WELCOME TO GA!

ORIENTATION

MEET YOUR INSTRUCTORS

ABOUT ME

- PhD in EE (learning and control in systems with uncertainty), MS in Statistics
- Researcher at IBM Watson
- Chief Technology Officer at a Data Science Healthcare startup
- Love to travel, hike and take photos

Hi!

STUDENT SERVICES

StudentServicesLA@generalassemb.ly

STUDENT-FACING SUPPORT

PAYMENTS + LOGISTICS

CAMPUS + TOOLS

COURSE COMPLETION STATUS

ABOUT GENERAL ASSEMBLY

GENERAL ASSEMBLY'S MISSION IS TO BUILD OUR COMMUNITY BY TRANSFORMING MILLIONS OF THINKERS INTO CREATORS.

GENERAL ASSEMBLY IS A GLOBAL COMMUNITY OF INDIVIDUALS EMPOWERED TO PURSUE THE WORK WE LOVE.

ALL YOU CAN LEARN BUFFET

CLASSES & WORKSHOPS

Supplement and focus your learning during and after the course with a $150 credit for 1 year from your start date

STUDENT DISCOUNTS

Our students and alumni get free or discounted access to software and services from many vendors

GA COMMUNITY

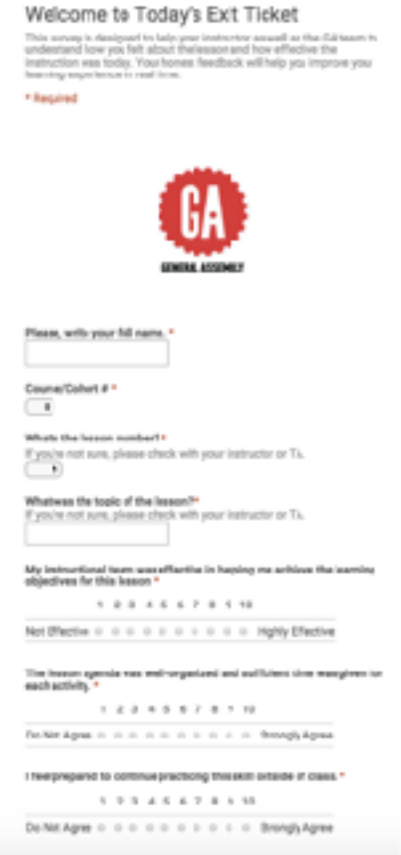
Expand your network at GA events, Meet-ups, and continue to collaborate and network with your classmates

TOOLS

FEEDBACK / SUPPORT

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

Exit Tickets



Welcome to Today's Exit Ticket

This survey is designed to help your instructor as well as the GA team to understand how you felt about thelesson and how effective the instruction was today. Your honest feedback will help you improve your learning experience in real time.

* Required

GENERAL ASSEMBLY

Please, write your full name. *

Course/Cohort # *

What's the lesson number? *

If you're not sure, please check with your instructor or TA.

What was the topic of the lesson?*

If you're not sure, please check with your instructor or TA.

My instructional team was effective in helping me achieve the learning objectives for this lesson *

	1	2	3	4	5	6	7	8	9	10	
Not Effective	○	○	○	○	○	○	○	○	○	○	Highly Effective

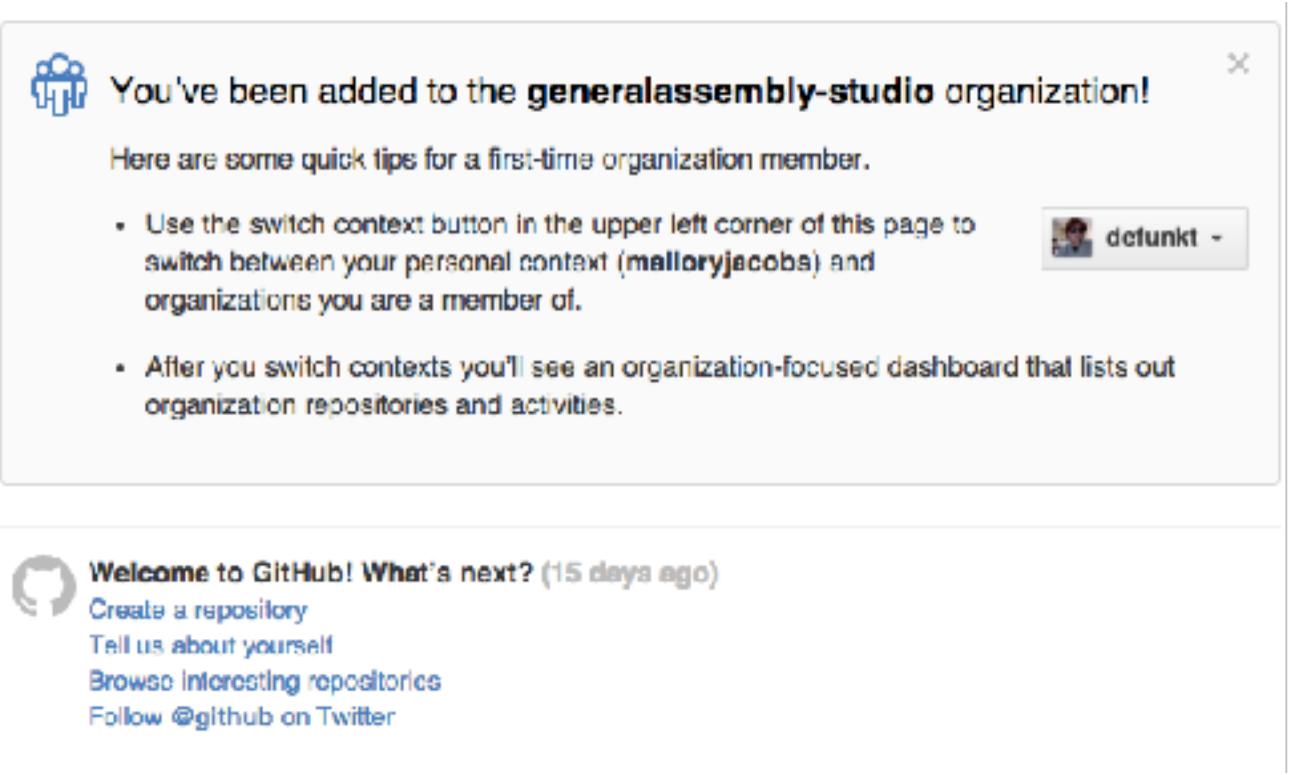
The lesson agenda was well-organized and sufficient time was given for each activity. *

	1	2	3	4	5	6	7	8	9	10	
Do Not Agree	○	○	○	○	○	○	○	○	○	○	Strongly Agree

I feel prepared to continue practicing this skill outside of class. *

	1	2	3	4	5	6	7	8	9	10	
Do Not Agree	○	○	○	○	○	○	○	○	○	○	Strongly Agree

GitHub



You've been added to the **generalassembly-studio** organization!

