Advanced
Big Data Analytics

Agenda

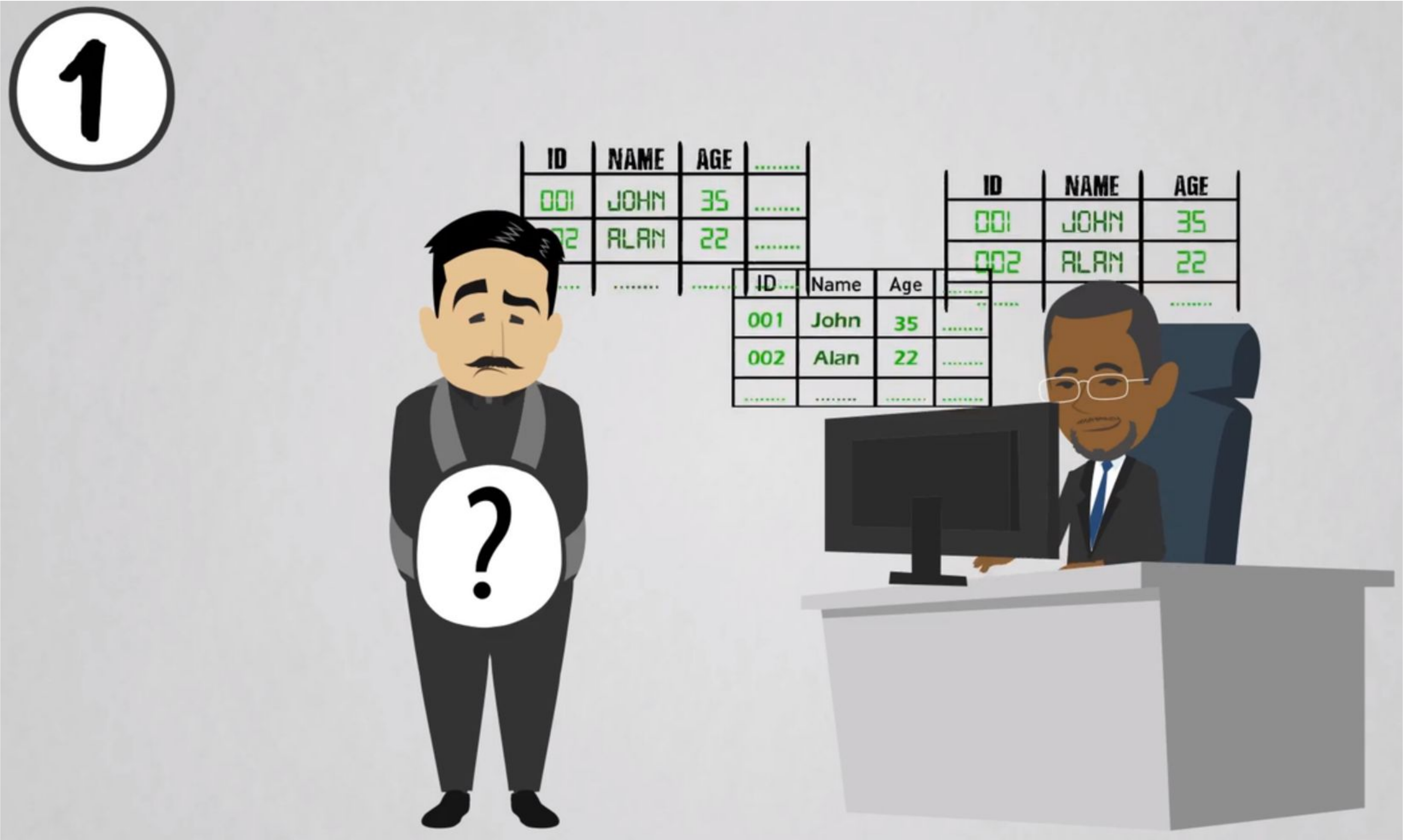
1. Approach a Business Task
2. Different Viewpoints
   - ○ Data Analysis Process (Udacity)
   - ○ Data Analytics Life Cycle (EMC2)
   - ○ Data Analysis Life Cycle (Google)
   - ○ Data Analysis Process (Role of Looker)
3. Data Science Confusions
4. Questions

Approach a Business Task

Scenario 1

The boss

- has read the reports/dashboards
- want you to make some predictions for the firm's outgoing costs over the next year



Scenario 1

The logical way to approach this problem is to:

