

WELCOME TO DATA SCIENCE

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WELCOME TO DATA SCIENCE

LEARNING OBJECTIVES

- Describe the roles and components of a successful learning environment
- Define data science and the data science workflow
- Apply the data science workflow to meet your classmates
- Setup your development environment and review python basics

DATA SCIENCE

PRE-WORK

PRE-WORK REVIEW

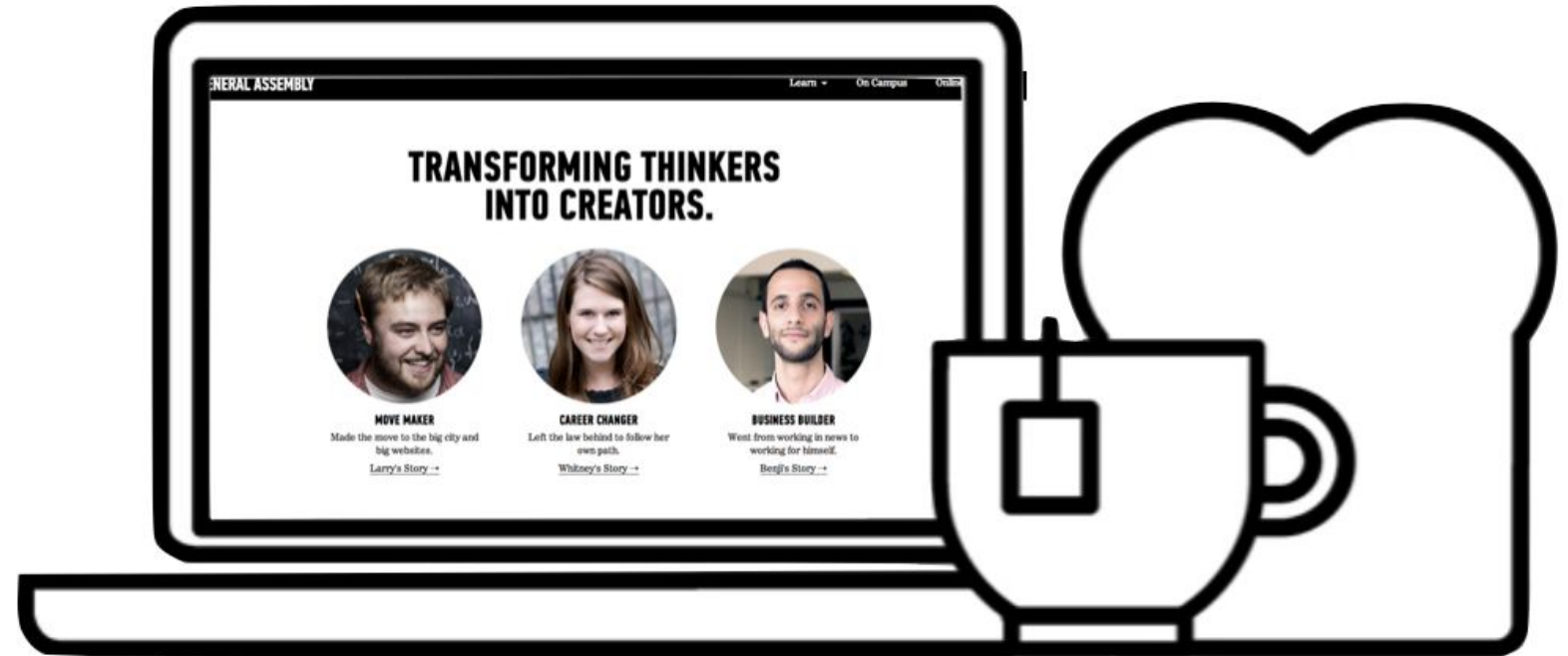
- Define basic data types used in object-oriented programming
- Recall the Python syntax for lists, dictionaries, and functions
- Create files and navigate directories using the command line interface

DATA SCIENCE

WELCOME TO GA!