Here are some quick tips for a first-time organization member.

- Use the switch context button in the upper left corner of this page to switch between your personal context (**malloryjacobs**) and organizations you are a member of.
- After you switch contexts you'll see an organization-focused dashboard that lists out organization repositories and activities.

Welcome to GitHub! What's next? (15 days ago)

Create a repository

Tell us about yourself

Browse interesting repositories

Follow @github on Twitter

Slack

#dat-sm-18

FEWD 19

CHANNELS

general
instructors
random

DIRECT MESSAGES

#general

April 21st

ira_herman

```
// Initial Count of ToDo items
var count = 3;
```

ira_herman

First add listener

IFTTT

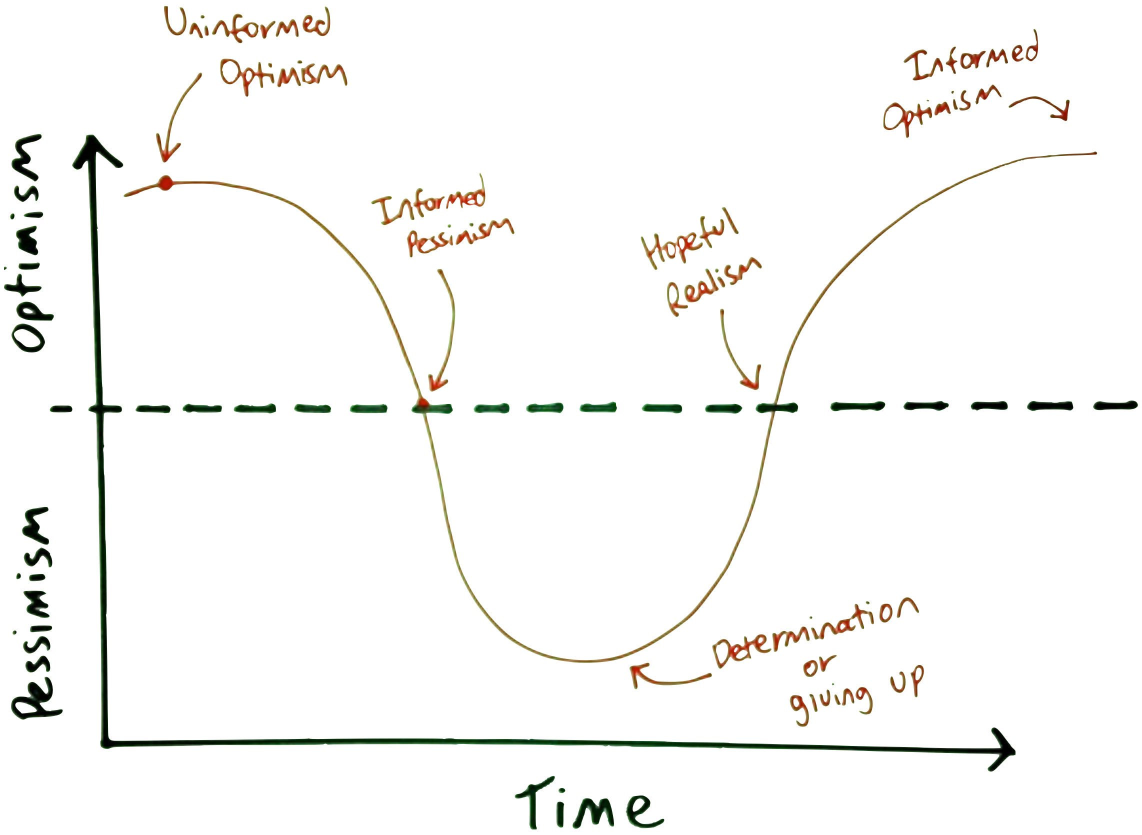
Welcome to Today's Exit Ticket

This survey is designed to help your instructor as well as the GA team to understand how you felt about the lesson and how effective the instruction was today. Your honest feedback will help you improve your learning experience in real time.

Slack preferred over email for quick questions

ROAD TO SUCCESS

EMOTIONAL CYCLE OF CHANGE

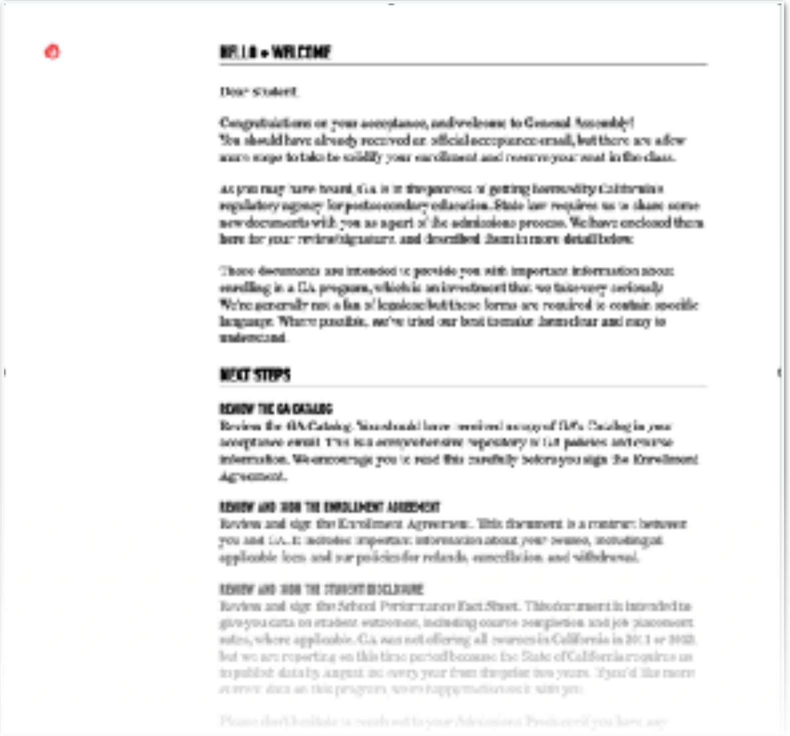


Don’t Forget

Have you signed your enrollment agreement?