- ○ gather some relevant data
- ○ then prepare it for analysis

Scenario 2

The boss says

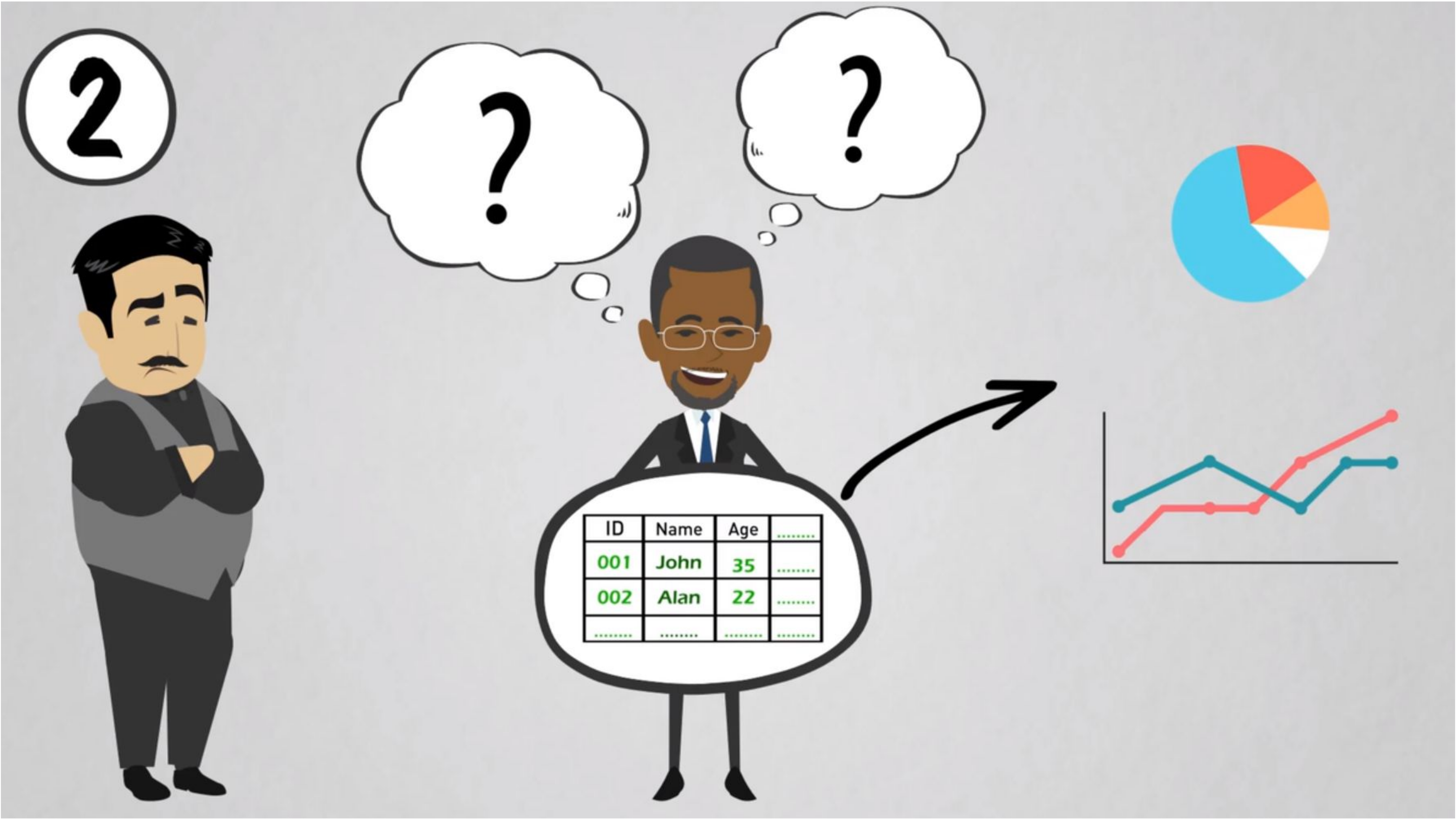
- We have an enormous amount of data
- We don’t know what we could do with it but it must be useful
- Can you do something with it, such as:
    - Tell us how we could increase our profit for next year

ID	Name	Age	....
001	John	35	....
002	Alan	22	....
....	....	....	....

Scenario 2

In this case

- Having the dataset is the starting point
- You don't need to collect data to answer a business question
- You can analyse it and apply different analytics tools to extract insights and make forecasts



ID	Name	Age	....
001	John	35	....
002	Alan	22	....
....	....	....	....