FEEDBACK/SUPPORT

- Access to EIRs: office hours, in class support
- Exit Tickets
- Mid-Course Feedback
- End of Course Feedback



Exit Tickets

- ▶ Meant to help me help you
- ▶ But please first try to come directly to me to address your issues and concerns before simply adding complaints to your reviews. Steps in the below order:
 1. Ask me questions during class for things that you don't understand. I will assume you understand it unless stated otherwise!
 2. Come to office hours (after class)
 3. Add question to the “parking lot” and/or slack
 4. Do the home works, review your notes, try to search for the answer yourself online. Struggling is a sign that you are learning.
 5. If all fails, then go ahead and add it to the review and I can address it directly with you
- ▶ Remember that a review for you just takes a few minutes but I have to deal with it for the entire class. Accountability goes both ways! Don't complain, if you don't understand something, let us know and we are here to help!

GA GRADUATION REQUIREMENTS

HOMEWORK
(COMPLETE 80% OF
HOMEWORK/LABS)

ATTENDANCE
(MISS NO MORE THAN 2
CLASSES)

**FINAL
PROJECT**

**COMMUNITY
ENGAGEMENT**
PARTICIPATION +
FEEDBACK

FOREVER AND EVER



**BUILD
YOUR
NETWORK**

It's not just about
altruism, your network
is your most valuable
asset



**FIND
OPPORTU
NITIES**

Alumni have started
companies together and
recruited other alumni to
join their teams



**13,000+
STRONG**

You're part of the alumni
community forever



PERKS!

15% OFF CLASSES
AND WORKSHOPS, \$500
TUITION CREDIT

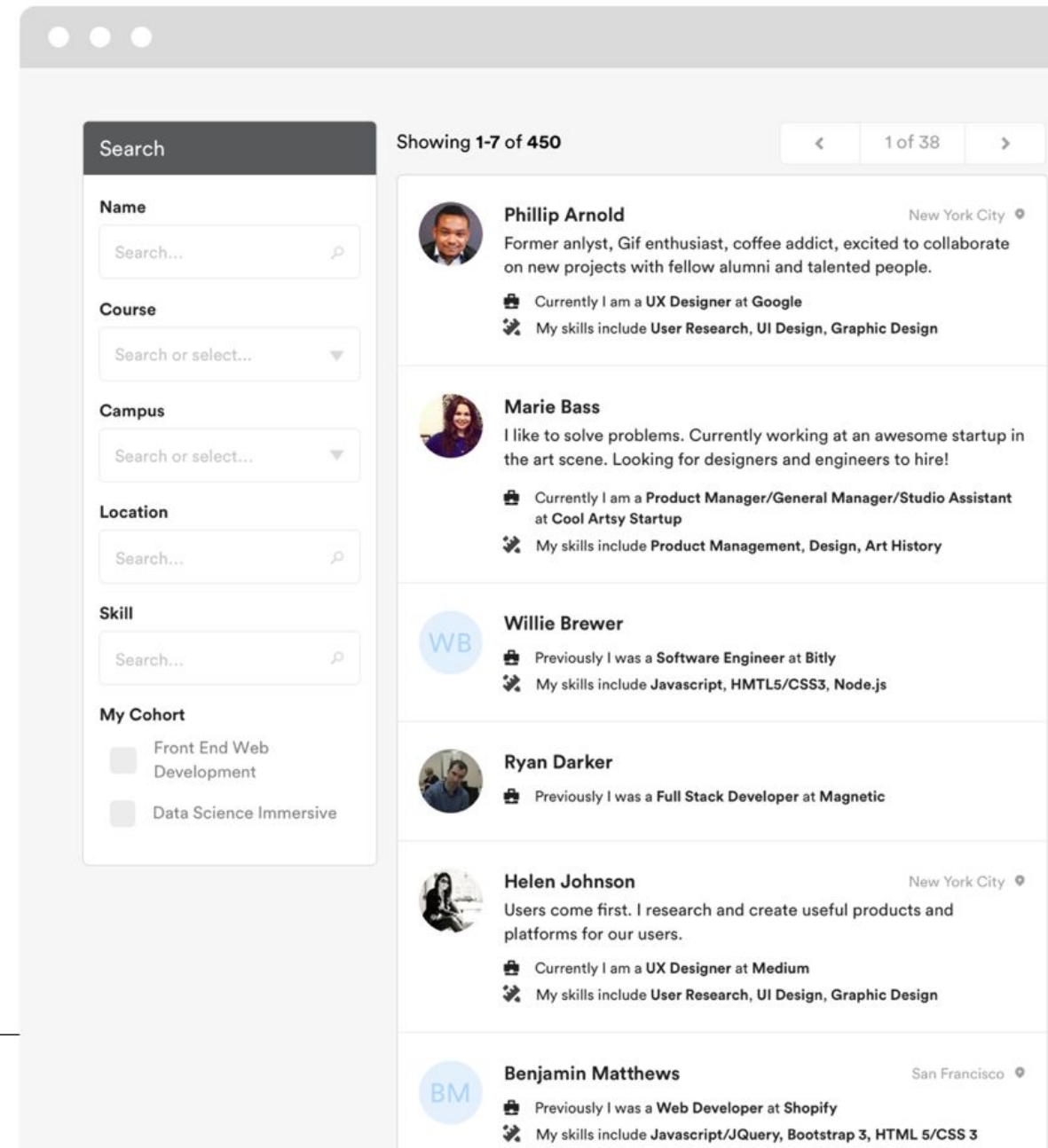
We can't wait to have you
back on campus

