

# Storytelling with data

## 01 | Analytics Communication — Scopes, Audiences, Challenges

**introductions**

# Meeting your professor

## Education

### Doctor of Jurisprudence

*Honors in research and writing*

Focus — analysis

### Master of Science

*Sports Management*

Focus — data science analytics

Won, SABR analytics competition

### Bachelor of Science

*Chemical Engineering*

Focus — numerical methods,  
statistical process control



## Scott Spencer Columbia University

*Faculty, Lecturer, Alumnus*

## Teaching and Research

### *Developing generative models*

Building Bayesian, generative models to enable decision-making in complex fields such as sports performance.

### *Communicating uncertainty*

Writing monograph on quantitative persuasion amid uncertainty. Developing R packages to tie human perception to graphical representation of data.

### *Contributing open-source software*

Contribute to interfaces to Stan, a probabilistic programming language.

## Consultant, Data Scientist

### *Professional sports*

Example — Major League Baseball research and development for player performance & manager decision-making

### *Data for good*

Example — Bayesian, generative modeling effects of climate change on perceived expectations of property values

### *Innovation*

Example — whether invented attributes of an edible oil previously existed or was made or sold by competitor

## *hy-flex*

Class meets Wednesdays 8:10-10PM  
Zoom and 329 Pupin Laboratories

## *office hours*

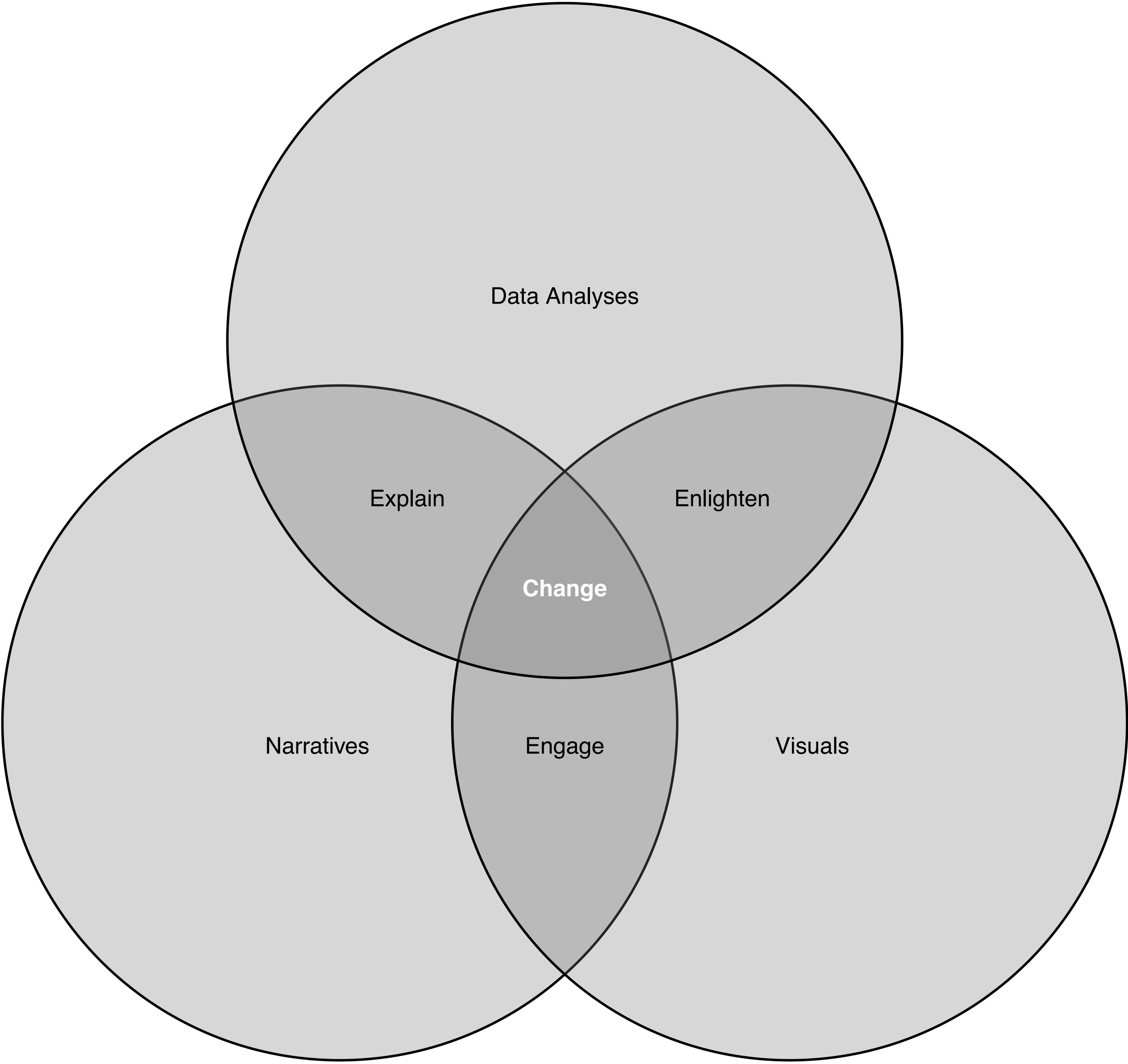
Professor Spencer  
[Click to schedule appointment](#)