GA Catalog:

✓Attendance Policy
✓Cancellation/Withdrawal
✓Tuition Payments
✓Homework + Projects (80%)
✓Letter of Completion



HELLO + WELCOME

Dear Student,

Congratulations on your acceptance, and welcome to General Assembly! You should have already received an official acceptance email, but there are a few more steps to take to solidify your enrollment and reserve your seat in the class.

As you may have heard, GA is in the process of getting licensed by California's regulatory agency for postsecondary education. State law requires us to share some new documents with you as a part of the admissions process. We have enclosed them here for your review/signature, and described them in more detail below.

These documents are intended to provide you with important information about enrolling in a GA program, which is an investment that we take very seriously. We're generally not a fan of legalese, but these forms are required to contain specific language. Where possible, we've tried our best to make them clear and easy to understand.

NEXT STEPS

REVIEW THE GA CATALOG
Review the GA Catalog. You should have received a copy of GA's Catalog in your acceptance email. This is a comprehensive repository of GA policies and course information. We encourage you to read this carefully before you sign the Enrollment Agreement.

REVIEW AND SIGN THE ENROLLMENT AGREEMENT
Review and sign the Enrollment Agreement. This document is a contract between you and GA. It includes important information about your course, including all applicable fees and our policies for refunds, cancellation, and withdrawal.

REVIEW AND SIGN THE STUDENT DISCLOSURE
Review and sign the School Performance Fact Sheet. This document is intended to give you data on student outcomes, including course completion and job placement rates, where applicable. GA was not offering all courses in California in 2011 or 2012, but we are reporting on this time period because the State of California requires us to publish data by August 1st every year from the prior two years. If you'd like more current data on this program, we're happy to discuss it with you.

Please don't hesitate to reach out to your Admissions Producer if you have any

GA Graduation Requirements

ASSIGNMENTS

(COMPLETE 80% OF WORK/LABS)

ATTENDANCE

(MISS NO MORE THAN 2 CLASSES)

FINAL PROJECT

COMMUNITY ENGAGEMENT

PARTICIPATION + FEEDBACK

Our Grads

BUILD YOUR NETWORK

It’s not just about altruism, your network is your most valuable asset. Alumni have started companies together and recruited other alumni to join their teams

ACCESS TO OUR ALUMNI COMMUNITY

You’re part of the alumni community forever

OFFICIAL LETTER OF COMPLETION

Sent to your inbox via email after the course is completed. *important if you’re being reimbursed by your business

PERKS!

DISCOUNTS OFF CLASSES AND WORKSHOPS, TUITION CREDIT

We can’t wait to have you back on campus

HOW TO SUCCEED

- Ask
- Share
- Do
- Do
- Do

ASK AWAY!

GENERAL ASSEMBLY

WELCOME TO DATA SCIENCE

Naumaan Nayyar

Chief Technology Officer, Vivace Systems

INTRODUCTIONS

INTRODUCTIONS

- Who are you?
- Tell us about yourself
- Share your professional experiences
- What do you expect to get out of this course?

LEARNING OBJECTIVES

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

DATA SCIENCE

PRE-WORK

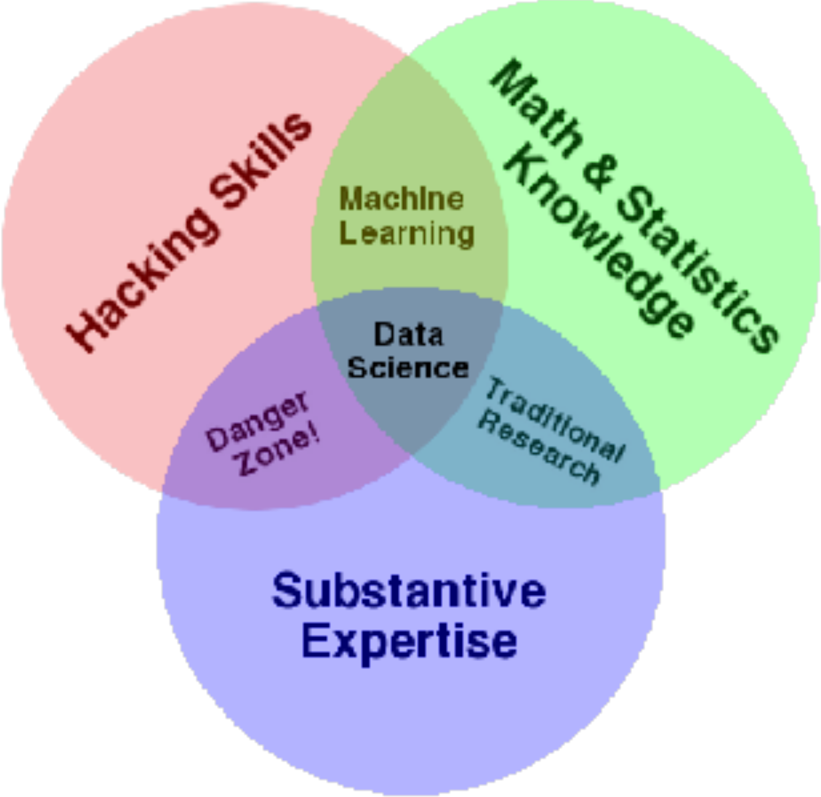
PRE-WORK REVIEW

- 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

WHAT IS DATA SCIENCE?

WHAT IS DATA SCIENCE?

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



WHAT IS DATA SCIENCE?

- Data Science
- Software Engineering
- Machine Learning (or Statistics… ?)