GA Directory

The GA Directory is a place for students, alumni and instructors to connect.

- Find your classmates
- Reach out to alumni and instructors
- Hire talent based on skills and experience

directory.generalassemb.ly

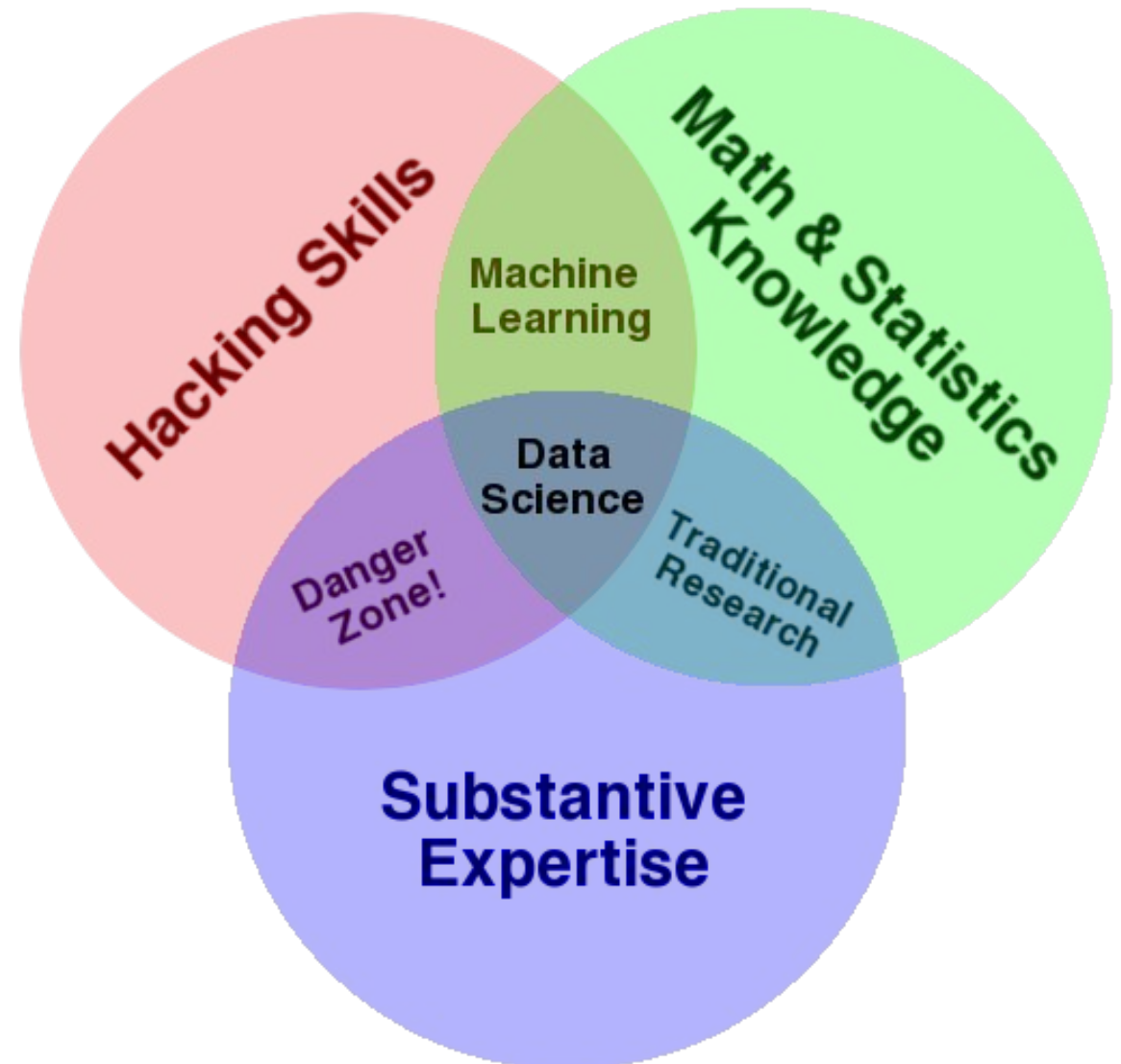


INTRODUCTION

WHAT IS DATA SCIENCE?

WHAT IS DATA SCIENCE?

- A set of tools and techniques for data
- Interdisciplinary problem-solving
- Application of scientific techniques to practical problems



WHO USES DATA SCIENCE?

NETFLIX

amazon.com[®]

Google



 **FiveThirtyEight**



WHO USES DATA SCIENCE?

► Can you think of others?

Position Title	Mathematics /Statistics (e.g. P-value analysis, AB testing)	Database Querying (SQL)	Algorithms (e.g. Supervised learning, Entity Resolution)	Software Engineering (e.g. Python, Java, Object Oriented)	Big Data/Systems Engineering (e.g. Spark, HBase, Hadoop)	Soft Skills/Domain Expertise (E.g. public speaking, presentation skills)
Product Data Scientists	Medium	Medium	Medium	High	High	Medium
Data Engineering	Low	Medium	Low	High	High	Low
Data Scientist	High	Medium	High	Low	Low	High
Business Intelligence Data Scientists	Medium	High	Medium	Low	Low	High
Data Analyst	Low	High	Low	Low	Low	High

WHAT ARE THE ROLES IN DATA SCIENCE?

- Data Science involves a variety of roles, not just one.

Data Developer	Developer	Engineer	
Data Researcher	Researcher	Scientist	Statistician
Data Creative	Jack of All Trades	Artist	Hacker
Data Businessperson	Leader	Businessperson	Entrepreneur

