
Data Science
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UNIT 1 ORIENTATION, DEV ENVIRONMENT, PYTHON REVIEW, DATA SOURCE PRESENTATION

GENERAL ASSEMBLY

Orientation

- Introduction
- Course Overview
- Introduction to Data Science
- Types of Data

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Introduction

Name

Background in Data or reason for taking class

Something about you ie Hobby, fun fact, current projects, Favorite movies or books

Course Overview

20 session grouped by 4 units, 3-unit demonstration projects, 1 final project.

UNIT 1 PYTHON FOUNDATIONS

- Unit presentation: Python Technical Code Challenges

UNIT 2 EXPLORATORY DATA ANALYSIS AND HYPOTHESIS

- EDA + Chipotle data
- Final presentation: Proposal + Dataset

UNIT 3 MODELS(Linear regression, KNN/ Classification, Logistic regression)

- Final presentation: Initial EDA Brief
- Linear Regression and KNN Practice(Optional)

UNIT 4 TIME SERIES, NLP, MODEL EVALUATIONS

- Final presentation Technical Report
- Final presentation Executive Report

Course Outline

UNIT 1 PYTHON FOUNDATIONS
- Welcome to Data Science
- Config Dev Environment
- Python Foundations
- Lab and Presentation

UNIT 2 EDA AND HYPOTHESIS
- EDA in Pandas
- Working with data: APIs
- Data Visualization
- Statistics in Python
- Experiments and Hypothesis
- Lab and Presentation

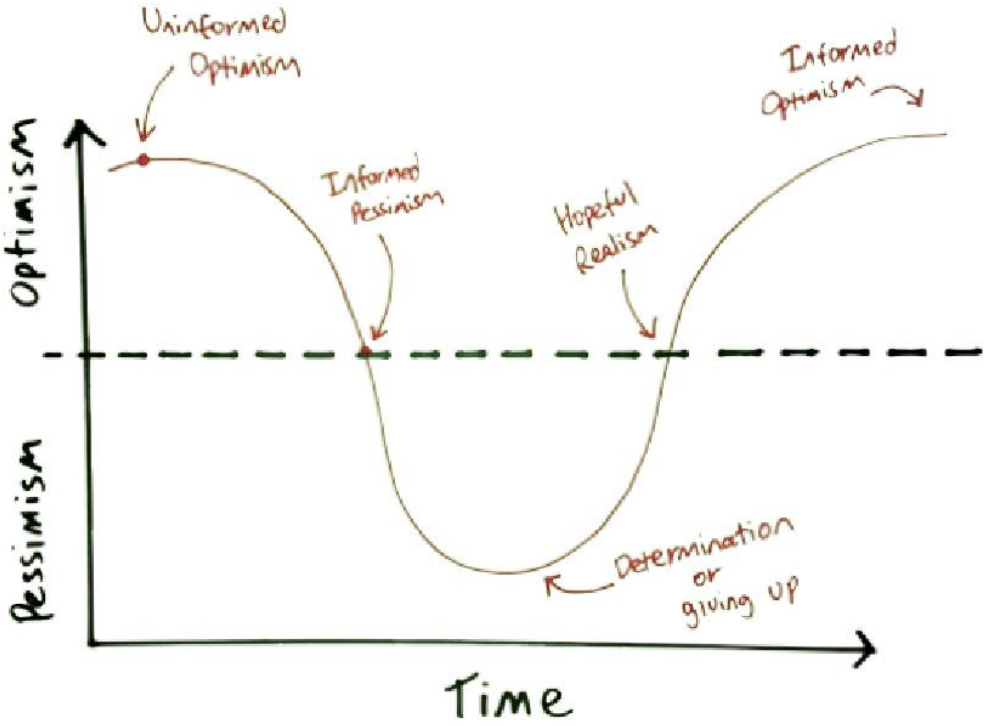
UNIT 3 MODELS(Linear Regression, KNN/ Classification, Logistic regression)
- Linear Regression
- Train-Test Split & Bias Variance
- KNN / Classification
- Logistic Regression
- Lab and Workshop

UNIT 4 WRANGLING, TIME SERIES, & NLP
- Intro to Time Series
- Intro to Natural Language Processing
- Flex more models, SQL Data management, Data cleaning, more evals
- Review + Lab
- Presentations

Learning

10% skill
90% Never give up, Never surrender

Strategies for Class:
- Progress rating
- Road Map/Cheat sheets
- Mentor and Present



Tips for success

Study partners, study groups increase retention, accountability, support, learning perspectives, networking, and can lead to friendships or fun.

Practice skills on easy data sets: Start small, find a data set that is easy and/or something that you like or fascinates you. Get the skills down and focus on harder data problems later.

Teach others a topic that is hard for you, a classmate, a partner, or a friend.

Free time Fake out. When you don't feel like doing a task, put a show on that you have seen 100 times, open your laptop and just start on the task, you will find it can turn into a few hours because well you have already seen that episode and you are not really working because you are watching TV.

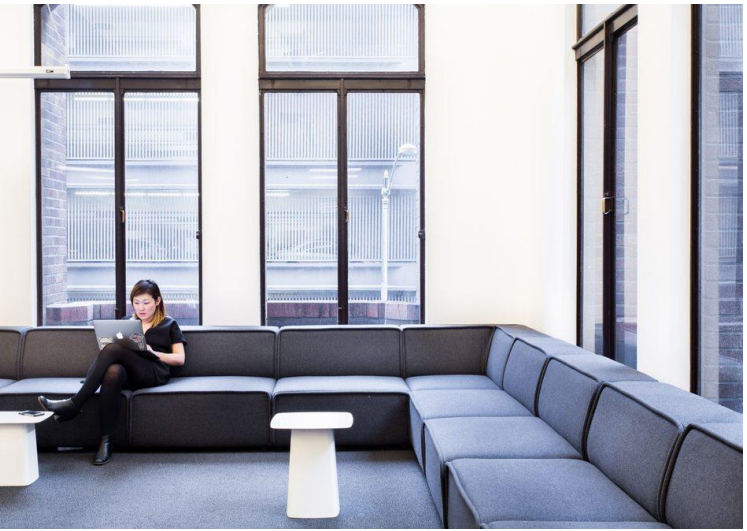
Set specific small goals with quick deadlines. It is easier to complete several 1hr tasks then one 8-hour task.

Procrastinate with 2 or 3 other tasks. Rotate when you procrastinate.

Be a learn it all instead of a know it all. There is always something new to learn even with something you feel you have mastered.

Tips for success

“I dedicate 1 to 3 hours a day, determined to master the material.”



Tips for success

1) Out of the units what is most interesting to you and what seems most challenging?