Associate Scherling  
[Click to schedule appointment](#)



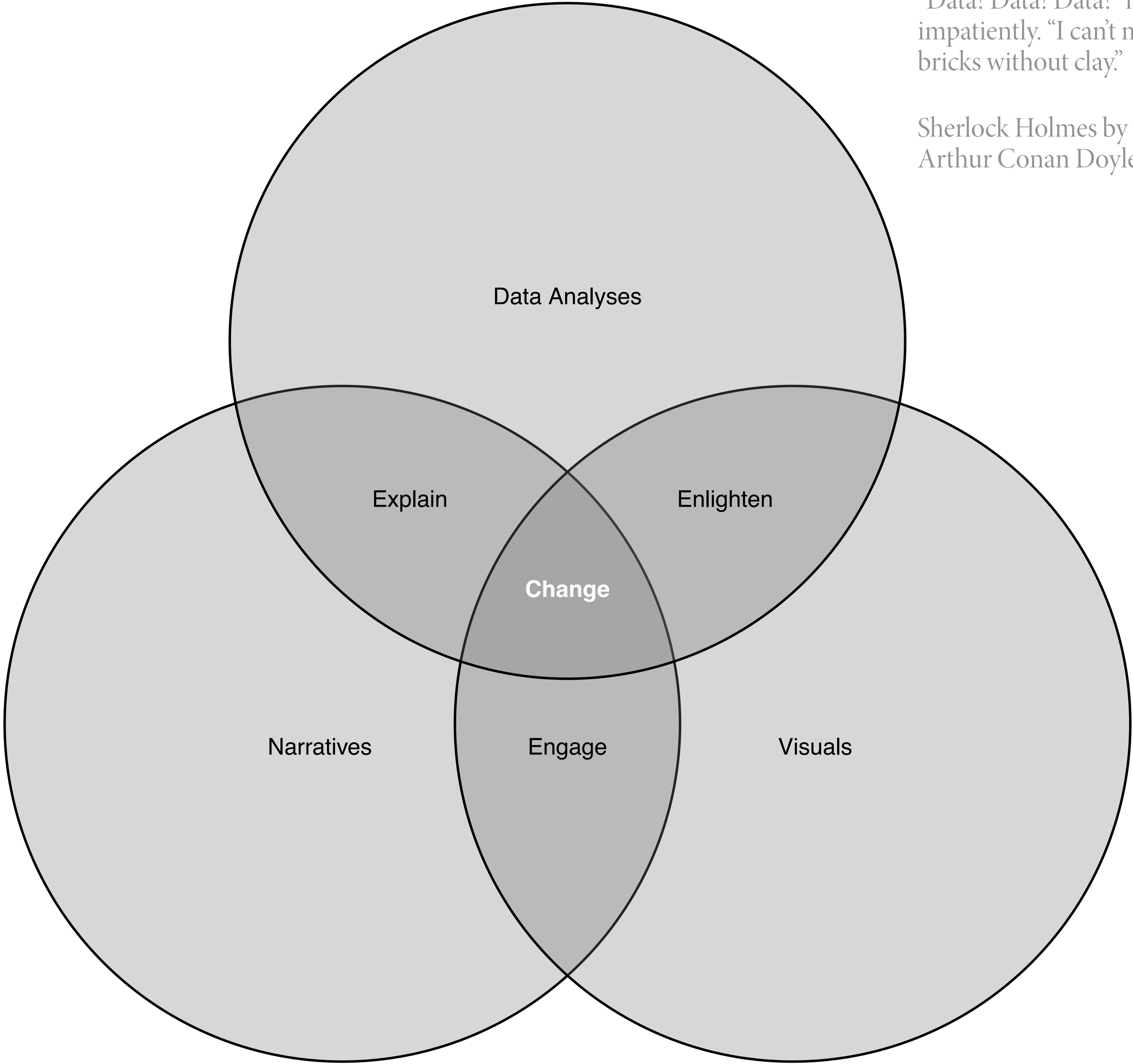
Who are your fellow students and future colleagues? **Let's say hello!**