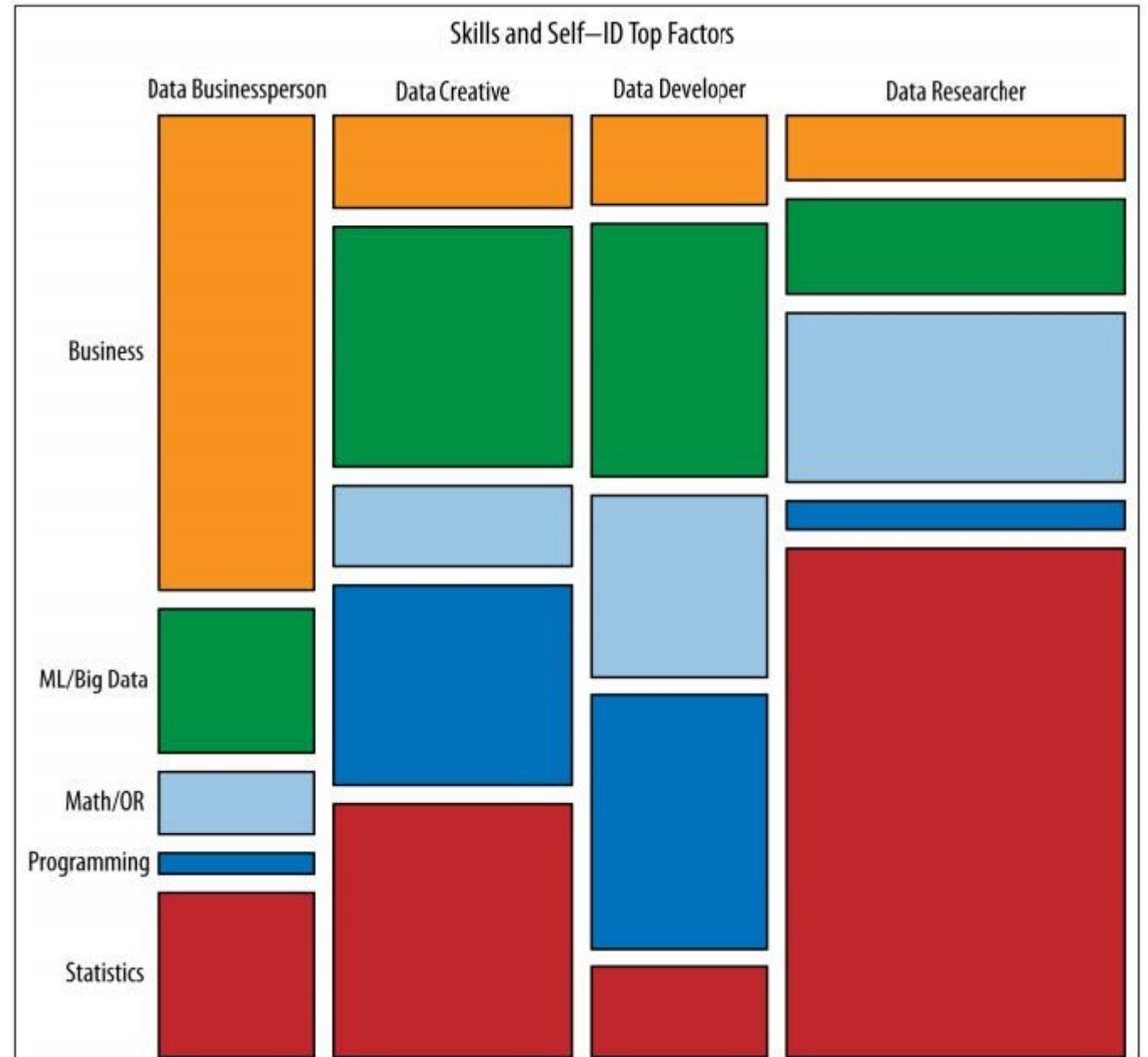
WHAT ARE THE ROLES IN DATA SCIENCE?

- Data Science involves a variety of skill sets, not just one.

Business	ML / Big Data	Math / OR	Programming	Statistics
Product Development	Unstructured Data	Optimization	Systems Administration	Visualization
Business	Structured Data	Math	Back End Programming	Temporal Statistics
	Machine Learning	Graphical Models	Front End Programming	Surveys and Marketing
	Big and Distributed Data	Bayesian / Monte Carlo Statistics		Spatial Statistics
		Algorithms		Science
		Simulation		Data Manipulation
				Classical Statistics

WHAT ARE THE ROLES IN DATA SCIENCE?

- These roles prioritize different skill sets.
- However, all roles involve some part of each skillset.
- Where are your strengths and weaknesses?



QUIZ

DATA SCIENCE BASELINE

ACTIVITY: DATA SCIENCE BASELINE QUIZ



EXERCISE

DIRECTIONS (10 minutes)

1. Form groups of three.
2. Answer the following questions.
 - a. True or False: Gender (coded male=0, female=1) is a continuous variable.
 - b. According to the table on the next slide, admit is the _____
 - i. Outcome
 - ii. Predictor
 - c. Draw a normal distribution, binomial distribution and exponential distribution
 - d. True or False: Linear regression is an unsupervised learning algorithm.