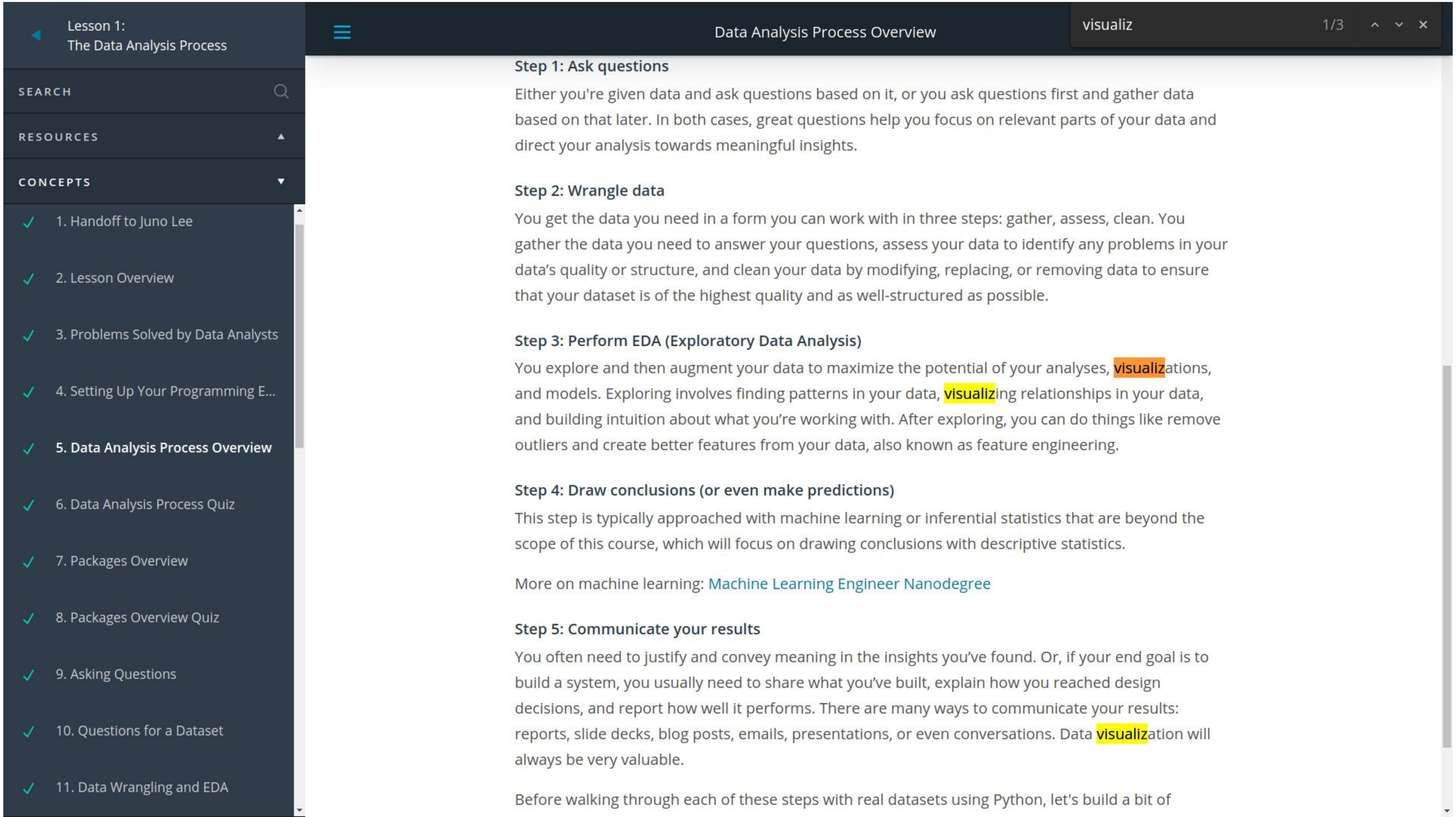
In both Scenario 1 & Scenario 2

- The solution to any task begins with having a proper dataset
- This must be first on the to-do list
- Only then, we can proceed with
  - further analysis
  - and forecasting

Different Viewpoints

Data Analysis Process

Data Analysis Process (From Udacity Nanodegree)


Lesson 1:
The Data Analysis Process
SEARCH
RESOURCES
CONCEPTS
✓ 1. Handoff to Juno Lee
✓ 2. Lesson Overview
✓ 3. Problems Solved by Data Analysts
✓ 4. Setting Up Your Programming E...
✓ 5. Data Analysis Process Overview
✓ 6. Data Analysis Process Quiz
✓ 7. Packages Overview
✓ 8. Packages Overview Quiz
✓ 9. Asking Questions
✓ 10. Questions for a Dataset
✓ 11. Data Wrangling and EDA
Data Analysis Process Overview
visualiz
1/3

Step 1: Ask questions

Either you're given data and ask questions based on it, or you ask questions first and gather data based on that later. In both cases, great questions help you focus on relevant parts of your data and direct your analysis towards meaningful insights.

Step 2: Wrangle data

You get the data you need in a form you can work with in three steps: gather, assess, clean. You gather the data you need to answer your questions, assess your data to identify any problems in your data's quality or structure, and clean your data by modifying, replacing, or removing data to ensure that your dataset is of the highest quality and as well-structured as possible.

Step 3: Perform EDA (Exploratory Data Analysis)

You explore and then augment your data to maximize the potential of your analyses, visualizations, and models. Exploring involves finding patterns in your data, visualizing relationships in your data, and building intuition about what you're working with. After exploring, you can do things like remove outliers and create better features from your data, also known as feature engineering.

Step 4: Draw conclusions (or even make predictions)

This step is typically approached with machine learning or inferential statistics that are beyond the scope of this course, which will focus on drawing conclusions with descriptive statistics.

More on machine learning: Machine Learning Engineer Nanodegree

Step 5: Communicate your results

You often need to justify and convey meaning in the insights you've found. Or, if your end goal is to build a system, you usually need to share what you've built, explain how you reached design decisions, and report how well it performs. There are many ways to communicate your results: reports, slide decks, blog posts, emails, presentations, or even conversations. Data visualization will always be very valuable.

Before walking through each of these steps with real datasets using Python, let's build a bit of

Data Analysis Process (From Udacity Nanodegree)

1. **Question**
2. **Wrangle**
3. **Explore**
4. **Draw Conclusions**
5. **Communicate**

Data Analysis Process (From Udacity Nanodegree)

Step 1: Ask Questions

- ○ Given data then ask questions, or
- ○ Ask questions then **gather** data

Step 2: Wrangle Data

a. **Gather** data to answer question

b. **Assess** data to identify any problems in your data’s quality or structure

c. **Clean** data by modifying, replacing, or removing data

Data Analysis Process (From Udacity Nanodegree)

Step 3: Perform Exploratory Data Analysis (EDA)

- **Explore then augment** data to maximize the potential of:
  - analyses & visualizations & models
- **Exploring** involves:
  - finding **patterns** in data
  - **visualizing** relationships in data
  - building **intuition** about what you’re working with
- **After Exploring** (**optional**)
  - **Remove Outliers:**
  - **Feature Engineering:** create better features from data

Data Analysis Process (From Udacity Nanodegree)

Step 4: Draw Conclusions (or even make **predictions**)