"…better statisticians than your average programmer and they're better programmers than your average statistician"

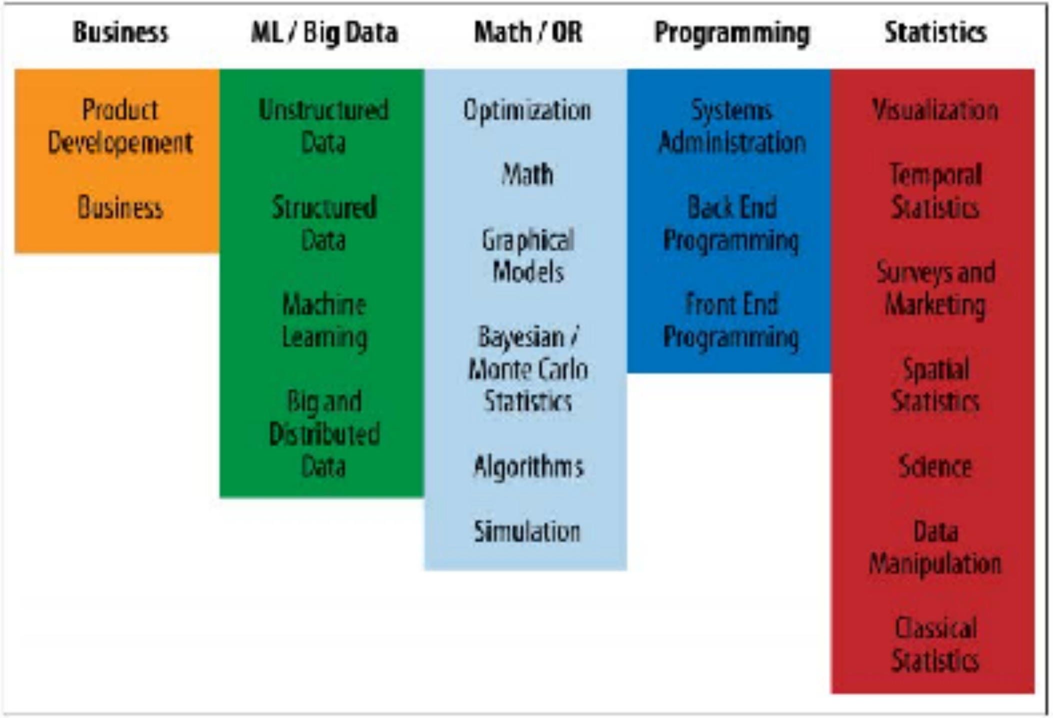
WHO USES DATA SCIENCE?

WHO USES DATA SCIENCE?

- How does your company or industry use data science?

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 Developement	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

QUIZ

DATA SCIENCE BASELINE

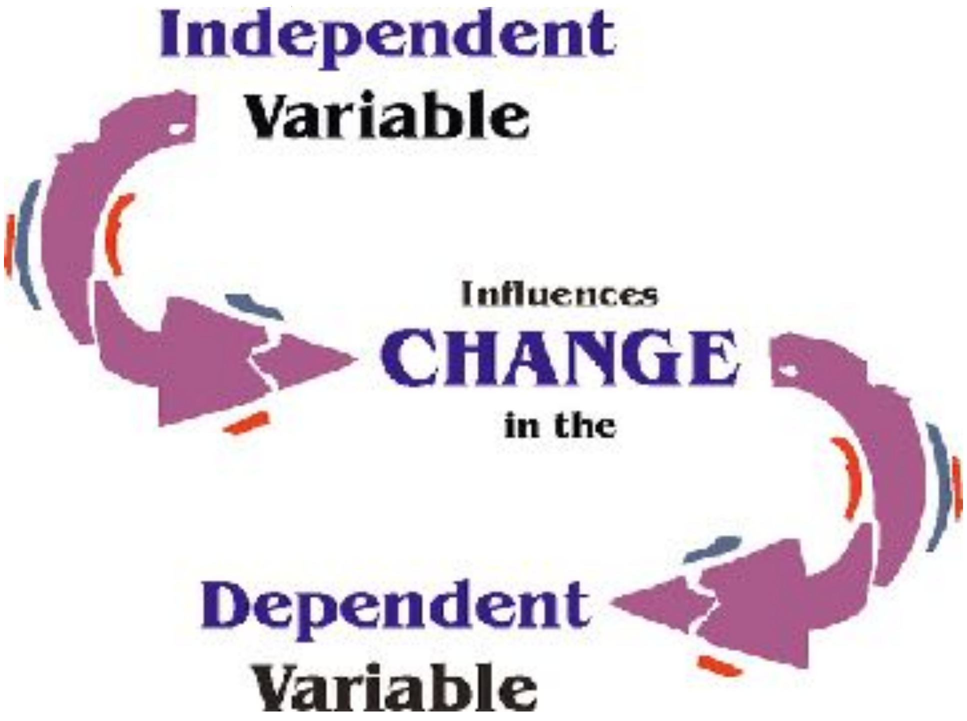
ACTIVITY: DATA SCIENCE BASELINE QUIZ

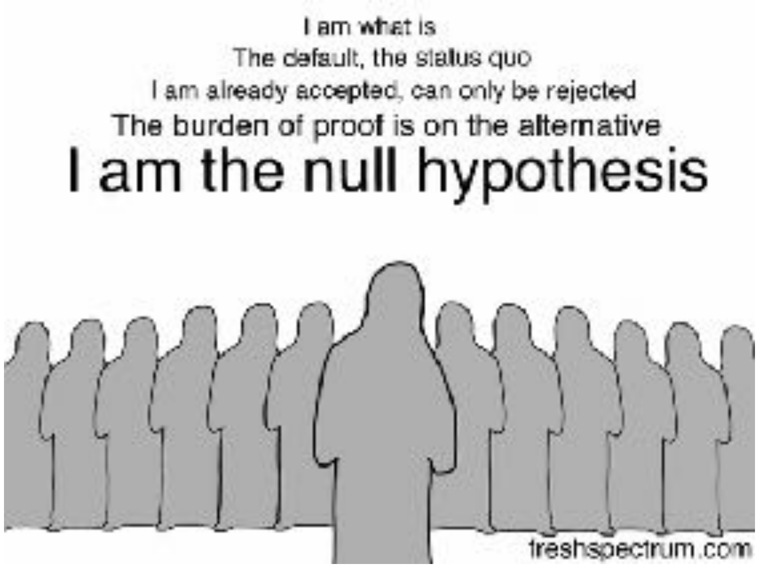
EXERCISE

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. Define the following:
        i. Independent variable (Predictor)
        ii. Dependent variable (Outcome)
        iii. Covariate
    c. Draw a normal distribution
    d. True or False: Linear regression is an unsupervised learning algorithm.
    e. What is a hypothesis test?