ACTIVITY: DATA SCIENCE BASELINE QUIZ



EXERCISE

	admitgre	gpa	prestige
0	380	3.61	3
1	660	3.67	3
1	800	4	1
1	640	3.19	4
0	520	2.93	4
1	760	3	2
1	560	2.98	1
0	400	3.08	2
1	540	3.39	3
0	700	3.92	2

This dataset is from a UCLA
graduate school admission college.

INTRODUCTION

THE DATA SCIENCE WORKFLOW

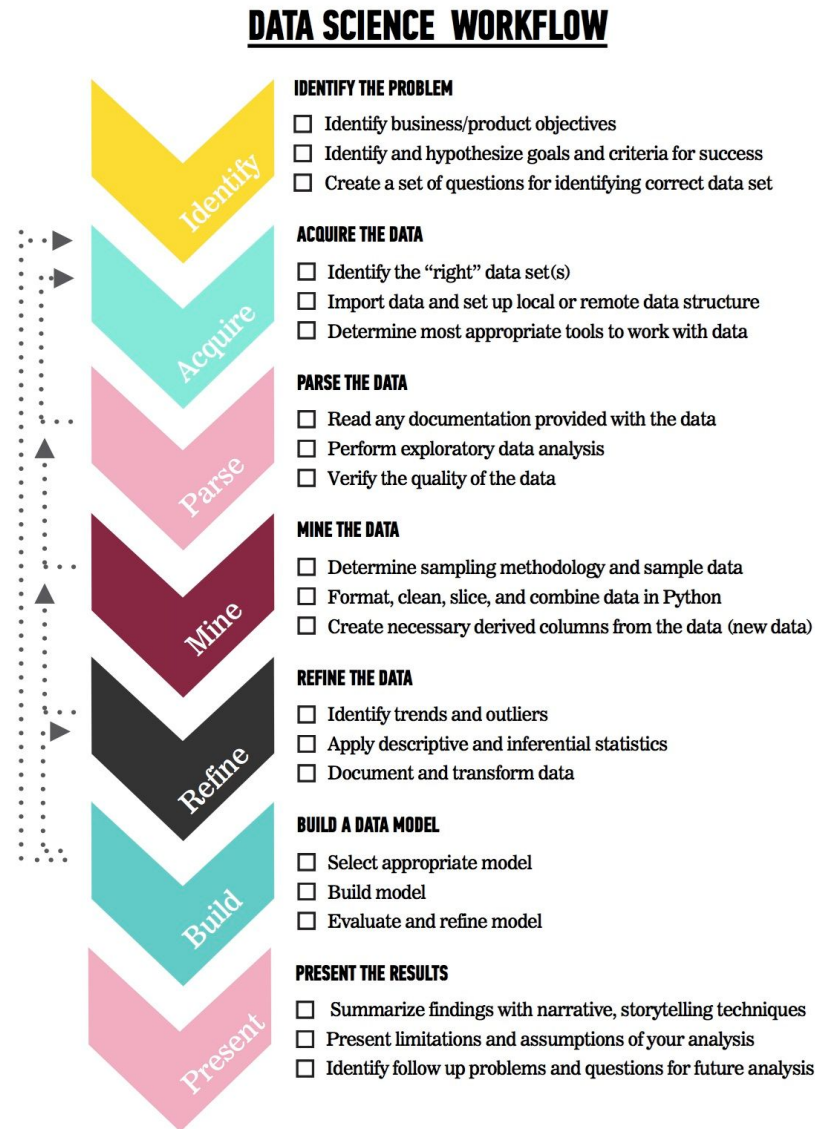
OVERVIEW OF THE DATA SCIENCE WORKFLOW

- A methodology for doing Data Science
- Similar to the scientific method
- Helps produce *reliable* and *reproducible* results
 - *Reliable*: Accurate findings
 - *Reproducible*: Others can follow your steps and get the same results

OVERVIEW OF THE DATA SCIENCE WORKFLOW

The steps:

