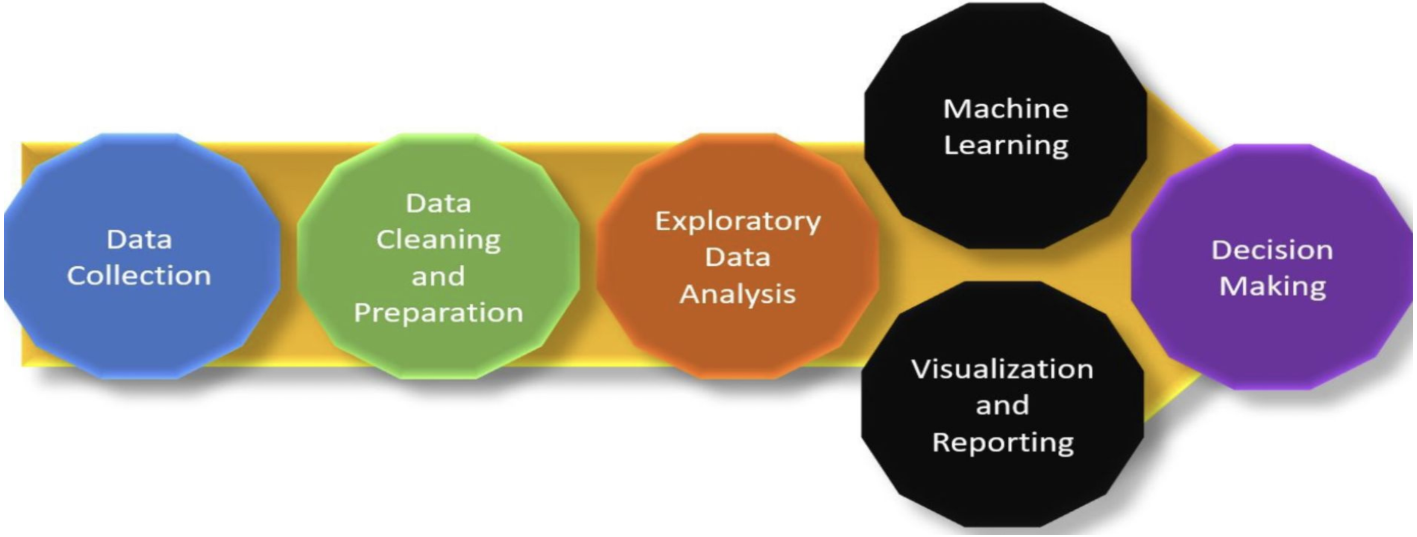
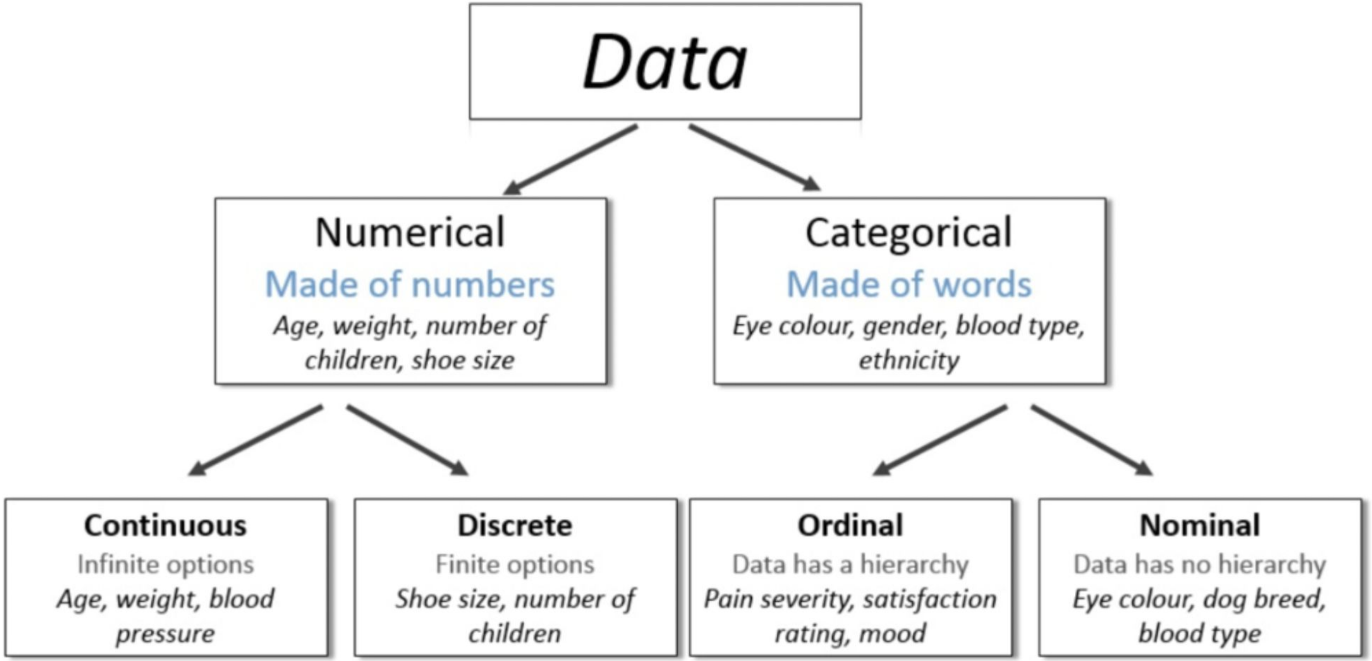
MSDS610 Final Presentation - Fall 2022
Exploratory Data Analysis