2) Which Study tips seem realistic to apply? Do you have additional study tips?

Introduction to Data Science

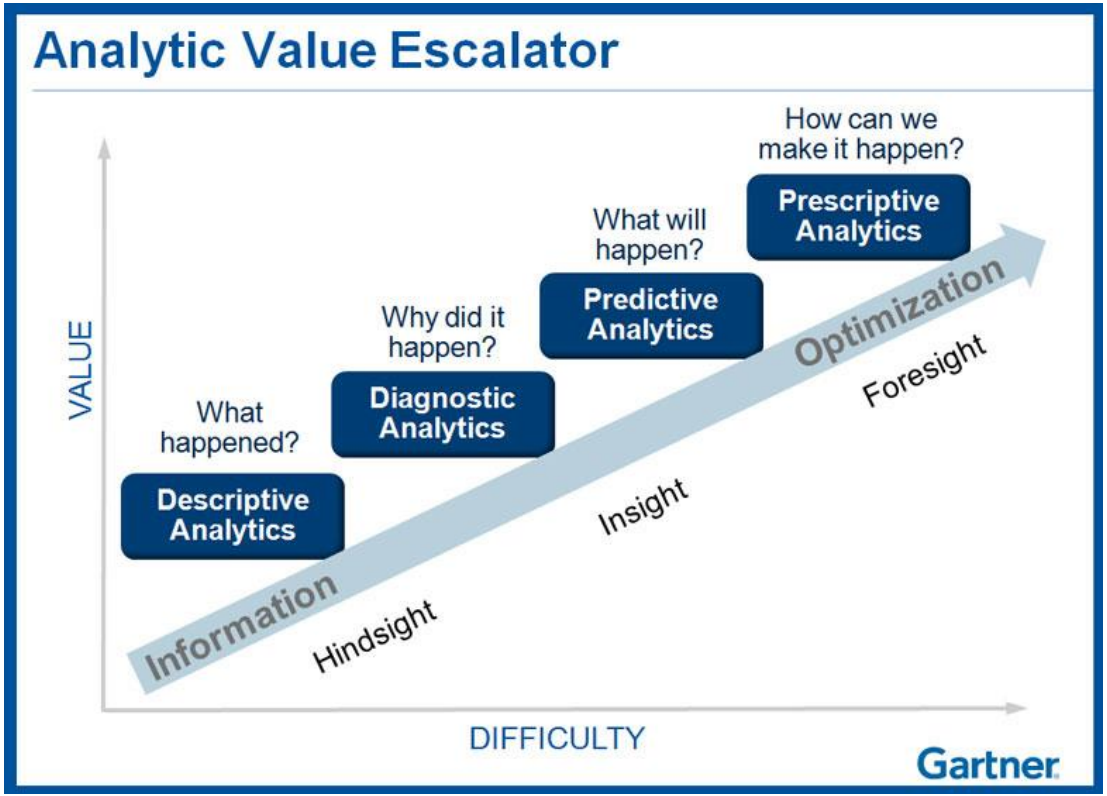
What is Data Science and Why do we care?
What are the tools of a Data Scientist?
What is a Data Scientist workflow look like?

What is Data Science

BI or Business Intelligence
Business Analyst
Data Analyst
Data Scientist
Data Engineer

A good article on the difference between BI and Data Science
https://www.itproportal.com/2016/08/18/10-differences-between-data-science-and-business-intelligence/

What is Data Science



What is Data Science

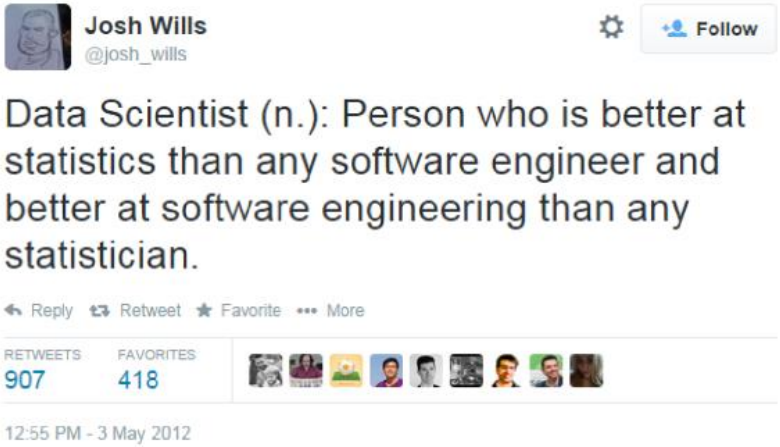
"**Data** Scientists are people with some mix of **coding and statistical skills** who work on **making data useful** in various ways."

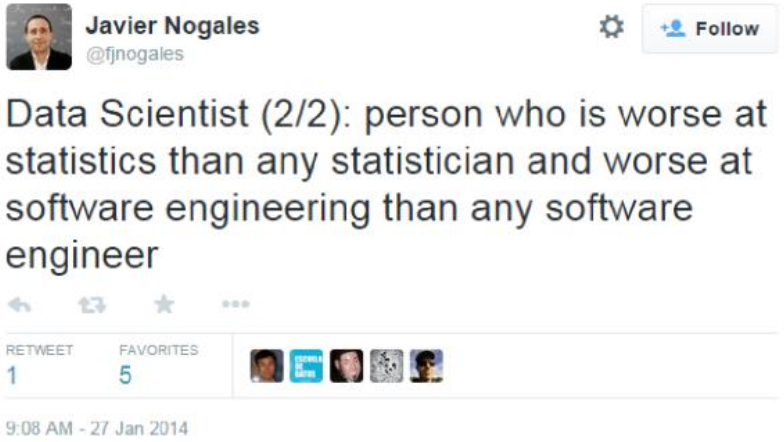
Data Scientist Type B (for Building):

- Some statistical background, but **strong coder or software engineer**.
- Primarily concerned with **using data "in production"**: building models which interact with users (by giving recommendations, for example).

Our course is focused primarily on **Type A**.