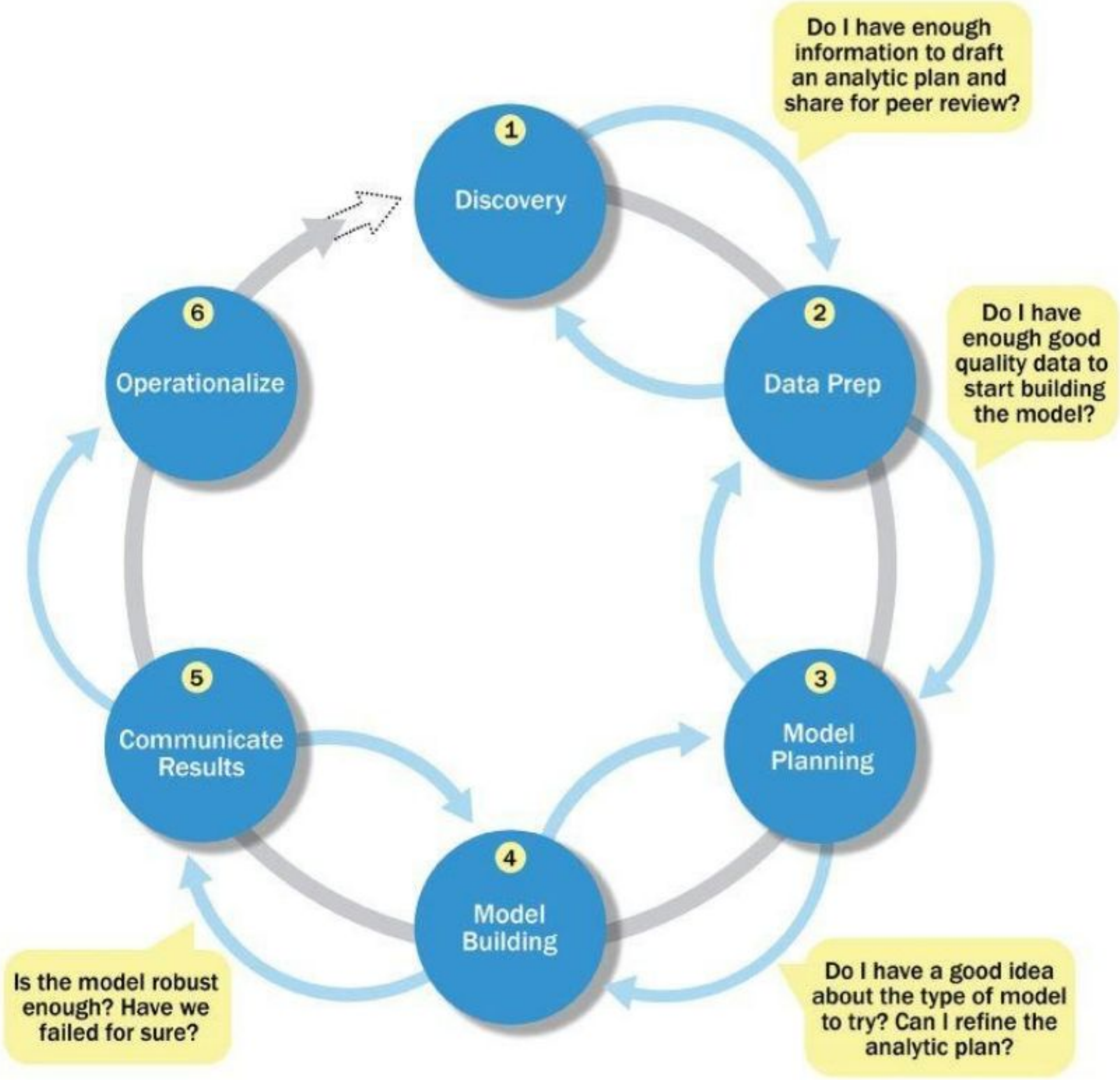
- typically approached with **inferential statistics** or **ML**

Step 5: Communicate Results

- often need to **justify** and **convey** meaning in the insights
- if your end goal is to build a system, you usually need to:
  - **share** what you’ve built
  - **explain** how you reached design decisions
  - **report** how well it performs
- communicate results by: report | slides | presentation | post | email | conversation
- **Data Visualization** will always be very valuable

Data Analytics Life Cycle

Data Analytics Life Cycle (from EMC2)



Do I have enough information to draft an analytic plan and share for peer review?

Do I have enough good quality data to start building the model?

Do I have a good idea about the type of model to try? Can I refine the analytic plan?

Is the model robust enough? Have we failed for sure?

Data Analytics Life Cycle (from EMC2)

Phase 1: Discovery

- team **learns** the **business** domain
- team **assesses** the **resources** available to support the project
- **framing** the **business problem** as an **analytics challenge**
- **formulating** initial **hypotheses** to test and begin learning the data.

Data Analytics Life Cycle (from EMC2)

Phase 2: Data Preparation

- presence of an **analytic sandbox**
- Execute ELT or ETL to get data into the **sandbox**
  - Extract, Transform and Load (**ETL**)
  - Extract, Load, and Transform (**ELT**)
  - Data should be **transformed** so the team can work with it and analyze it
- team also needs to familiarize itself with the data thoroughly

- team may perform data **visualizations** to help understand the data,
  - including its trends, outliers, and relationships among data variables

Data Analytics Life Cycle (from EMC2)

Phase 3: Model Planning

- team **determines** the **methods**, **techniques**, and **workflow** it intends to follow
- team **explores** the **data** to learn about the relationships between variables

- Objective of the **data exploration** in this phase
  - understand relationships among variables to inform selection of the variables
  - A common way to conduct this step is to perform data **visualizations**

Phase 4: Model Building

- team **develops datasets** for testing, training, and production purposes
- team **builds/executes models** based on the work done in Model Planning
- team **considers** whether its existing **tools** will suffice for running the models

Data Analytics Life Cycle (from EMC2)

Phase 5: Communicate Results

- team **determines** if the **results** of the project are a **success** or a failure
- team **identify** key **findings**
- team **quantify** the **business value**
- team **develop** a **narrative** to summarize and convey findings to stakeholders

- The deliverable of this phase will be the **most visible** portion of the process to the outside stakeholders and sponsors