Abhradeep Mukherjee
Stephen Louis
Ensun Pak

Problem Solving Journey


Data Collection
Data Cleaning and Preparation
Exploratory Data Analysis
Machine Learning
Visualization and Reporting
Decision Making

Data Types



Data

Numerical

Made of numbers

Age, weight, number of children, shoe size

Categorical

Made of words

Eye colour, gender, blood type, ethnicity

Continuous

Infinite options

Age, weight, blood pressure

Discrete

Finite options

Shoe size, number of children

Ordinal

Data has a hierarchy

Pain severity, satisfaction rating, mood

Nominal

Data has no hierarchy

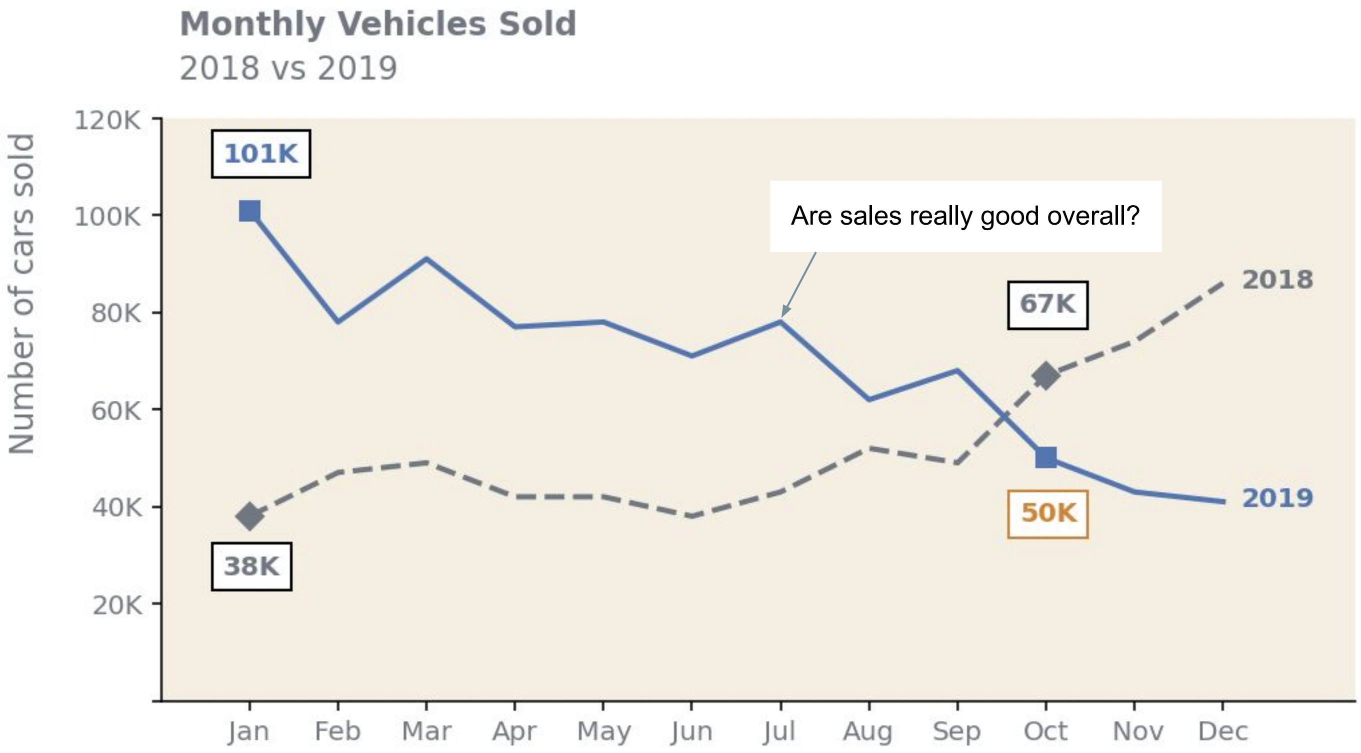
Eye colour, dog breed, blood type

Data Visualization

Myths about Data Analysis

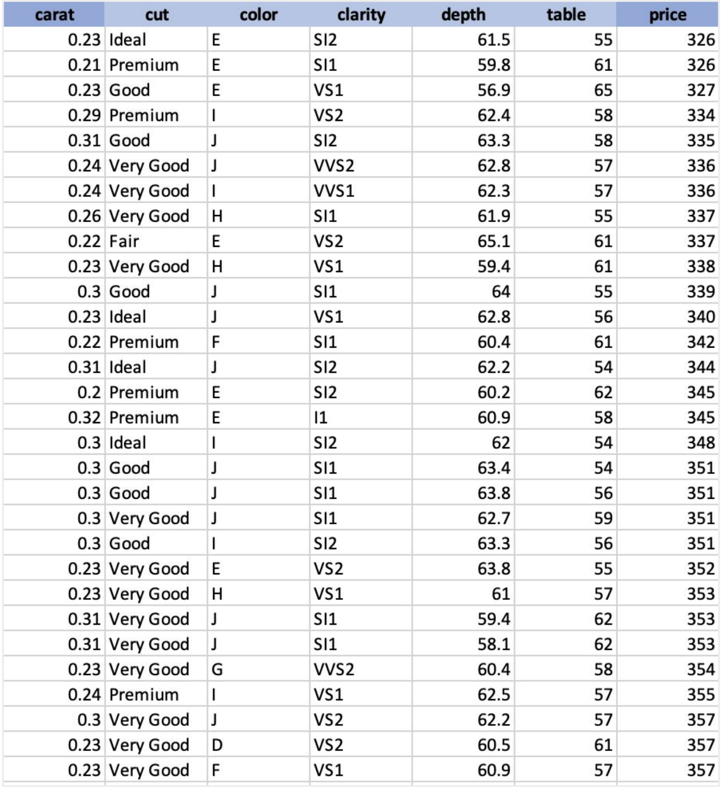
- **Numbers** are always right
- **Tables** convey more information
- **Colors** are not important
- **EDA** is only done once