What is Data Science





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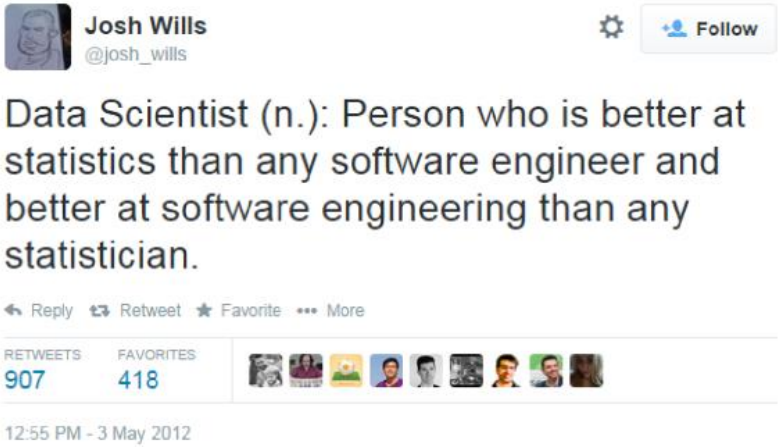

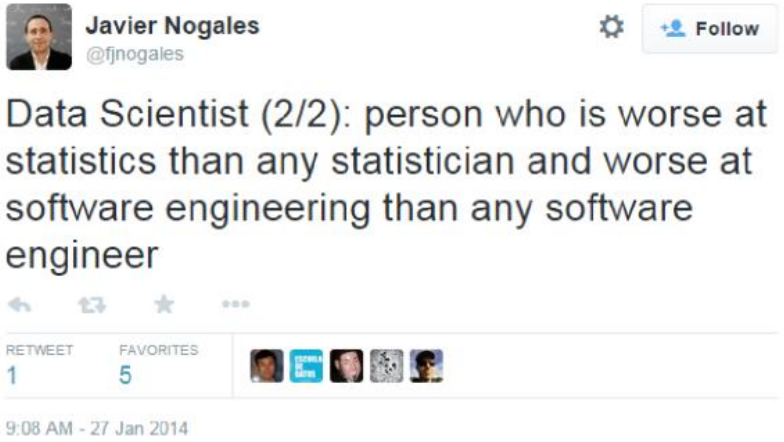

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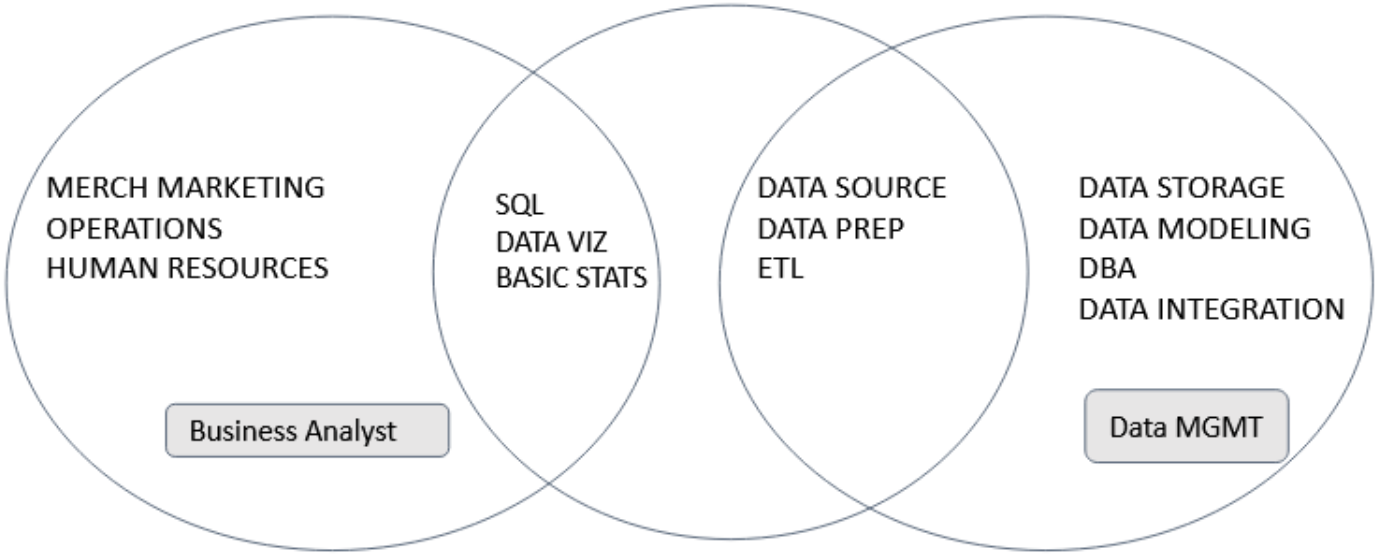

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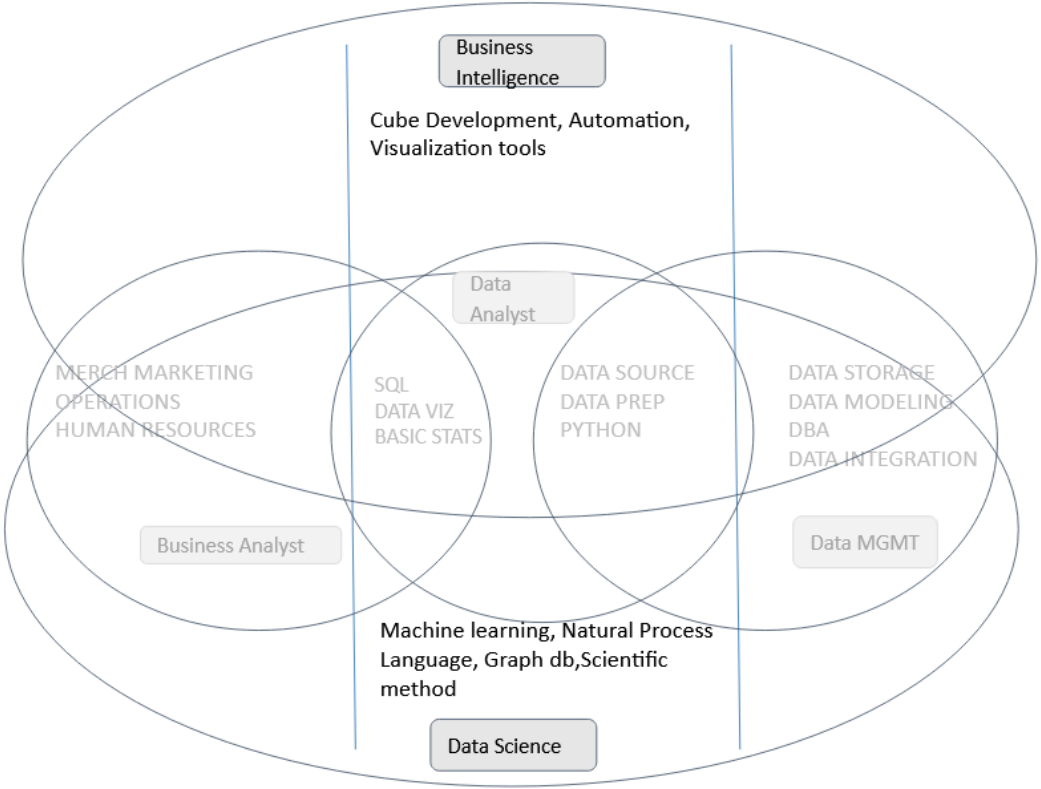