1. Identify the problem
2. Acquire the data
3. Parse the data
4. Mine the data
5. Refine the data
6. Build a data model
7. Present the results



OVERVIEW OF THE DATA SCIENCE WORKFLOW



IDENTIFY THE PROBLEM

- ☐ Identify business/product objectives
- ☐ Identify and hypothesize goals and criteria for success
- ☐ Create a set of questions for identifying correct data set

OVERVIEW OF THE DATA SCIENCE WORKFLOW



ACQUIRE THE DATA

- ☐ Identify the “right” data set(s)
- ☐ Import data and set up local or remote data structure
- ☐ Determine most appropriate tools to work with data

OVERVIEW OF THE DATA SCIENCE WORKFLOW



PARSE THE DATA

- ☐ Read any documentation provided with the data
- ☐ Perform exploratory data analysis
- ☐ Verify the quality of the data

OVERVIEW OF THE DATA SCIENCE WORKFLOW



MINE THE DATA

- ☐ Determine sampling methodology and sample data
- ☐ Format, clean, slice, and combine data in Python
- ☐ Create necessary derived columns from the data (new data)

OVERVIEW OF THE DATA SCIENCE WORKFLOW



REFINE THE DATA

- ☐ Identify trends and outliers
- ☐ Apply descriptive and inferential statistics
- ☐ Document and transform data

OVERVIEW OF THE DATA SCIENCE WORKFLOW



BUILD A DATA MODEL

- ☐ Select appropriate model
- ☐ Build model
- ☐ Evaluate and refine model

DATA SCIENCE WORKFLOW: DATA ACQUISITION, DATA PREPROCESSING, MODEL BUILDING, MODEL EVALUATION, MODEL DEPLOYMENT

OVERVIEW OF THE DATA SCIENCE WORKFLOW



PRESENT THE RESULTS

- ☐ Summarize findings with narrative, storytelling techniques
- ☐ Present limitations and assumptions of your analysis
- ☐ Identify follow up problems and questions for future analysis

FUTURAMA EXAMPLE

- Problem Statement: “Using Planet Express customer data from January 3001-3005, determine how likely previous customers are to request a repeat delivery using demographic information (profession, company size, location) and previous delivery data (days since last delivery, number of total deliveries).”



- We can use the Data Science workflow to work through this problem.

FUTURAMA EXAMPLE: IDENTIFY THE PROBLEM

- Identify the business/product objectives.
- Identify and hypothesize goals and criteria for success.
- Create a set of questions to help you identify the correct data set.

FUTURAMA EXAMPLE: ACQUIRE THE DATA

- Ideal data vs. data that is available
- Learn about limitations of the data.
- What data is available for this example?
- What kind of questions might we want to ask about the data?

FUTURAMA EXAMPLE: ACQUIRE THE DATA

- Questions to ask about the data
 - Is there enough data?
 - Does it appropriately align with the question/problem statement?
 - Can the dataset be trusted? How was it collected?
 - Is this dataset aggregated? Can we use the aggregation or do we need to get it pre-aggregated?

FUTURAMA EXAMPLE: PARSE THE DATA

- Secondary data = we didn't directly collect it ourselves
- Example data dictionary

Variable	Description	Type of Variable
Profession	Title of the account owner	Categorical
Company Size	1- small, 2- medium, 3- large	Categorical
Location	Planet of the company	Categorical
Days Since Last Delivery	Integer	Continuous
Number of Deliveries	Integer	Continuous

FUTURAMA EXAMPLE: PARSE THE DATA

- Questions to ask while parsing
 - Is there documentation for the data? Is there a data dictionary?
 - What kind of filtering, sorting, or simple visualizations can help understand the data?
 - What information is contained in the data?
 - What data types are the variables?
 - Are there outliers? Are there trends?