ACTIVITY: DATA SCIENCE BASELINE QUIZ




I am what is
The default, the status quo
I am already accepted, can only be rejected
The burden of proof is on the alternative
I am the null hypothesis
freshspectrum.com

EXAMPLE

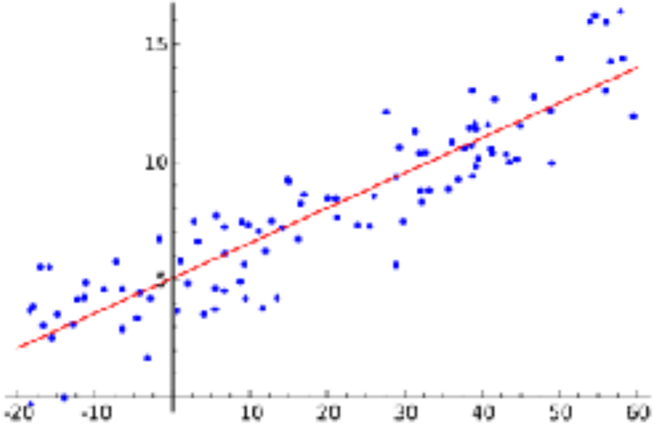
THINGS YOU WILL BE ABLE TO DO

SIMPLE LINEAR REGRESSION

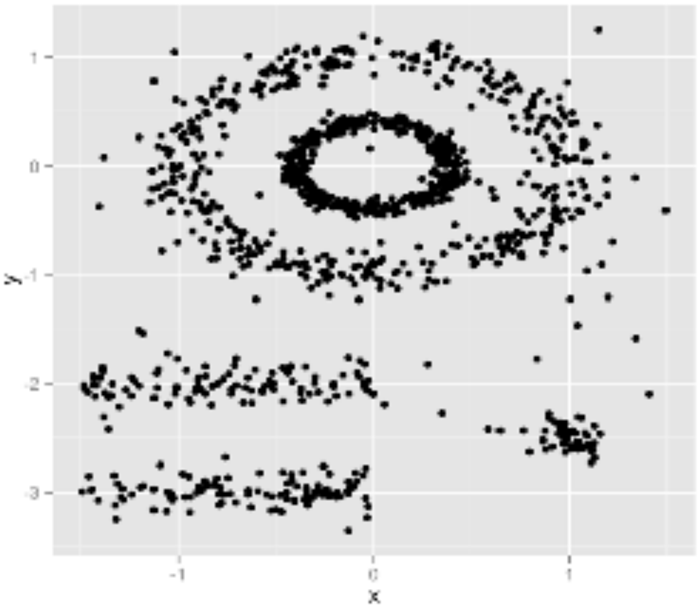
- Def: Explanation of a continuous variable given a series of independent variables

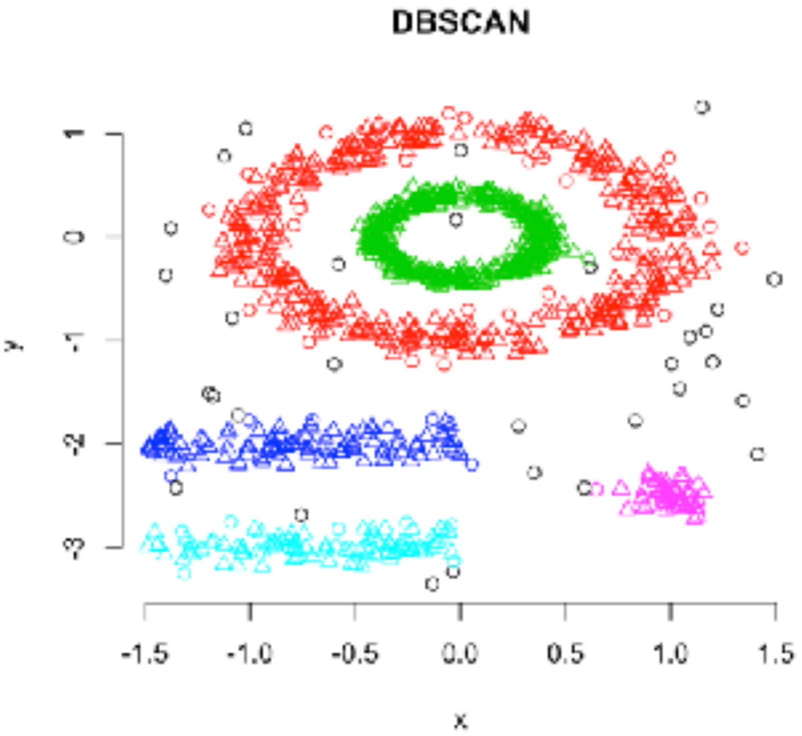
- The simplest version is just a line of best fit: $y = mx + b$

- Explain the relationship between **x** and **y** using the starting point **b** and the power in explanation **m**.



CLUSTERING: Density-Based





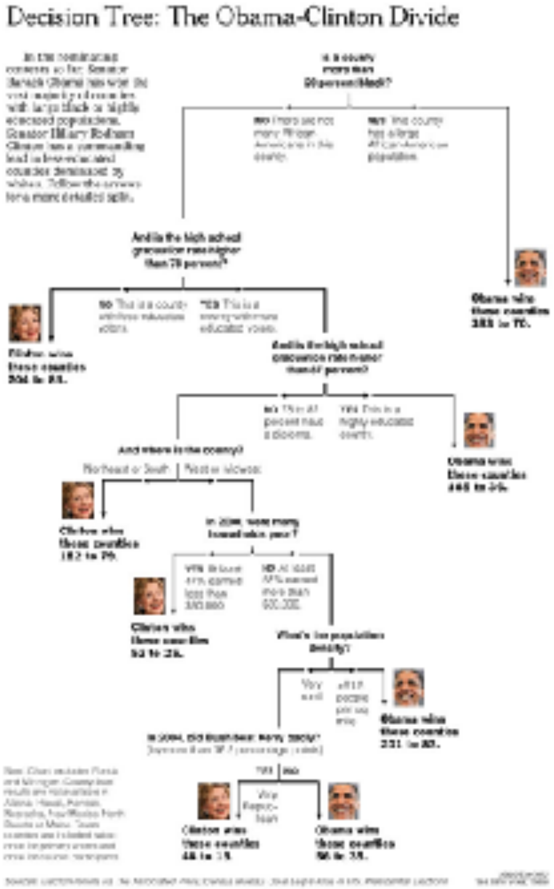
Source: http://www.sthda.com/english/wiki/dbscan-density-based-clustering-for-discovering-clusters-in-large-datasets-with-noise-unsupervised-machine-learning

INTUITION BEHIND DECISION TREES

- Decision trees are like the game “20 questions”. They make decision by answering a series of questions, most often binary questions (yes or no).

- We want the smallest set of questions to get to the right answer.

- Each questions should reduce the search space as much as possible.