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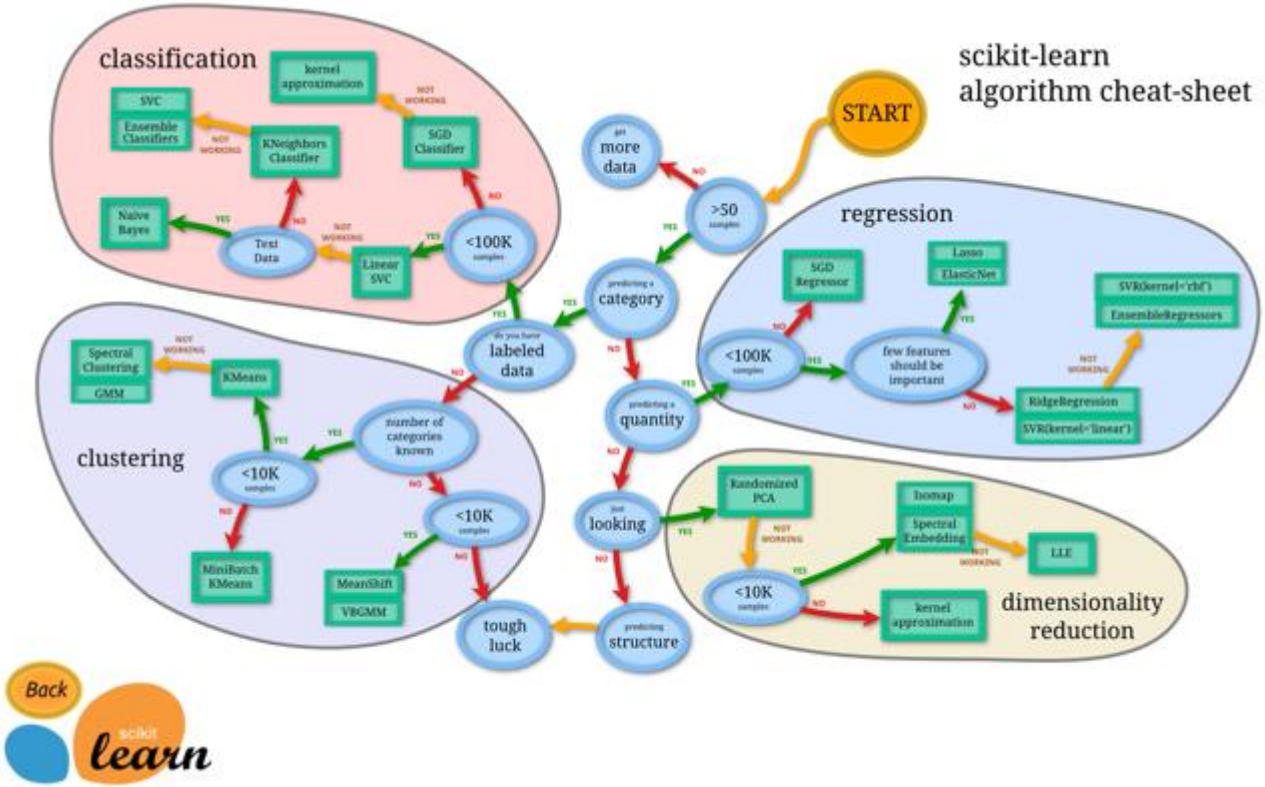

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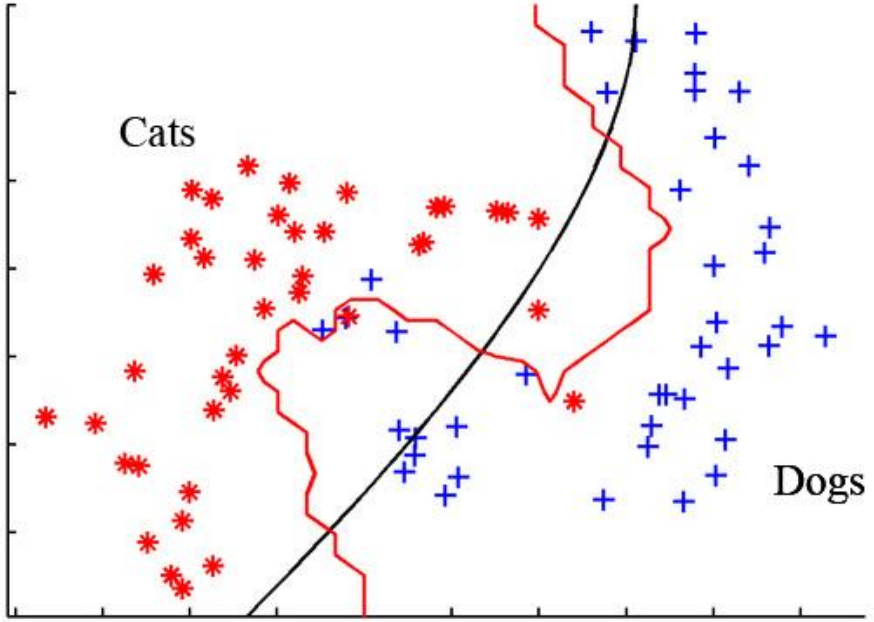