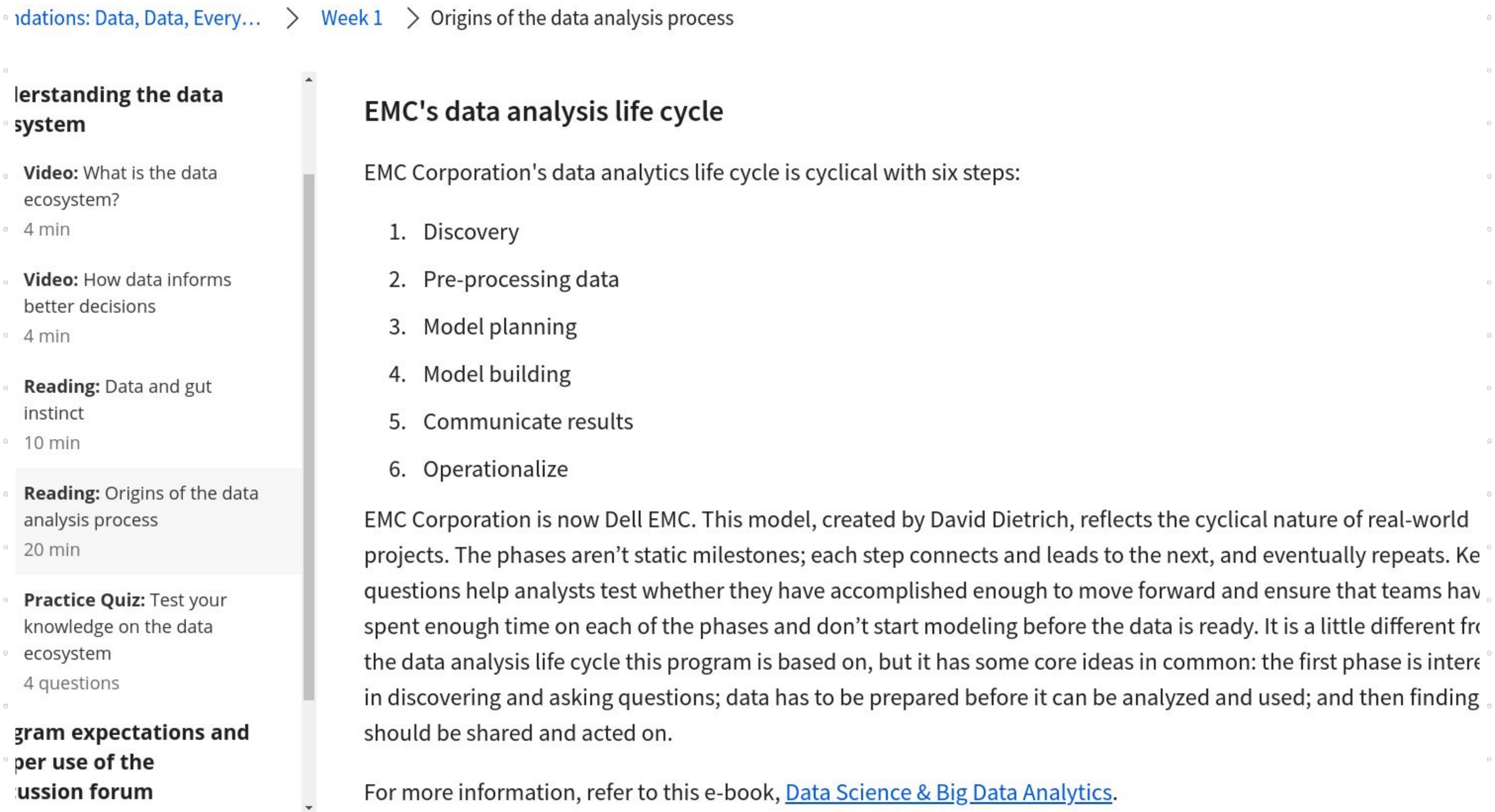
Data Analytics Life Cycle (from EMC2)

Phase 6: Operationalize

- team **delivers** final reports, briefings, code, and technical documents
- team may **run** a **pilot** project to implement the models in production

- Presentation for project sponsors:
  - contains high-level takeaways for executive level stakeholders,
  - with a few key messages to aid their decision-making process.
  - Focus on clean/easy **visuals** for presenter to explain and for the viewer to grasp
- Use imagery or data **visualization** when possible.
  - Although it may take more time to develop imagery,
  - people remember mental pictures to demonstrate a point more than long lists

Data Analytics Life Cycle (from EMC2 in Coursera)



ıdations: Data, Data, Every… > Week 1 > Origins of the data analysis process

lerstanding the data system

Video: What is the data ecosystem?
4 min

Video: How data informs better decisions
4 min

Reading: Data and gut instinct
10 min

Reading: Origins of the data analysis process
20 min

Practice Quiz: Test your knowledge on the data ecosystem
4 questions

gram expectations and per use of the ussion forum

EMC's data analysis life cycle

EMC Corporation's data analytics life cycle is cyclical with six steps:

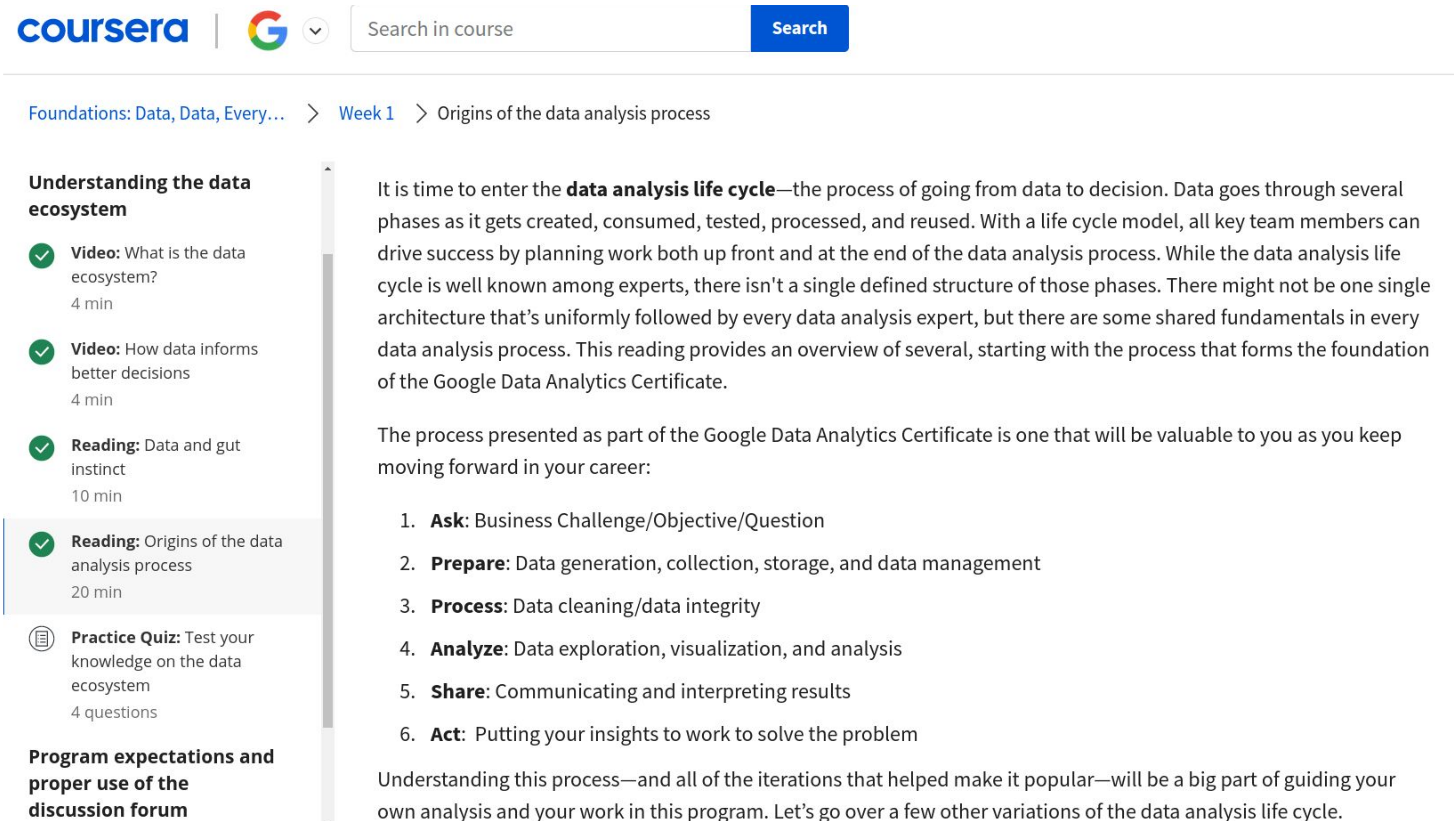
1. Discovery
2. Pre-processing data
3. Model planning
4. Model building
5. Communicate results
6. Operationalize