Myths about Data Analysis

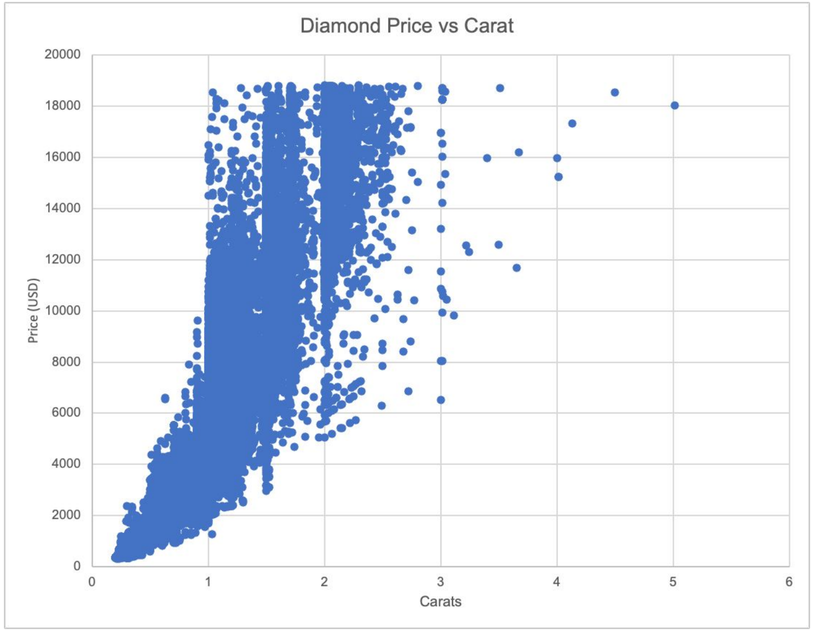


Are sales really good overall?