Decision Tree: The Obama-Clinton Divide

And where is the county?
Northeast or South
West or Midwest
Clinton wins these counties
Obama wins these counties
What's the population density?
YES
NO

INTRODUCTION

THE DATA SCIENCE WORKFLOW

OVERVIEW OF THE DATA SCIENCE WORKFLOW

- A methodology for doing Data Science
- Similar to the scientific method
- Helps produce ? and ? results

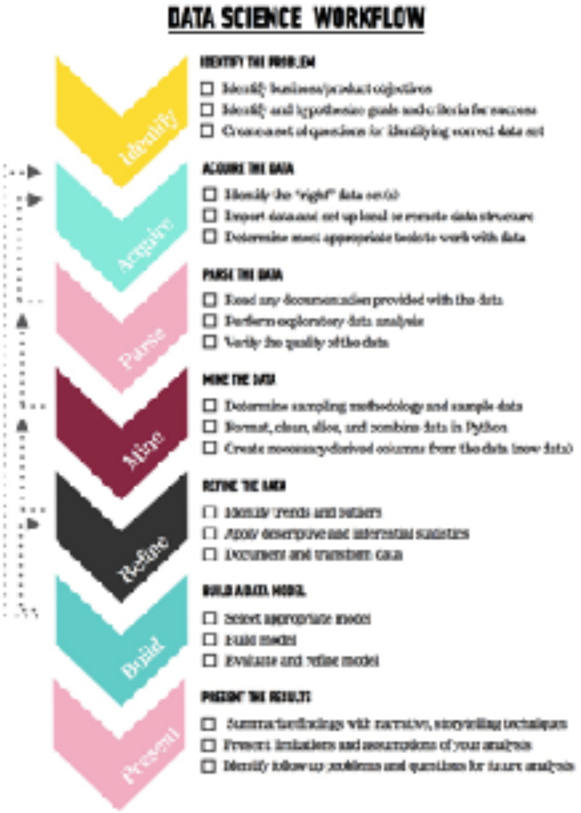
OVERVIEW OF THE DATA SCIENCE WORKFLOW

- 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



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

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

PARSE THE DATA

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

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)

REFINE THE DATA

□ Identify trends and outliers
□ Apply descriptive and inferential statistics
□ Document and transform data

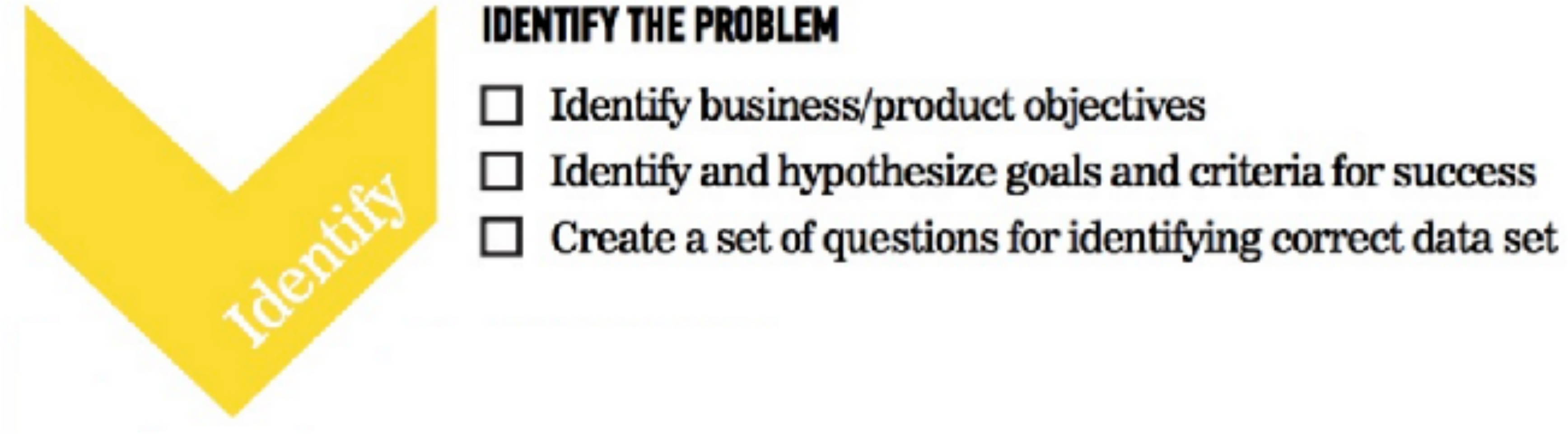
BUILD A DATA MODEL

□ Select appropriate model
□ Build model
□ Evaluate and refine model

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

OVERVIEW OF THE DATA SCIENCE WORKFLOW



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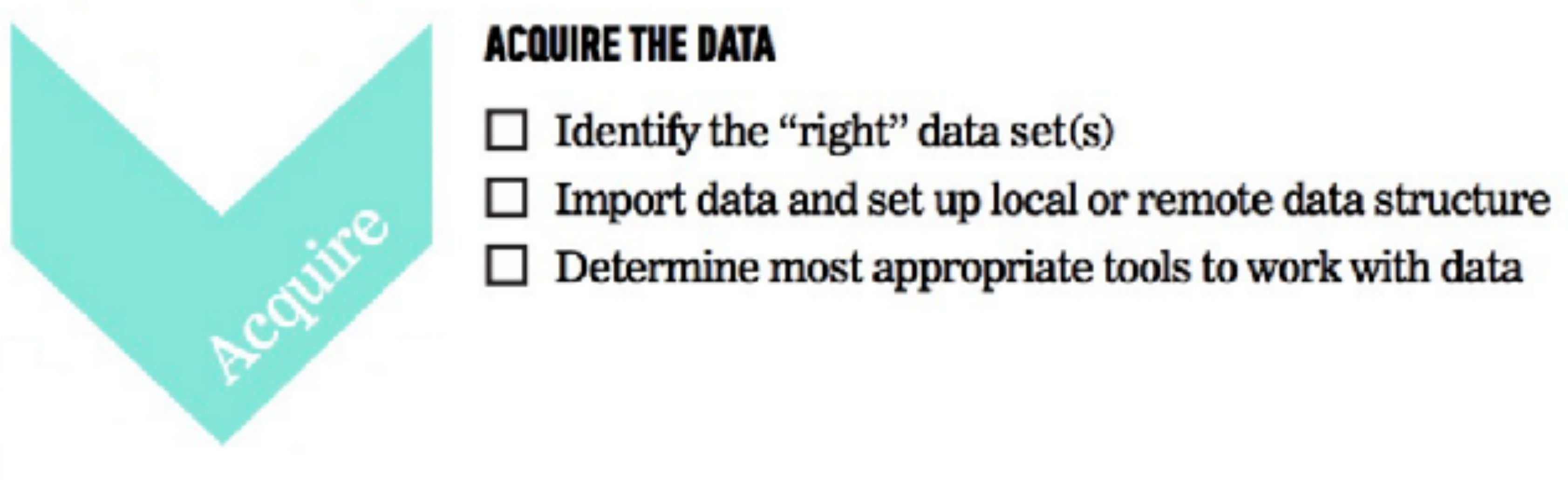
OVERVIEW OF THE DATA SCIENCE WORKFLOW