EMC Corporation is now Dell EMC. This model, created by David Dietrich, reflects the cyclical nature of real-world projects. The phases aren't static milestones; each step connects and leads to the next, and eventually repeats. Ke questions help analysts test whether they have accomplished enough to move forward and ensure that teams hav spent enough time on each of the phases and don't start modeling before the data is ready. It is a little different fro the data analysis life cycle this program is based on, but it has some core ideas in common: the first phase is intere in discovering and asking questions; data has to be prepared before it can be analyzed and used; and then finding should be shared and acted on.

For more information, refer to this e-book, Data Science & Big Data Analytics.

Data Analysis Life Cycle

Data Analysis Life Cycle
(From Google Data Analytics Professional Certificate)


coursera
Search in course
Search
Foundations: Data, Data, Every…
Week 1
Origins of the data analysis process
Understanding the data ecosystem
Video: What is the data ecosystem?
4 min
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4 min
Reading: Data and gut instinct
10 min
Reading: Origins of the data analysis process
20 min
Practice Quiz: Test your knowledge on the data ecosystem
4 questions
Program expectations and proper use of the discussion forum

It is time to enter the **data analysis life cycle**—the process of going from data to decision. Data goes through several phases as it gets created, consumed, tested, processed, and reused. With a life cycle model, all key team members can drive success by planning work both up front and at the end of the data analysis process. While the data analysis life cycle is well known among experts, there isn't a single defined structure of those phases. There might not be one single architecture that's uniformly followed by every data analysis expert, but there are some shared fundamentals in every data analysis process. This reading provides an overview of several, starting with the process that forms the foundation of the Google Data Analytics Certificate.

The process presented as part of the Google Data Analytics Certificate is one that will be valuable to you as you keep moving forward in your career:

1. **Ask**: Business Challenge/Objective/Question
2. **Prepare**: Data generation, collection, storage, and data management
3. **Process**: Data cleaning/data integrity
4. **Analyze**: Data exploration, visualization, and analysis
5. **Share**: Communicating and interpreting results
6. **Act**: Putting your insights to work to solve the problem

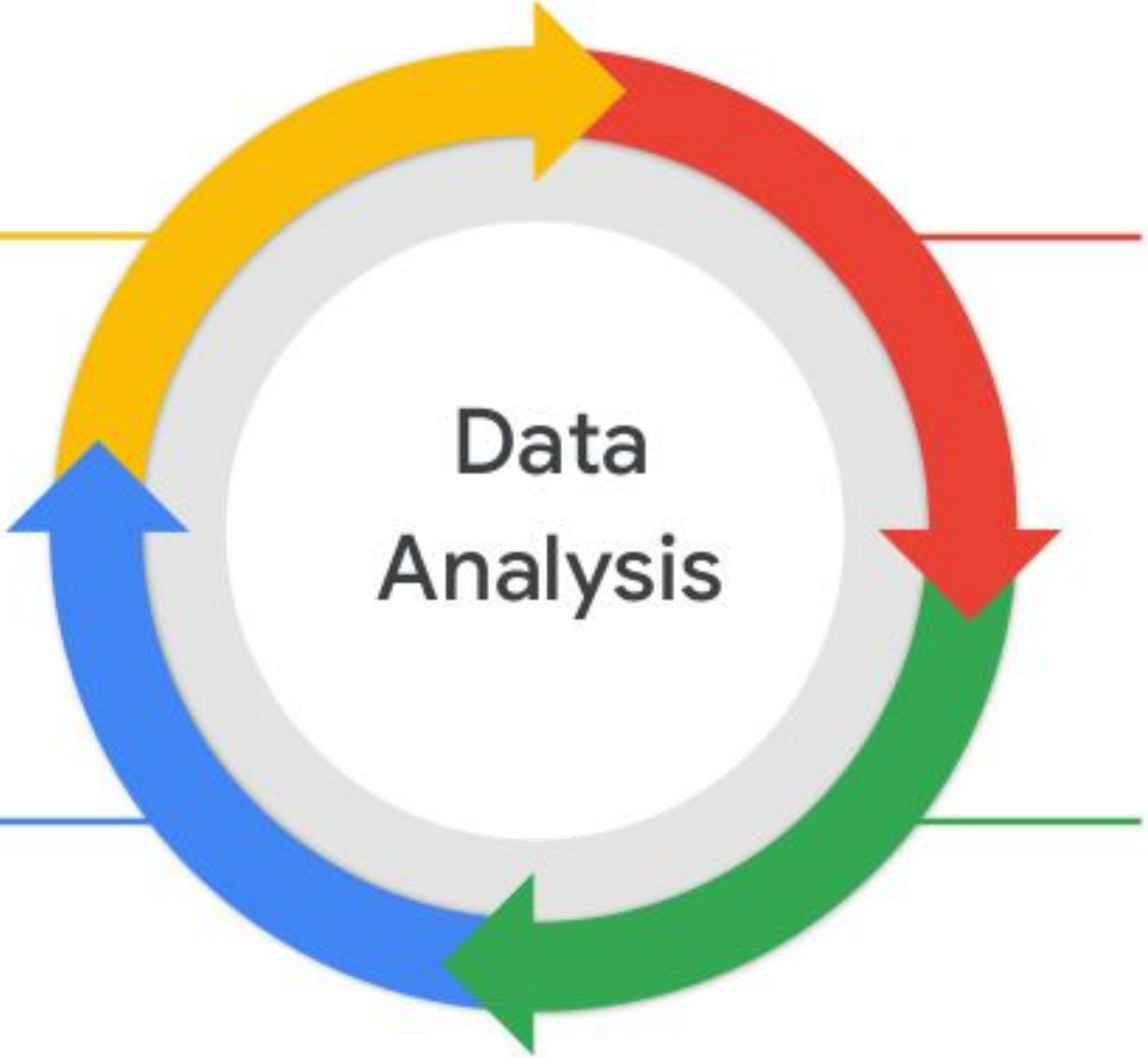
Understanding this process—and all of the iterations that helped make it popular—will be a big part of guiding your own analysis and your work in this program. Let's go over a few other variations of the data analysis life cycle.