## **course overview**



“Data! Data! Data!” he cried impatiently. “I can’t make bricks without clay.”

Sherlock Holmes by Sir Arthur Conan Doyle, *author*

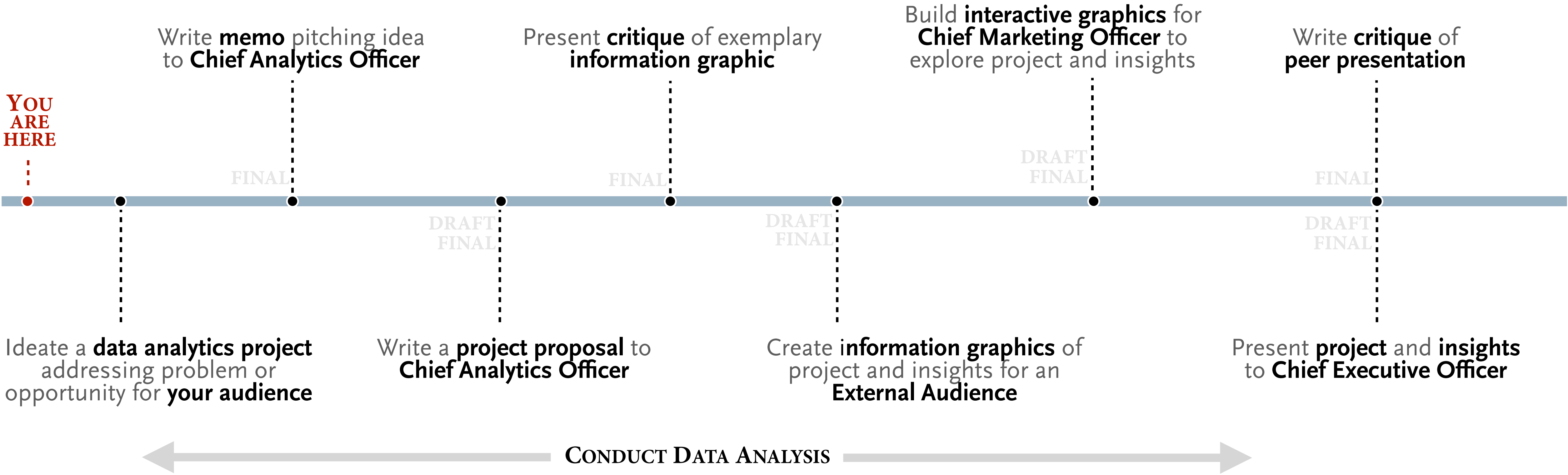


No one ever made a decision because of a number. They need a story.

Daniel Kahneman, *psychologist, behavioral economist, and author*

The greatest value of a picture is when it forces us to notice what we never expected to see.

