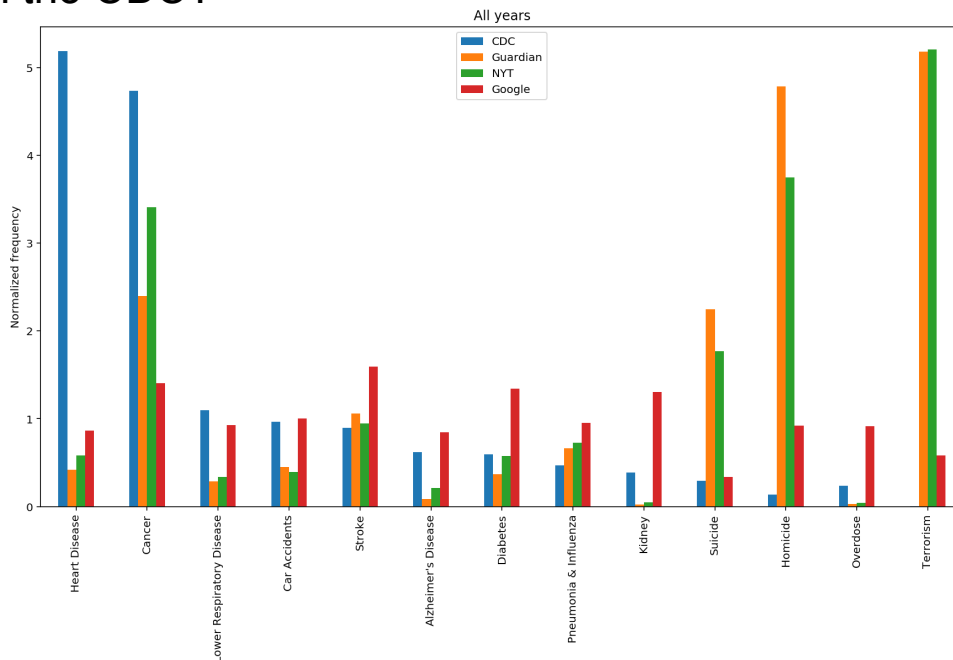
Descriptive

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