Data Analysis Life Cycle
(From Google Data Analytics Professional Certificate)

1. **Ask**
2. **Prepare**
3. **Process**
4. **Analyse**
5. **Share**
6. **Act**

Data Analysis Process

Role of Looker in the Data Analysis Process



Define questions, facilitated by data exploration in Looker

Identify required data by reviewing available data in Looker

Analyze data using Looker

Interpret results from shareable visualizations and dashboards in Looker

Data Science Confusions

Confusion 1: Constant Evolution of Industry - 1

Statistician

25 years ago

Statistics

Data mining

Predictive analytics

Data Science

The **Statistician** only used **Statistics**

Confusion 1: Constant Evolution of Industry - 2

Statistician

25 years ago

responsible for:

gathering and cleaning data sets

applying statistical methods

+ growth of data

+ radical improvement of technology

extracting patterns from data

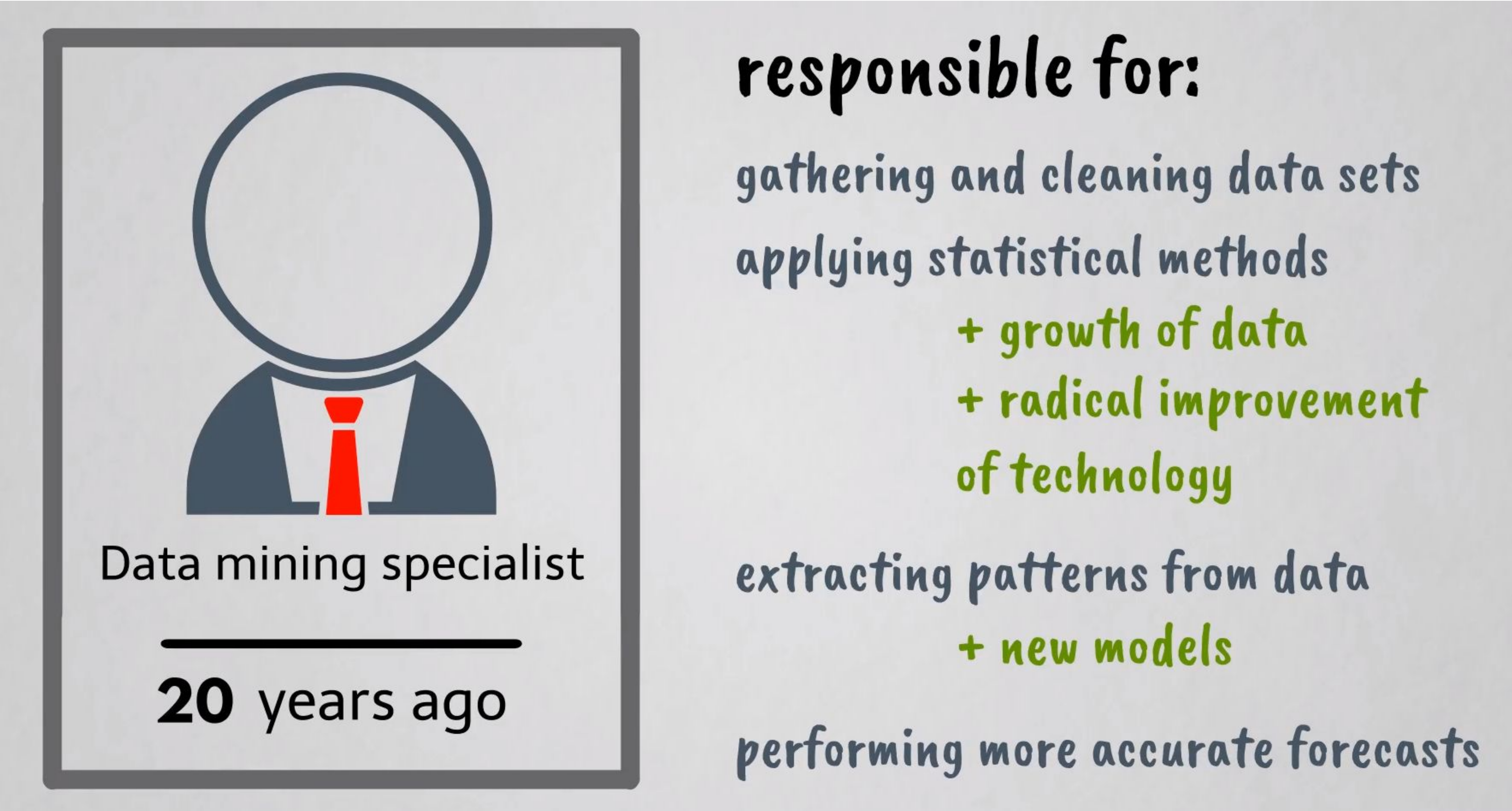
Then, the **Statistician extracted patterns** from the data