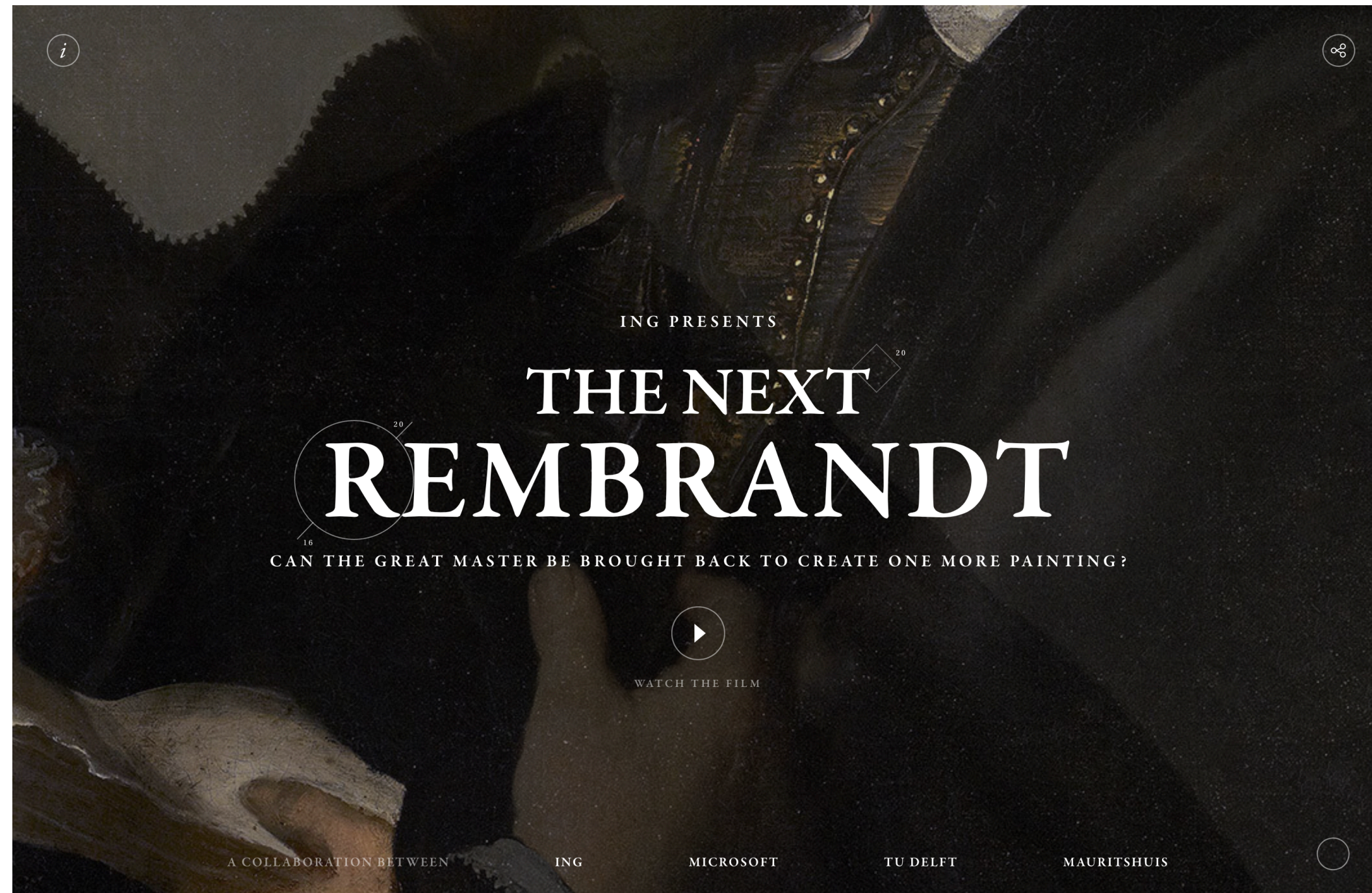
John W Tukey, *mathematician*





**data analytics project scope**





What were the **data** the analysts worked with?

How specific were their explanations of **project scope** and **methods**?

Who may have been their **audience**?