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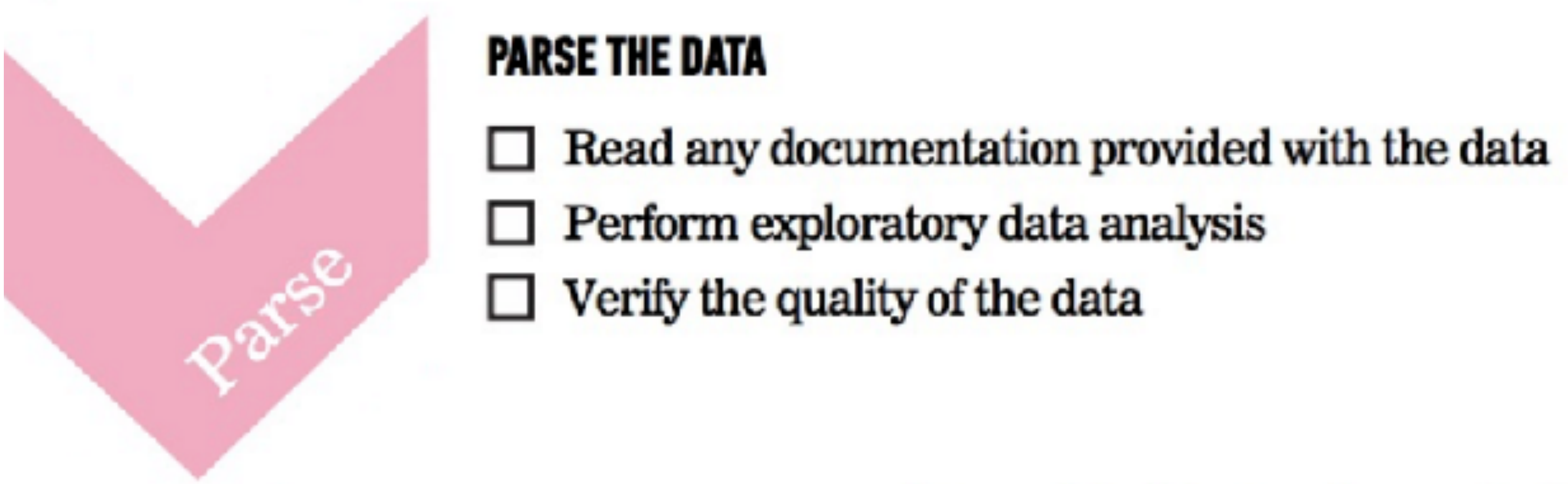
OVERVIEW OF THE DATA SCIENCE WORKFLOW



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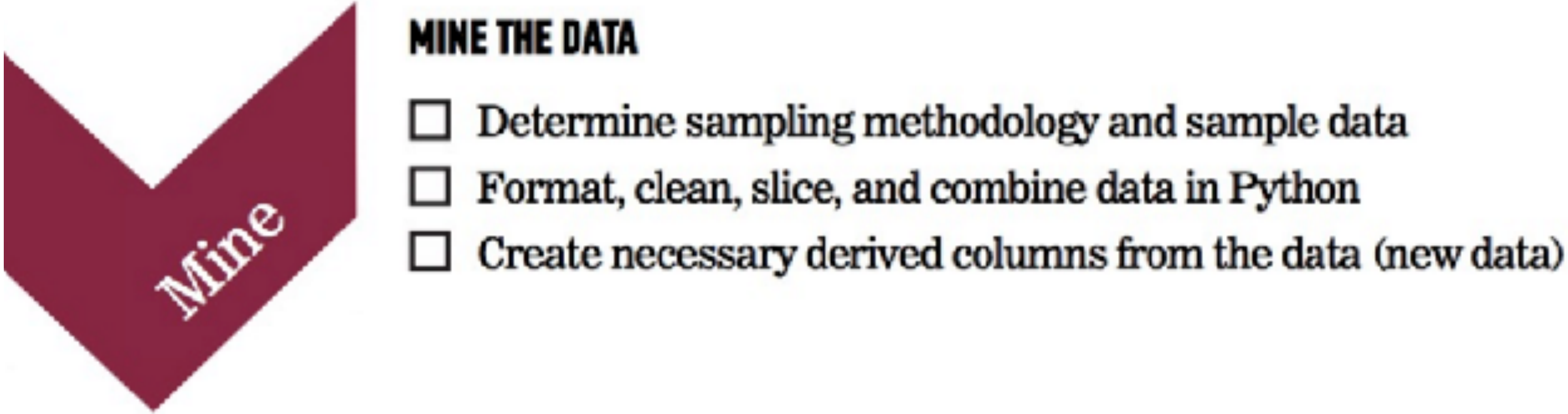
OVERVIEW OF THE DATA SCIENCE WORKFLOW