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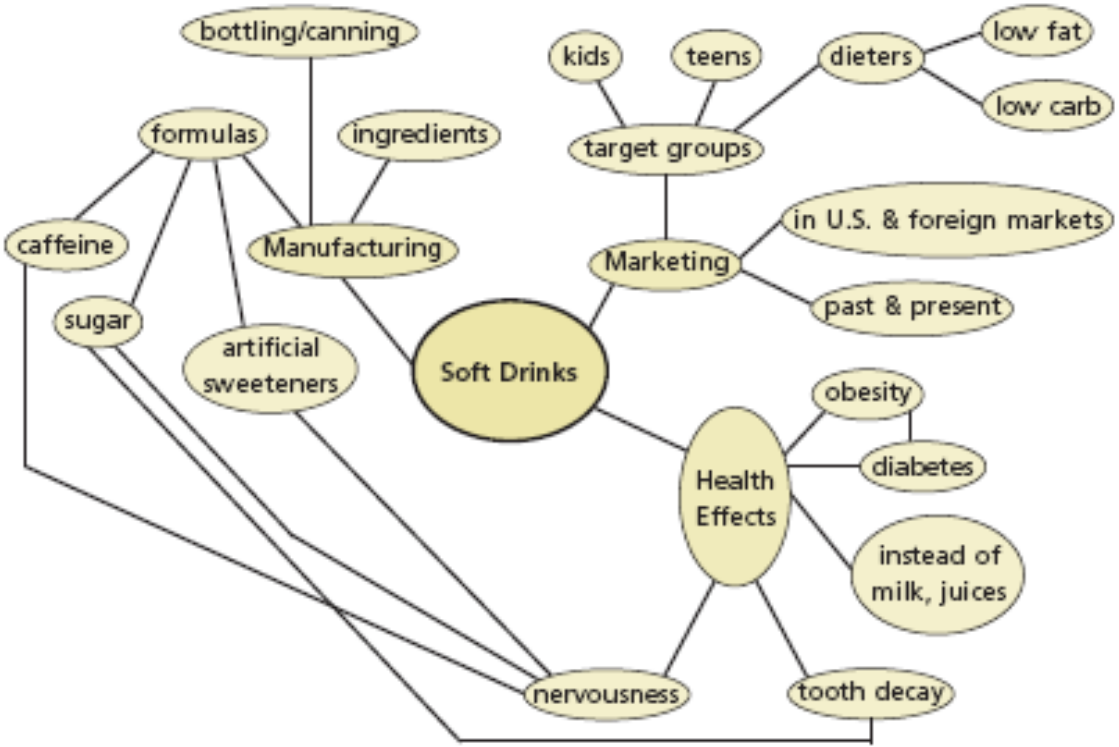

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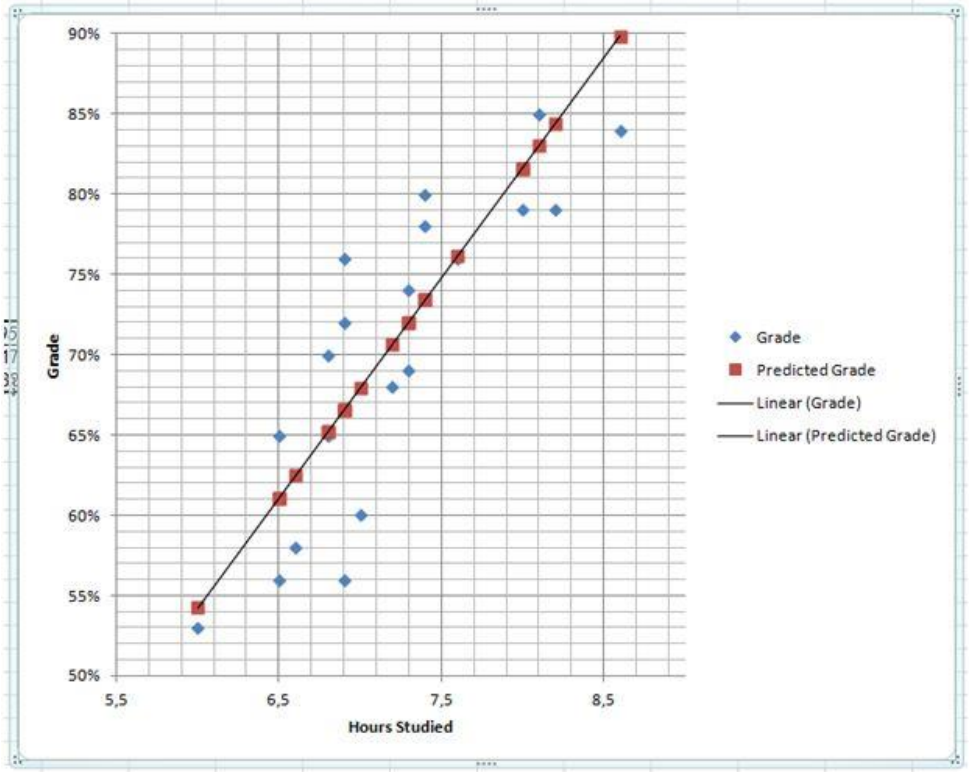


What is Data Science

What is Data Science

EXAMPLES OF DATA SCIENCE IN ACTION

- Facebook facial recognition in photos
- Netflix/Amazon/Spotify recommendations
- Siri/Echo/Cortana voice recognition assistants
- Building art with Neural Networks - https://github.com/jcjohnson/neural-style
- Faceswap - https://www.youtube.com/watch?v=UngUWA43q5o
- Stock Market - https://www.quantopian.com/ - building crowd source hedge funds
- Helping people
  https://www.drivendata.org/ - who is a good bet to give money to
  http://www.datakind.org/projects
  - Help find missing children - http://www.datakind.org/projects/finding-30000-missing-children
- Find correlations from sickness, grades, and attendance and try to find ways to improve them http://coolculture.org/webfm_send/62
- Additional examples https://www.kaggle.com/wiki/DataScienceUseCases

Data Science Toolkit

Data Science Toolkit

Data storage, Understanding schemas, tables, fields, relational and non relational databases is a foundation of data analytics

ORACLE

PostgreSQL

Amazon Redshift

Azure Synapse Analytics

Data Science Toolkit

Business knowledge can include understanding: Knowing KPI's, Gather requirements, MetaData, Operational reports, Business acumen, communication and navigating politics and personalities of your business culture

Having a strong understanding of Lookup functions, string and numeric functions is necessary to understand the business and how the currently tackle problems.

$$r_k = \frac{\sum_{t=k+1}^{n} (y_t - \bar{y})(y_{t-k} - \bar{y})}{\sum_{t=1}^{n} (y_t - \bar{y})^2}$$

Basic Statistics(Central Tendency) Understanding concepts is fine. Understanding long hand even better.

This is a must to understand the basic charts and graphs and be able to tell a story with them.

Structured Query Language: Unless someone is getting all of your data for you and cleaning it all for you, you will want to be proficient in SQL up to Advanced levels.

Data Science Toolkit

Python is a general-purpose programing language. Allows you to give directions to a computer to tell it what to do.

R is a system for statistical computation and graphics.

SAS **SAS** (Statistical Analysis System) is a software suite developed by **SAS** Institute for advanced analytics, multivariate analyses, business intelligence, data management, and predictive analytics.