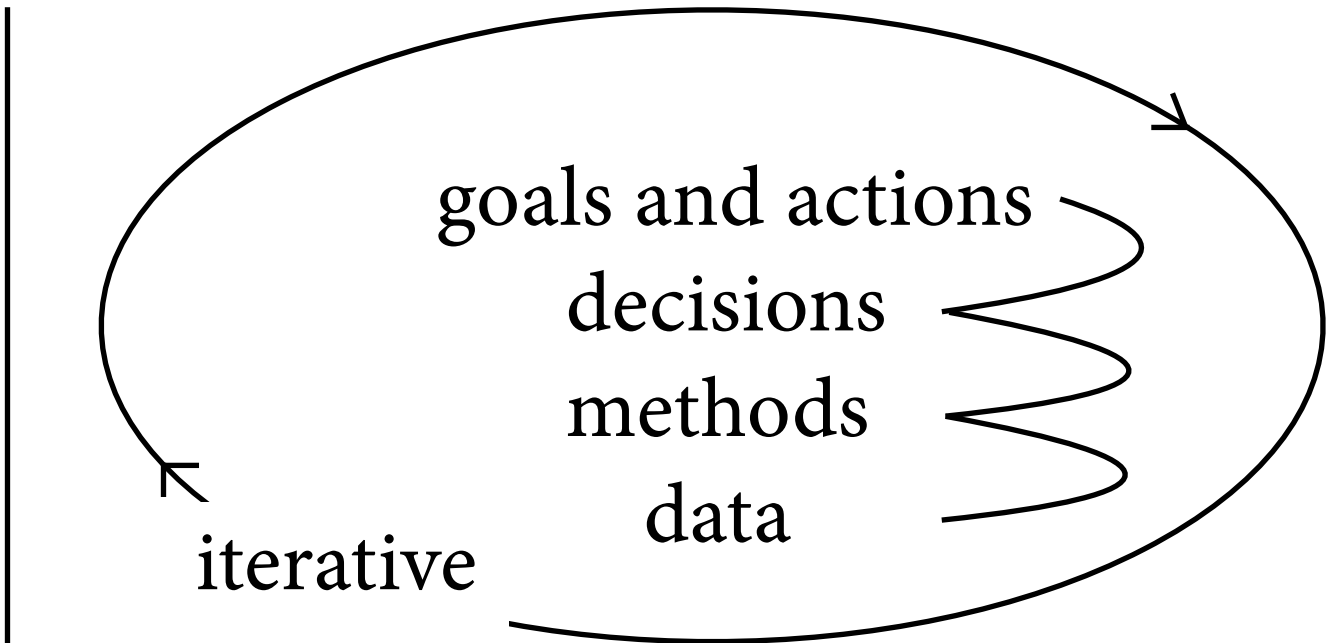
Assuming the audience, **appropriate detail**?

Do you feel this is a **story**? Why or why not?



analytics project scope | a starting point for scoping a data analytics project

process



initial questions

- What **problem** is to be solved?
- Is the problem **important**?
- Could an answer have **impact**?
- Do **data** have a role in **solving the problem**?
- Are the right **data available**?
- In what **contexts** are the data generated?
- Is the **organization** ready to **tackle the problem** and **take actions from insights**?



**Rebalancing** is one of the **biggest challenges** of any bike share system, especially in ... New York where residents don't all work a traditional 9-5 schedule, and ... people work in a variety of other neighborhoods.

— Simmons, Dani. Citi Bike spokeswoman.





## Identifying events and user behavior

What **events** may be correlated with or cause empty or full bike docking stations?

What potential **user behaviors** or **preferences** may lead to these events?

From what **analogous** things could we draw **comparisons** to provide **context**?

## Measurements of events and behaviors

How may these events and behaviors have been **measured and recorded**?

What **data are available**? Where?  
What form?

May these data be **sufficient to find insights** through analysis, useful for decisions and goals?