Confusion 1: Constant Evolution of Industry - 3

Data mining specialist
20 years ago
Statistics
Data mining
Predictive analytics
Data Science

Hence, the **Statistician** began using what is called **Data Mining**

Confusion 1: Constant Evolution of Industry - 4



Data mining specialist

20 years ago

responsible for:

gathering and cleaning data sets

applying statistical methods

+ growth of data

+ radical improvement of technology

extracting patterns from data

+ new models

performing more accurate forecasts

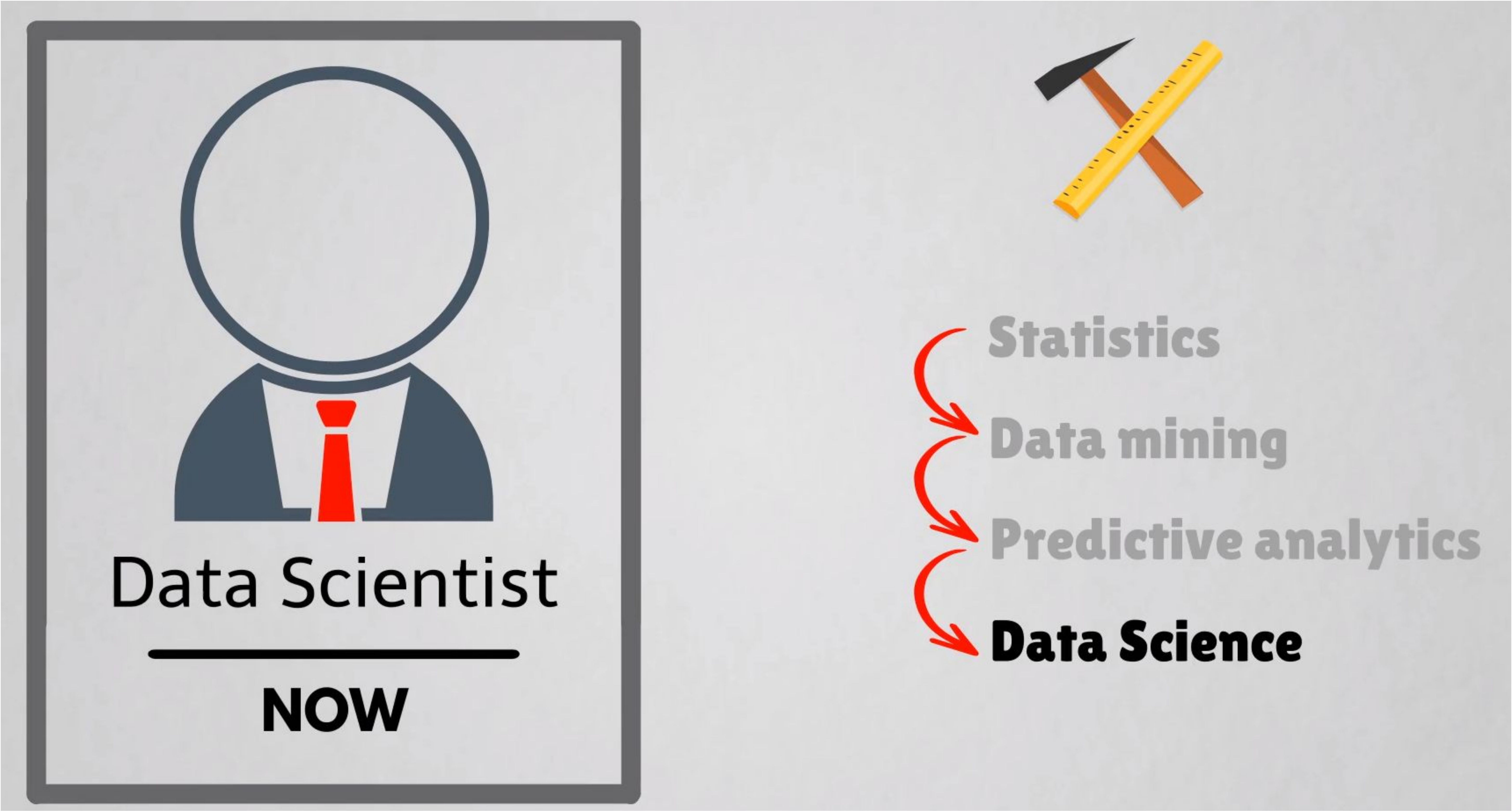
Then, the **Statistician** performed **more accurate** forecasts

Confusion 1: Constant Evolution of Industry - 5

Predictive analytics specialist
10 years ago
Statistics
Data mining
Predictive analytics
Data Science

Hence, the **Statistician** began using what is called **Predictive Analytics**

Confusion 1: Constant Evolution of Industry - 6



Now, the **Statistician** has the title **Data Scientist** without changing the job

Confusion 2: HR Manager - Example 1

HR manager
Job offer
data analytics specialist
I am not a data analyst!

HR Manager offers a job title different from the actual job

Confusion 2: HR Manager - Example 2

HR manager
Job offer
junior data scientist
I am not a business intelligence analyst!

HR Manager offers a job title different from the actual job

Questions

Links

https://github.com/FCAI-B/bda