Myths about Data Analysis



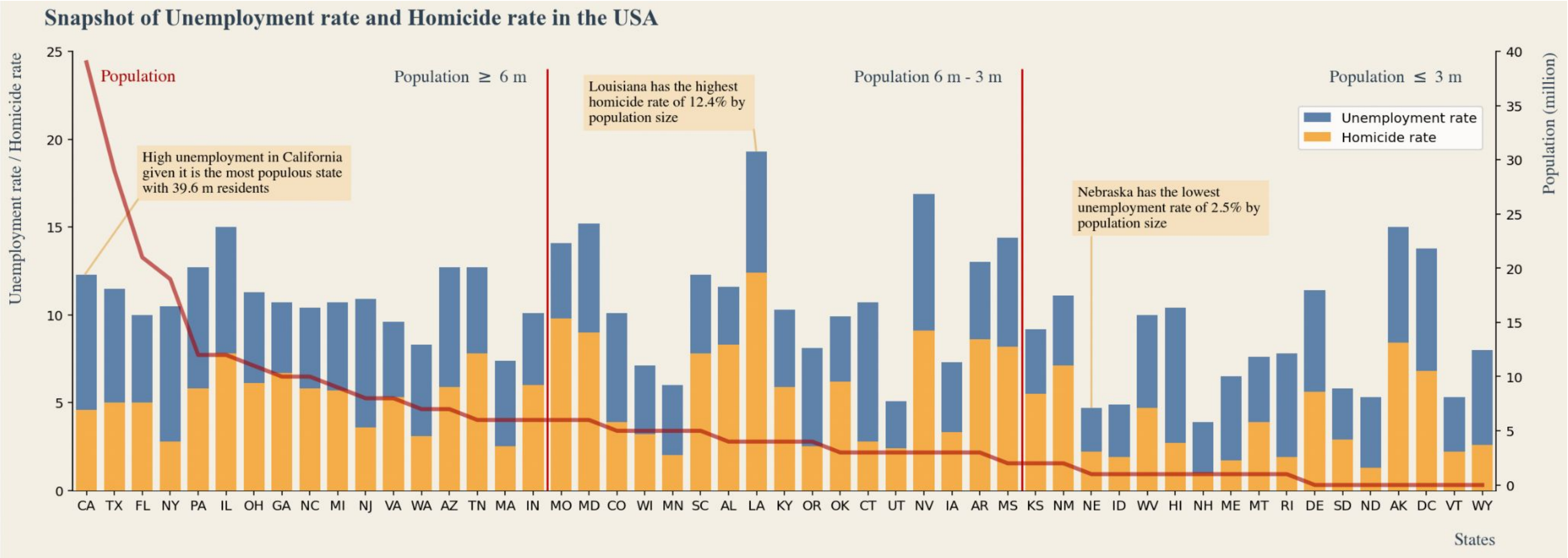
carat	cut	color	clarity	depth	table	price
0.23	Ideal	E	SI2	61.5	55	326
0.21	Premium	E	SI1	59.8	61	326
0.23	Good	E	VS1	56.9	65	327
0.29	Premium	I	VS2	62.4	58	334
0.31	Good	J	SI2	63.3	58	335
0.24	Very Good	J	VVS2	62.8	57	336
0.24	Very Good	I	VVS1	62.3	57	336
0.26	Very Good	H	SI1	61.9	55	337
0.22	Fair	E	VS2	65.1	61	337
0.23	Very Good	H	VS1	59.4	61	338
0.3	Good	J	SI1	64	55	339
0.23	Ideal	J	VS1	62.8	56	340
0.22	Premium	F	SI1	60.4	61	342
0.31	Ideal	J	SI2	62.2	54	344
0.2	Premium	E	SI2	60.2	62	345
0.32	Premium	E	I1	60.9	58	345
0.3	Ideal	I	SI2	62	54	348
0.3	Good	J	SI1	63.4	54	351
0.3	Good	J	SI1	63.8	56	351
0.3	Very Good	J	SI1	62.7	59	351
0.3	Good	I	SI2	63.3	56	351
0.23	Very Good	E	VS2	63.8	55	352
0.23	Very Good	H	VS1	61	57	353
0.31	Very Good	J	SI1	59.4	62	353
0.31	Very Good	J	SI1	58.1	62	353
0.23	Very Good	G	VVS2	60.4	58	354
0.24	Premium	I	VS1	62.5	57	355
0.3	Very Good	J	VS2	62.2	57	357
0.23	Very Good	D	VS2	60.5	61	357
0.23	Very Good	F	VS1	60.9	57	357



Which would you analyze for trend between carat and price?

By the way, there are 50k+ rows in the dataset.