FUTURAMA EXAMPLE: MINE THE DATA

- Think about sampling
- Get to know the data
- Explore outliers
- Address missing values
- Derive new variables (i.e. columns)

FUTURAMA EXAMPLE: MINE THE DATA

- Common steps while mining the data
 - Sample the data with appropriate methodology
 - Explore outliers and null values
 - Format and clean the data
 - Determine how to address missing values
 - Format and combine data; aggregate and derive new columns

FUTURAMA EXAMPLE: REFINES THE DATA

- Use statistics and visualization to identify trends
- Example of basic statistics

Variable	Mean (STD) or Frequency (%)
Number of Deliveries	50.0 (10)
Earth	50 (10%)
Amphibios 9	100 (20%)
Bogad	100 (20%)
Colgate 8	100 (20%)
Other	150 (30%)

FUTURAMA EXAMPLE: REFINE THE DATA

- Descriptive stats help refine by
 - Identifying trends and outliers
 - Deciding how to deal with outliers
 - Applying descriptive and inferential statistics
 - Determining visualization techniques for different data types
 - Transforming data

FUTURAMA EXAMPLE: CREATE A DATA MODEL

- Select a model based upon the outcome
- Example model statement: “We completed a logistic regression using Statsmodels v. XX. We calculated the probability of a customer placing another order with Planet Express.”
- Steps for model building

FUTURAMA EXAMPLE: CREATE A DATA MODEL

- The steps for model building are
 - Select the appropriate model
 - Build the model
 - Evaluate and refine the model
 - Predict outcomes and action items

FUTURAMA EXAMPLE: PRESENT THE RESULTS

- You have to effectively communicate your results for them to matter!
- Ranges from a simple email to a complex web graphic.
- Make sure to consider your audience.
- A presentation for fellow data scientists will be drastically different from a presentation for an executive.

FUTURAMA EXAMPLE: PRESENT THE RESULTS

- Key factors of a good presentation include
 - Summarize findings with narrative and storytelling techniques
 - Refine your visualizations for broader comprehension
 - Present both limitations and assumptions
 - Determine the integrity of your analyses
 - Consider the degree of disclosure for various stakeholders
 - Test and evaluate the effectiveness of your presentation beforehand

FUTURAMA EXAMPLE: PRESENT THE RESULTS

- Example presentations and infographics
 - [512 Paths to the White House](#)
 - [Who Old Are You?](#)
 - [2015 NFL Predictions](#)

GUIDED PRACTICE

DATA SCIENCE WORK FLOW

ACTIVITY: DATA SCIENCE WORKFLOW



EXERCISE

DIRECTIONS (25 minutes)

1. Divide into 4 groups, each located at a whiteboard.
2. **IDENTIFY:** Each group should develop 1 research question they would like to know about their classmates. Create a hypothesis to your question. Don't share your question yet! (5 minutes)
3. **ACQUIRE:** Rotate from group to group to collect data for your hypothesis. Have other students write or tally their answers on the whiteboard. (10 minutes)
4. **PRESENT:** Communicate the results of your analysis to the class. (10 minutes)
 - a. Create a narrative to summarize your findings.
 - b. Provide a basic visualization for easy comprehension.
 - c. Choose one student to present for the group.

DELIVERABLE

Presentation of the results

DEMO

ENVIRONMENT SETUP

DEV ENVIRONMENT SETUP

- Brief intro of tools
- Environment setup
 - Create a Github account
 - Install Python 2.7 and Anaconda
 - Practice Python syntax, Terminal commands, and Pandas
- iPython Notebook test and Python review

DEV ENVIRONMENT SETUP

- Test your new setup using the lesson 1 starter code available at <https://github.com/ga-students/DAT-NYC-9-27/blob/master/lessons/lesson-01/code/starter-code/starter-code-1.ipynb> in the Github repo
- Ask your classmates and instructor for help if you have problems!

CONCLUSION

REVIEW

CONCLUSION

- You should now be able to answer the following questions:
 - What is Data Science?
 - What is the Data Science workflow?
 - How can you have a successful learning experience at GA?

DATA SCIENCE

BEFORE NEXT CLASS

BEFORE NEXT CLASS

DUE DATE

- Project: Begin work on Project 1

WELCOME TO DATA SCIENCE

Q & A

WELCOME TO DATA SCIENCE

EXIT TICKET

DON'T FORGET TO FILL OUT YOUR EXIT TICKET