SPSS Modeler IBM **SPSS Modeler** is a data mining and text analytics software application from IBM. It is used to build predictive models and conduct other analytic tasks

Data Science Toolkit

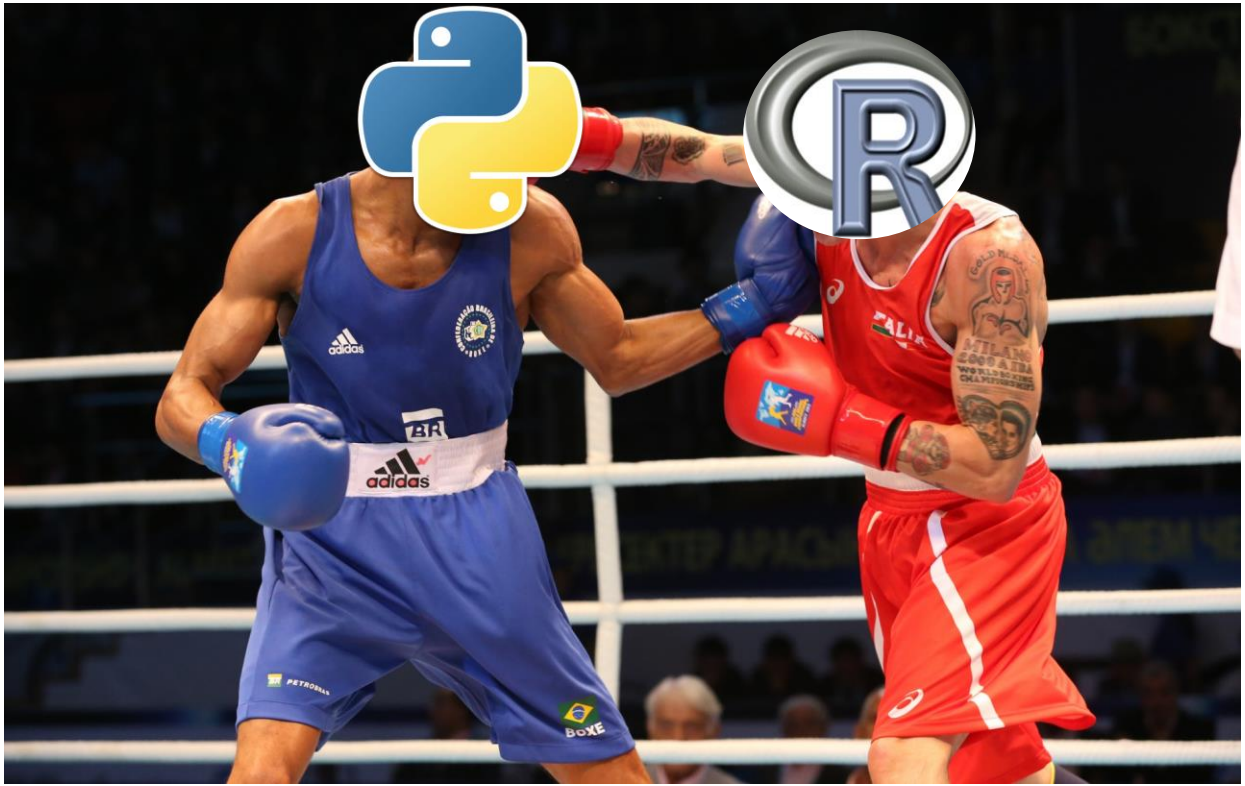
Jupyter Notebooks allows you to create and share documents that contain live code, equations, visualizations and explanatory text.

Plain text formatter that converts for use in html, used to create documentation within Jupyter

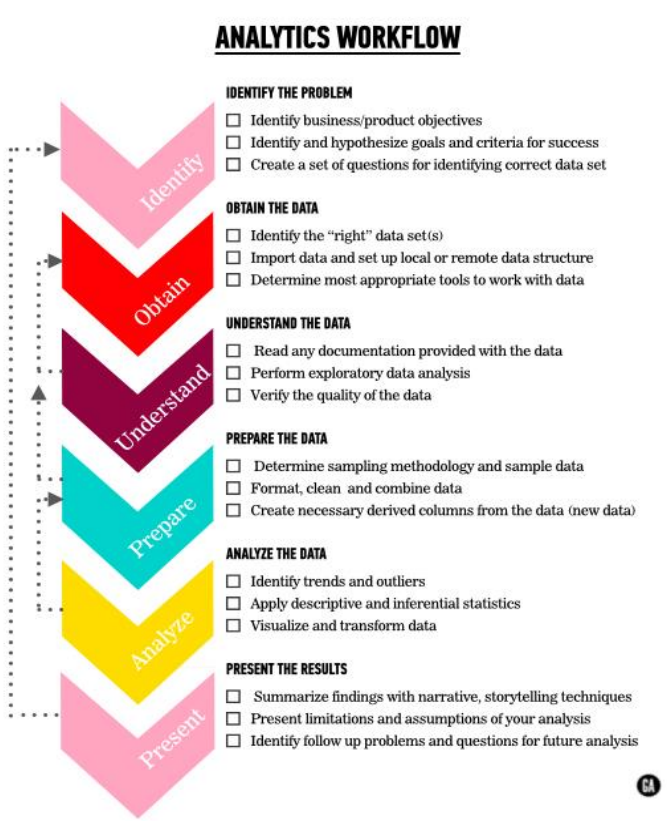
Purpose of git is to manage a project, or a set of files as they change over time. It allows for version control and collaboration.

Command line is a user interface to a computers operating system. It allows you to navigate, manipulate and analyze files, data and more.

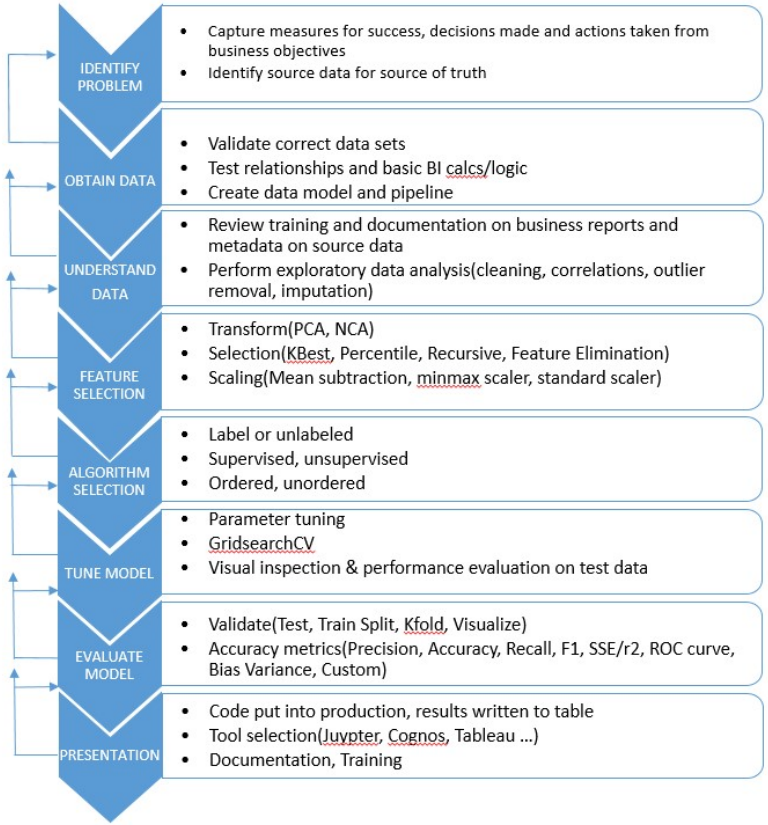
Data Science Toolkit



Data Science Workflow



Data Science Workflow



1) What is the difference between a Data Analyst, Data Engineer, and a Data Scientist?