Myths about Data Analysis



Snapshot of Unemployment rate and Homicide rate in the USA

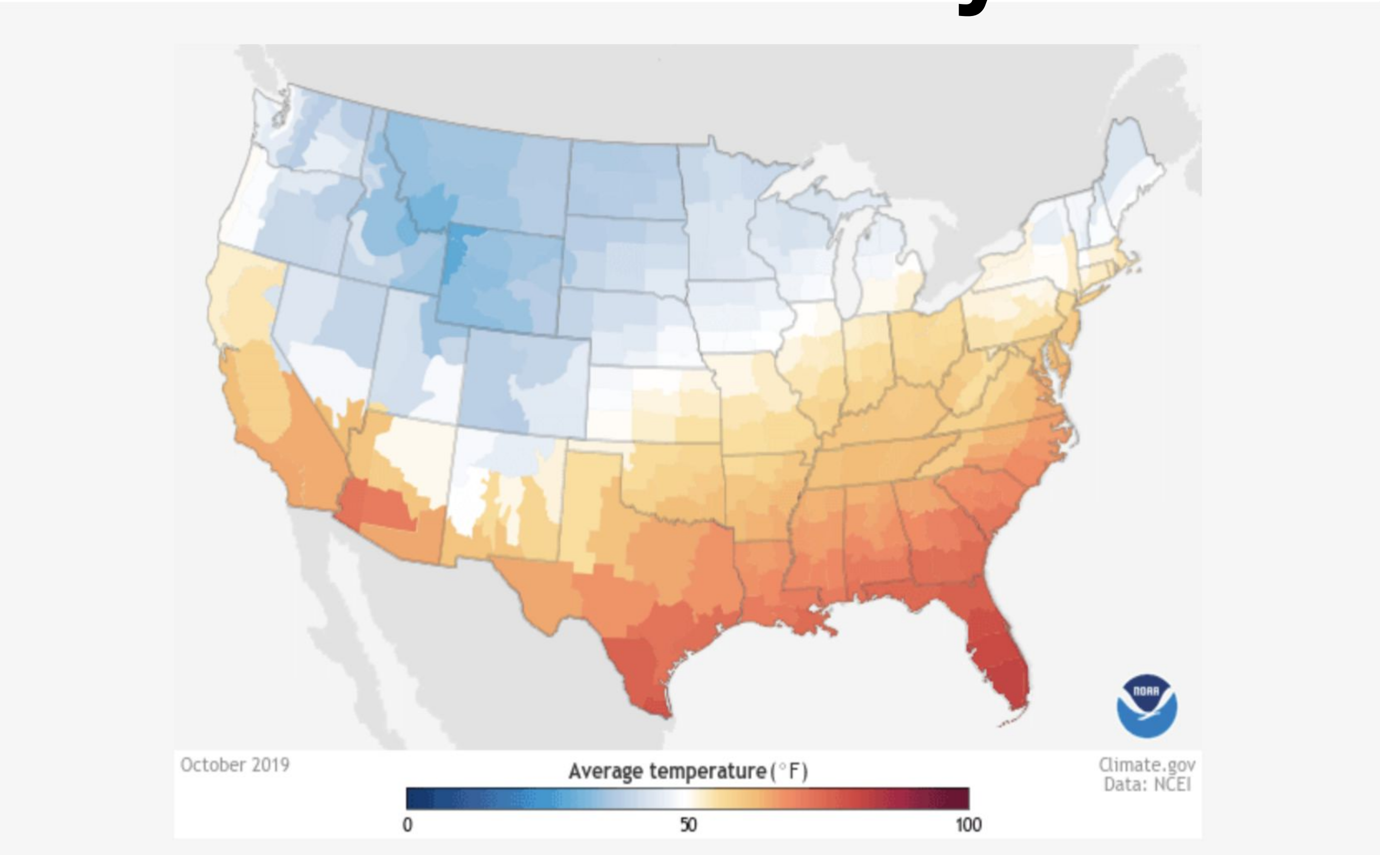
High unemployment in California given it is the most populous state with 39.6 m residents

Louisiana has the highest homicide rate of 12.4% by population size

Nebraska has the lowest unemployment rate of 2.5% by population size

We can incorporate many different types of visualization in one place to tell a story. Imagine trying to read this information in table format.

Myths about Data Analysis



Take this visualization, for example, looking at weather temperatures. Blue and red are readily understood without any explanation, and are easily distinguishable.

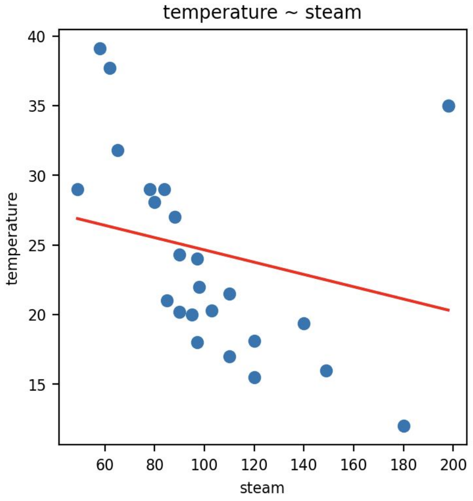
Simple Real World Analogy

What happens without EDA?