## Examples of publicly available data sources

Data are recorded of each **bike** unlocked and docked, along with remaining **dock** capacities at the locations, dates, and times of each event: <https://www.citibikenyc.com/system-data>

**Taxi** pickup and drop-off locations and times: <https://www1.nyc.gov/site/tlc/about/tlc-trip-record-data.page>

**Subway** lines entrance/exit locations: <https://data.cityofnewyork.us/Transportation/Subway-Stations/arq3-7z49>

Historical **weather**: <https://www.weather.gov/documentation/services-web-api>

**Traffic** data and more: <http://www.nyc.gov/html/dot/html/about/datafeeds.shtml#realtime>



## Columbia University Library Research Data Services

Research Data Services is jointly supported by the Libraries and CUIT, providing support and consulting for research data needs at Columbia University. Our **expert staff are available to help** with many aspects of the research data lifecycle including **research**, **data management**, **finding data**, recommendations for **cleaning** and **understanding** data, **mapping** and **visualizing** your data.

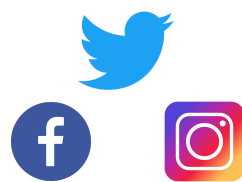
<https://library.columbia.edu/services/research-data-services.html>

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## Columbia Library Clio database search

Real-time and historical SEC EDGAR filings, scanned images of company annual reports and foreign exchange filings.

<https://clio.columbia.edu/databases?q=research+reports>



**Social media:** Ravindran, Sharan Kumar, and Vikram Garg. *Mastering Social Media Mining with R*. Packt Publishing, 2015. Print. Clio: <https://clio.columbia.edu/catalog/14225862>



**Web:** Munzert, Simon et al. *Automated Data Collection with R*. Wiley, 2015. Print. Clio: <https://clio.columbia.edu/catalog/11269563>



**R's** base installation, and many **R packages** contain built-in datasets. The command `data(package = .packages(all.available = TRUE))` lists all data available in all your *installed* packages.



The **General Social Survey** includes more than 40 years of personal-interview survey questions on social characteristics and attitudes in the United States. <http://gss.norc.org>



**Kaggle** is an online community of data scientists owned by Google who publish data sets, over 14,000 now, for public use. <https://www.kaggle.com/datasets>



**Global cities' OpenData** provides public access to numerous global cities' data sets gathered from their agencies: *e.g.*, New York City <https://opendata.cityofnewyork.us/data/>; London <https://data.london.gov.uk/>; Hong Kong <https://data.gov.hk/en/>



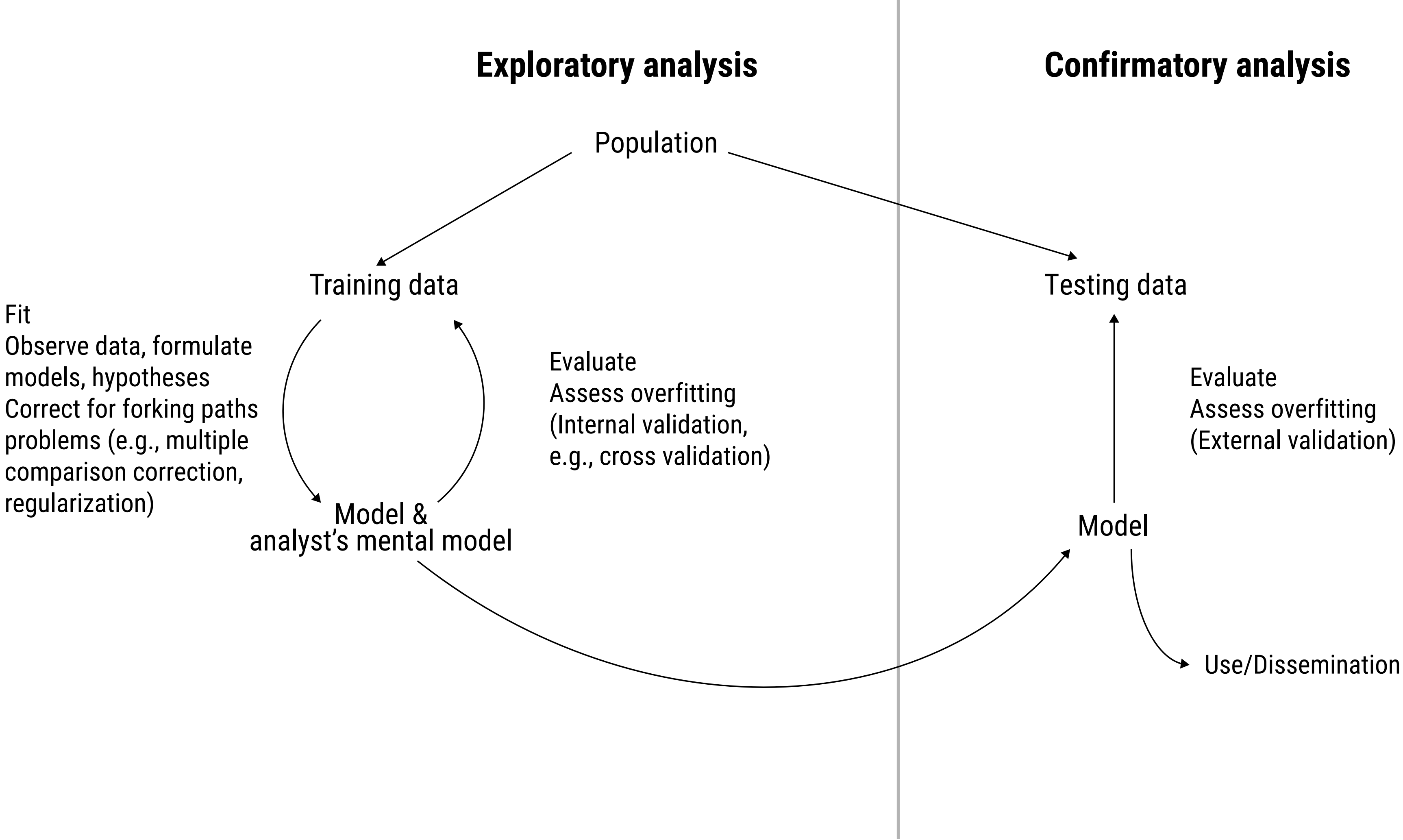
**Data.gov** is a USA federal collection of datasets. <https://www.data.gov> **Of note, other countries offer this too.**