2) In your own words how would you describe the 4 primary algorithm groups in scikit learn?

3) What is the difference between R and Python? Which should you learn?

4) What is the difference between an Analytics workflow and a Data Science workflow?

5) When would you use Jupyter?

Classroom Exercise

Create a Github account https://github.com/

Ensure you can view the home page for class
https://github.com/Morrisdata/DS

Ensure you can view the current chapter
https://github.com/Morrisdata/DS/tree/master/01_Welcome_To_Data_Science

Download or view in Github the current slide deck
https://github.com/Morrisdata/DS/blob/master/01_Welcome_To_Data_Science/GA%20Data%20Science%202024%20-%2001%20Welcome%20To%20Data%20Science.pdf

Types of Data

Quantitative

- **Discrete and Continuous**

Qualitative

- **Nominal and Ordinal**

----Types of Data Formats----

Flat File
Text Documents
Time Series
Transactional Data
Relational Data
Spatio-Temporal Data
Image Data
Network Data

Types of Data

Text Files – data conveyed in written or printed form. Surveys, Social Media Posts, Books, messages in chat. Can be used for word clouds sentiment analysis, give insights, however, may contain errors, bias

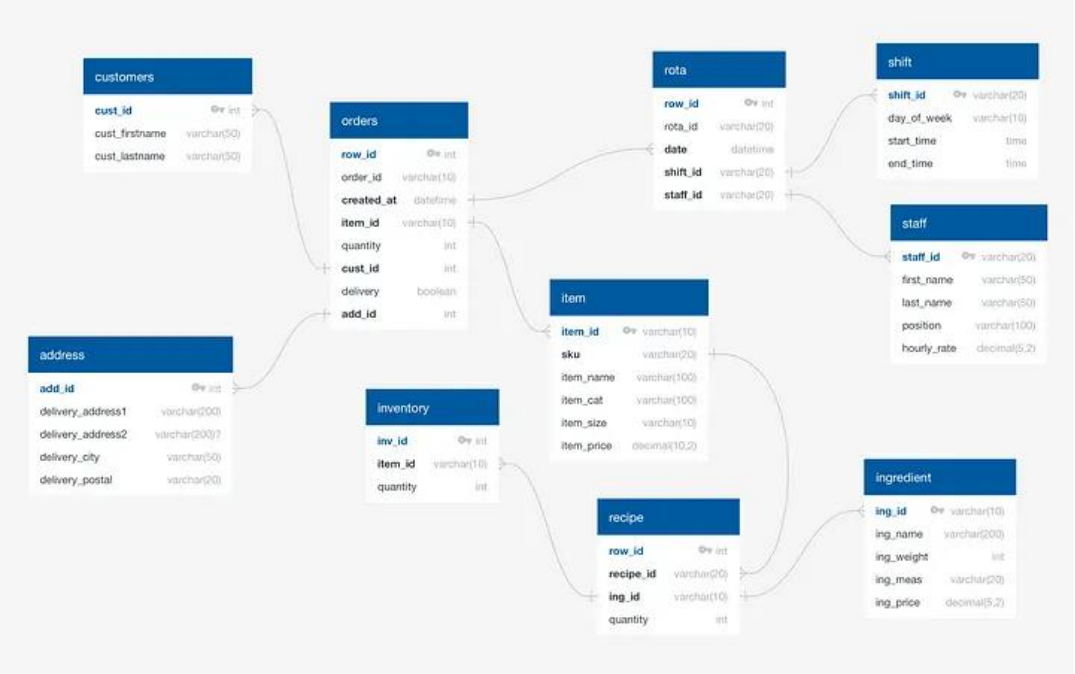
Flat File – rows and columns of data typically seen in .csv files. Single files that are not modeled or related.

Transactional Data– Date stamped events (logs): can be represented as time series. Customer bought a coffee at 12PM

Time Series – Similar to Transactional data, however, can be used to as successive measurements over time rather than over transaction. Number of coffees sold between 12 and 1pm or number of customers served between 12 and 1PM.

Types of Data

Relational Data- stores tables that relate to on another example would be a customer table that relates to an item table that relates to a transaction table.

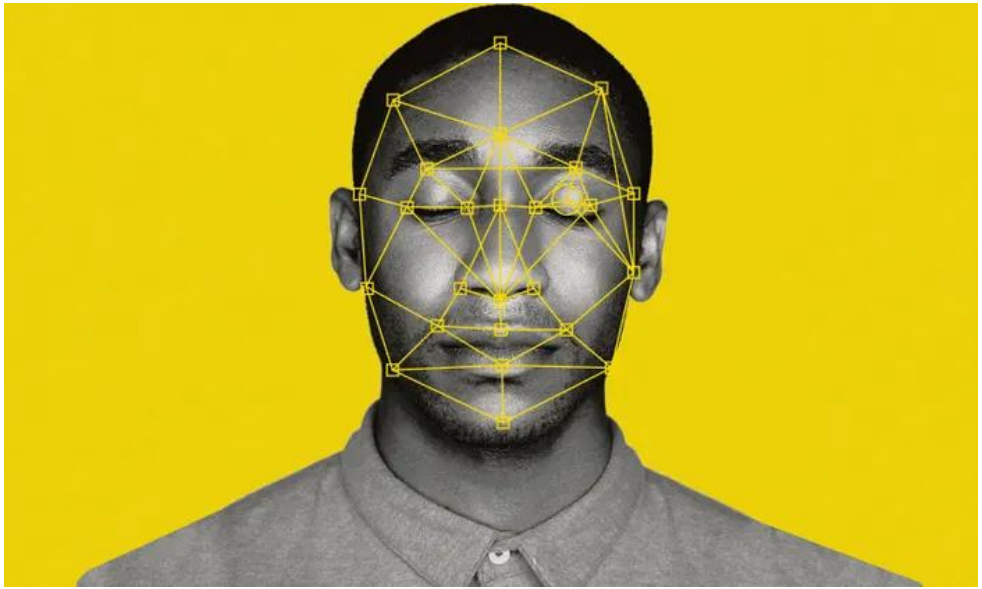


Types of Data

Spatio-Temporal Data – information about space and time. Examples include Weather patterns, predicting earthquakes, determining global warming, evaluation of traffic for city planning and more.