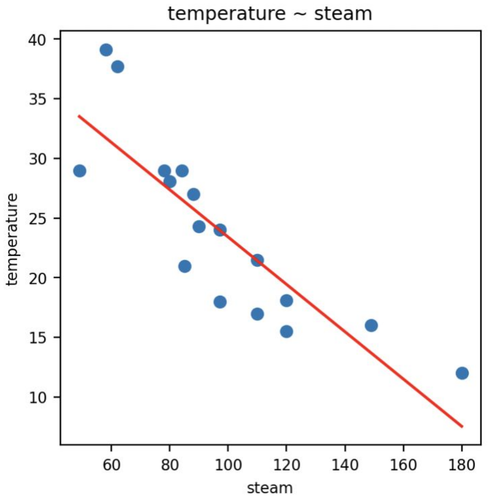
- An energy company was using field data in oil operations.
- In order to pump oil, steam is used to warm up the oil in order to ensure that the oil flows more easily.
  - The steam was based on infrared readings of the temperature of the lines.
- The lines were dirty and insulated causing the temperature readings to be way off.
  - Because this problem went unnoticed, more steam was constantly used.
  - This resulted in excessive operational expenses that exceeded tens of millions of dollars.

Different Scenarios

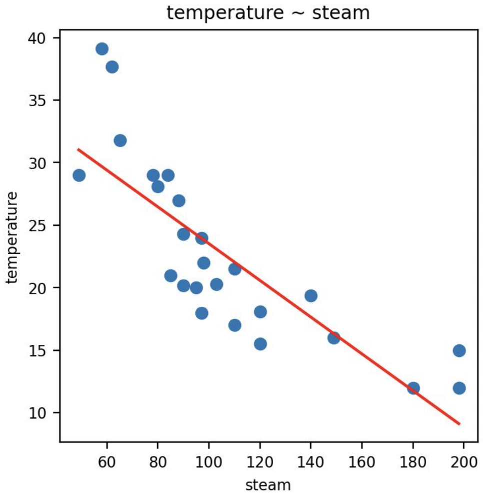
Imagine the steam input is driven by signals from a SLR model dataset through these three scenarios.



With outlier data

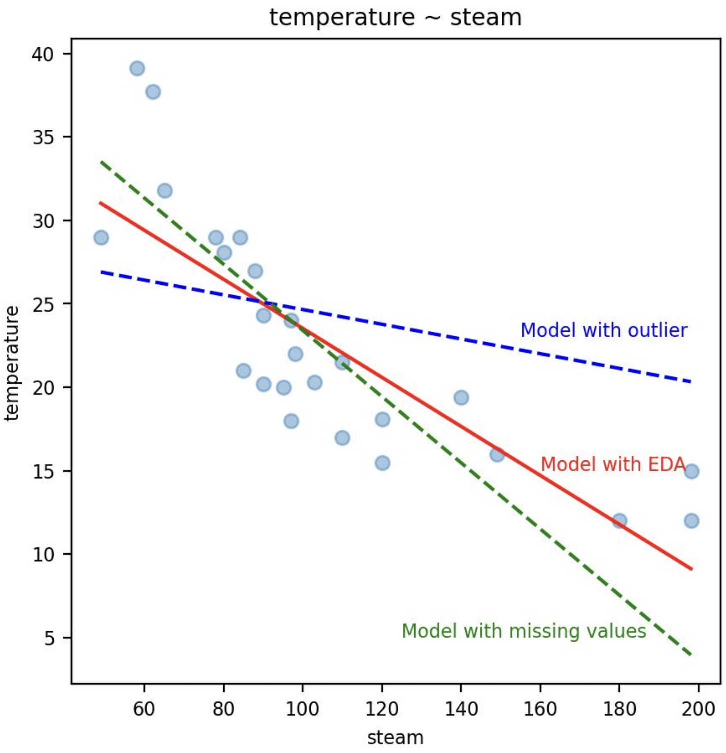


With missing data



With proper EDA

Scenarios Compared



- Understanding the data does matter!
- Inaccurate data can create inaccurate predictions
    - Inaccurate predictions can create huge expenditures over time

Messy Real World Data
Kedeisha Bryan
WF

Thank you!