**Google Dataset Search** is just like a regular Google search, but focused on datasets. <https://toolbox.google.com/datasetsearch>



**Google Trends** is provides data on the relative interest of any keyword searches over time.: <https://trends.google.com/trends/>



**common components communicated**

I. Title

II. Abstract

III. Project description

A. Results from prior agency support

B. Problem statement and significance

C. Introduction and background

- Relevant literature review
- Preliminary data
- Conceptual, empirical, or theoretical model
- Justification of approach or novel methods

D. Research plan

- Overview of research design
- Objectives or specific aims, hypotheses, and methods
- Analysis and expected results
- Timetable

E. Broader impacts

IV. References cited

V. Budget and budget justification



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## II. Abstract

## III. Project description

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**Title** | accurately represents the *content* and *scope* of the proposal.

# analytics project scope | research proposal guidelines — where audience is *granting agencies*

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**Abstract** | frames the goals and scope of the study, briefly describes the methods, and presents the hypotheses and expected results or outputs.

Sets up proper expectations, so be careful to avoid misleading readers into thinking that the proposal addresses anything other than the actual research topic.

Try for no more than two short paragraphs.

# analytics project scope | research proposal guidelines — where audience is *granting agencies*

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**Significance** | begins with the big picture and then funnels the reader through the hypotheses to the goals or specific aims of the research.

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II. Abstract

III. Project description

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**Literature review** | sets the stage for the proposal by discussing the most widely accepted or influential papers on the research.

The key here is to provide context and be able to show where the work would extend what has been done or how it fills a gap or resolves uncertainty, etc.

# analytics project scope | research proposal guidelines — where audience is *granting agencies*

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Preliminary data | can help establish credibility, likely success, or novelty of the proposal.

But avoid overstating the implications of the data or suggesting you've already solved the problem.



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**Research plan** | The goal is to keep the reader focused on the overall significance, objectives, specific aims, and hypotheses while providing important methodological, technological, and analytical details.

Contains the details of the implementation, analysis, and inferences of the study.

Convince the reader that the project can be accomplished.