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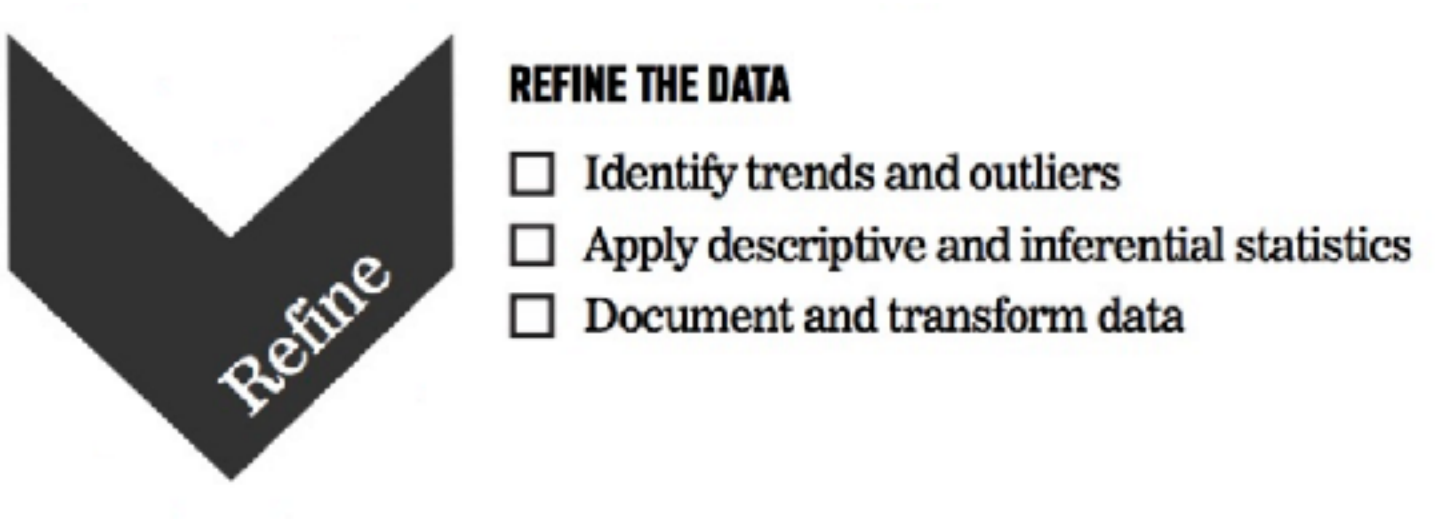
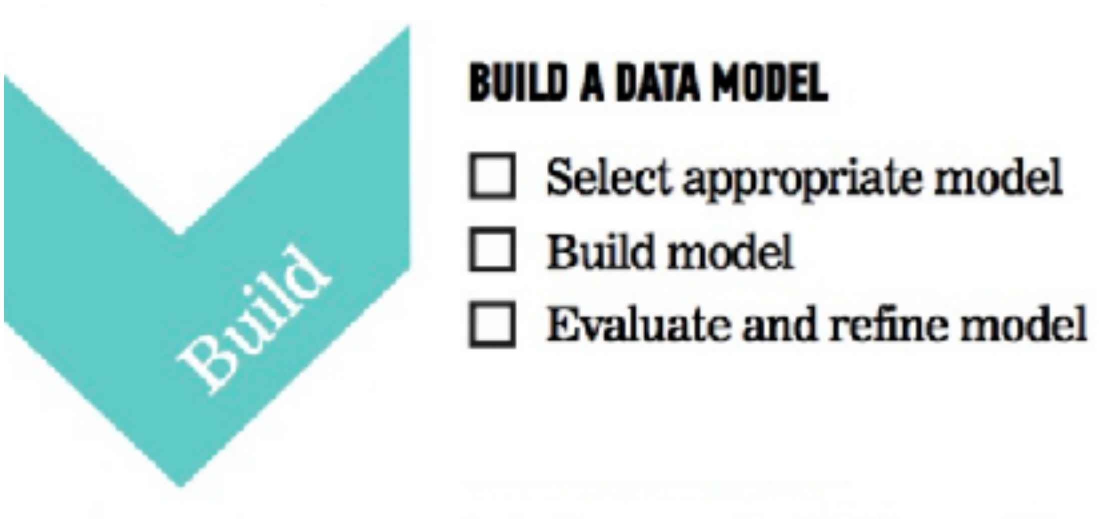
OVERVIEW OF THE DATA SCIENCE WORKFLOW



REFINE THE DATA

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

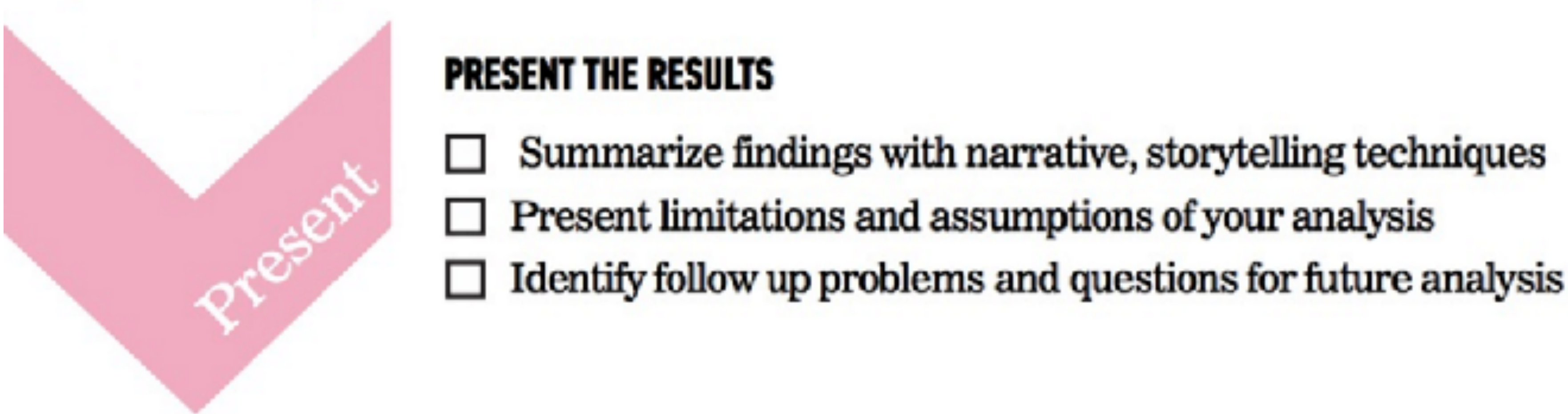
OVERVIEW OF THE DATA SCIENCE WORKFLOW



BUILD A DATA MODEL

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

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: REFINE 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 (TIME PERMITTING)

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 /*lessons*/*lesson-01*/*code*/*starter-code*/ 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?

BEFORE NEXT CLASS

BEFORE NEXT CLASS

- Complete Learn Python the Hard Way through Exercise 35, or as far as you have time
    - Remember the Python syntax for lists, dictionaries, and functions

- Create files and navigate through the CLI. GA Tutorial

- Go through Learn Pandas (up to Lesson 3)

RESOURCES

- Python quick reference
- Probability and Statistics refresher

Q & A

EXIT TICKET

DON’T FORGET TO FILL OUT YOUR EXIT TICKET