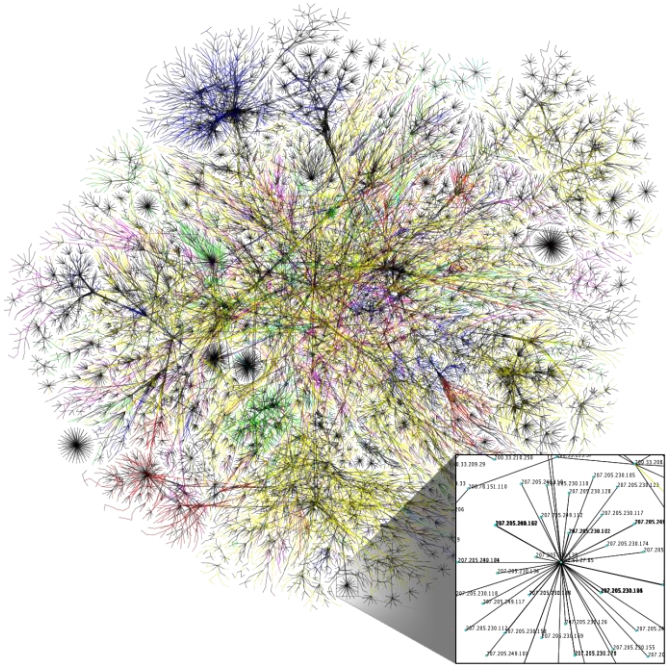
Types of Data

Image Data: photographic or trace objects that represent the underlying pixal data of an area image element. Examples include face recognition, label classifications(dog vs cat), autonomous driving, Quality Control in manufacturing, target identification, threat assessment, Healthcare,



Types of Data

Network Data : Data extracted from connected network devises and is limited to anonymized personal data.



Types of Data

Quantitative[Discrete, Continuous Data]: Expressed by a number and measured by numerical variables, How many, how much, how often.

Discrete Data – Number of employees at a company, Number of movies on streaming platform

Continuous Data – Tenure of employees at a company, Length of movies on streaming platform

Qualitative/Categorical[Nominal Data Ordinal Data]: cannot be expressed as a number and cannot be measured. Qualitative consists of words, symbols, or pictures. What is? Who is? Where is?

Ordinal: Place numbers in order but math cannot be done on the order – Heat setting on stove; low, medium, high

Nominal: Used for Labeling variables – Type of food cooked: Thia, Mexican, Indian

Tips for success

3 – have applied more than once and need little reference or support

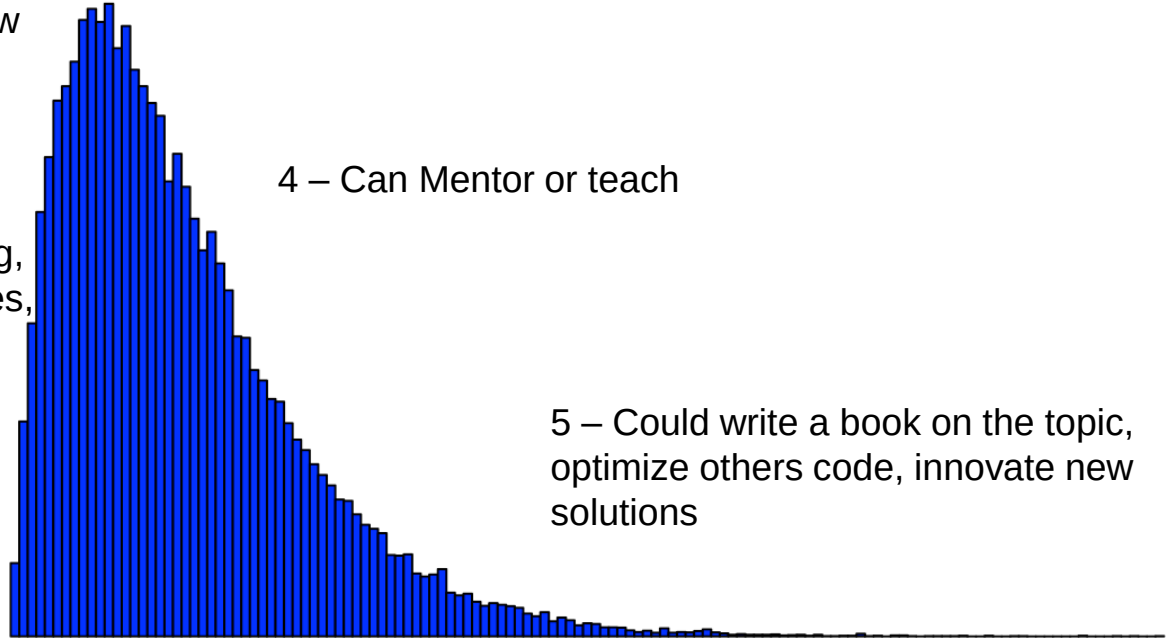
2 – have and can apply with reference review or some support

4 – Can Mentor or teach

1 – Actively Learning, Engaged in exercises, training content, or lectures

5 – Could write a book on the topic, optimize others code, innovate new solutions

0 – Don’t know



1) 8 data types were described, name as many as you can recall.

2) What is the difference between Qualitative and Quantitative?

3) What is the difference between Ordinal and Nominal?

4) Are Ordinal and Nominal considered Quantitative or Qualitative?

5) What is the difference Discreet and continuous?

6) Are Discreet and Continuous Quantitative or Qualitative?

Classroom Exercise

1. Download the titanic dataset
2. Identify a question
3. What are observations made about the data?
4. What next steps would you make?

https://github.com/Morrisdata/data/blob/main/titanic.xls

Bonus Content

Github is an in-depth versioning and collaboration tool. While we do not cover it extensively in class it is a good tool to be familiar with. Organization such as Microsoft and Amazon have their own versions of a Git environment. Using Github as a way to understand and practice is not a bad idea.

https://docs.github.com/en/get-started/quickstart/hello-world

GENERAL ASSEMBLY

Tasks

Familiarize with Git content
Complete any Python pre-work content
Connect with Students
Set up folder structures for ease of Content access
Consider the final project and a data set you are interested in

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