# analytics project scope | research proposal guidelines — where audience is *granting agencies*

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## Objectives, hypotheses, aims, methods |

*Objectives* refer to broad, scientifically far-reaching aspects of a study, while *hypotheses* refer to a more specific set of testable conjectures. Specific *aims* focus on a particular question or hypothesis and the *methods* needed and outputs expected to fulfill the aims.

Of note, these points will typically have already been briefly introduced earlier, *e.g.*, in the abstract. Bring in more detail here.

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**Analysis and expected results** | If early data are available, show how you will analyze them to reach your objectives or test your hypotheses.

If such data are unavailable, consider culling data from the literature to show how you expect the results to turn out and to show how you will analyze your data when they are available.

Complete a table or diagram, or run statistical tests using the preliminary or "synthesized" data. This can be a good way to show how you would interpret the results of such data.

**audiences *we* will consider in this course**

our audiences | c-suite executives, general audiences, mixed audiences

**Analytics  
Executives**

Lead an organization’s data analytics strategy, driving data-related business changes to transform company into a more analytics-driven one.

**Chief  
Executives**

Leads management of company; responsible for maximizing company value, high-level decisions on policy and strategy; drives change.

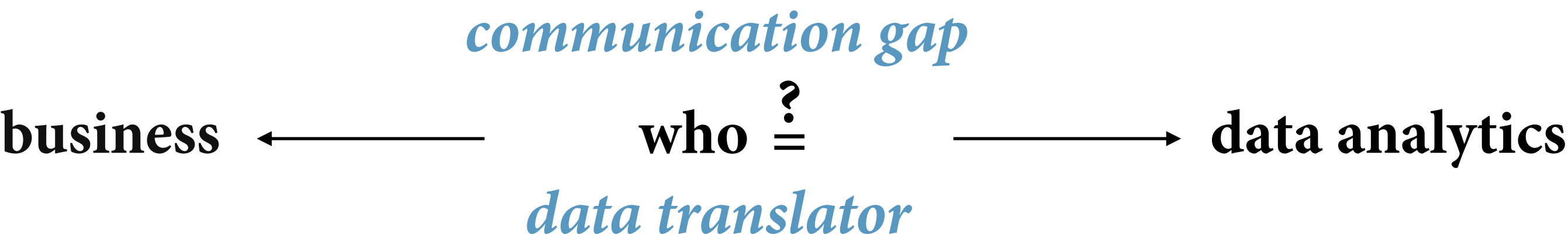
**Marketing  
Executives**

Lead responses to changing circumstances; shapes products, sales strategies, and marketing ideas, collaborating across the company.

**General and  
Mixed Audiences**

The most challenging audiences to understand and develop persuasive messages.

**analytics communication challenges**



# challenges | bridging the gaps with data translators, qualities needed

**project management**

**data wrangling**

**data analysis**

**subject expertise**

**design**

**storytelling**



**resources**

# References

**Spencer**, Scott. “Analytics Communication Scopes” and “Audiences and Challenges.” In *Data in Wonderland*. 2021. [https://ssp3nc3r.github.io/data\\_in\\_wonderland](https://ssp3nc3r.github.io/data_in_wonderland).

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**Brady**, Chris, Mike Forde, and Simon Chadwick. “Why Your Company Needs Data Translators.” MIT Sloan Management Review, March 2017, 1–6.

**Friedland**, Andrew J., Carol L. Folt, and Jennifer L. Mercer. *Writing Successful Science Proposals*. Third edition. New Haven: Yale University Press, 2018.

**Friedman**, Matthew. “Citi Bike Racks Continue to Go Empty Just When Upper West Siders Need Them.” News. West Side Rag (blog), August 19, 2017. <https://www.westsiderag.com/2017/08/19/citi-bike-racks-continue-to-go-empty-just-when-upper-west-siders-need-them>.

**Ing**, Microsoft, Tu Delft, and Mauritshuis. “The Next Rembrandt.” The Next Rembrandt, April 2016. <https://www.nextrembrandt.com>.

**Maynard-Atem**, Louise, and Ben Ludford. “The Rise of the Data Translator.” Impact 2020, no. 1 (January 2, 2020): 12–14. <https://doi.org/10.1080/2058802X.2020.1735794>.

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