Applied Social Data Science - Coding Camp

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Teaching Fellow

September 2 - 6, 2024

Introductions

My Background

My research

Introductions

Who are we?

Background and current course

Coding familiarity?

- Expectations with the program/ Coding camp week

Schedule

- Monday: Introduction (Maxwell Theatre)
- Wednesday: More R: Good practices(Maxwell Theatre)
- Friday: How to report and share results (Maxwell Theatre)

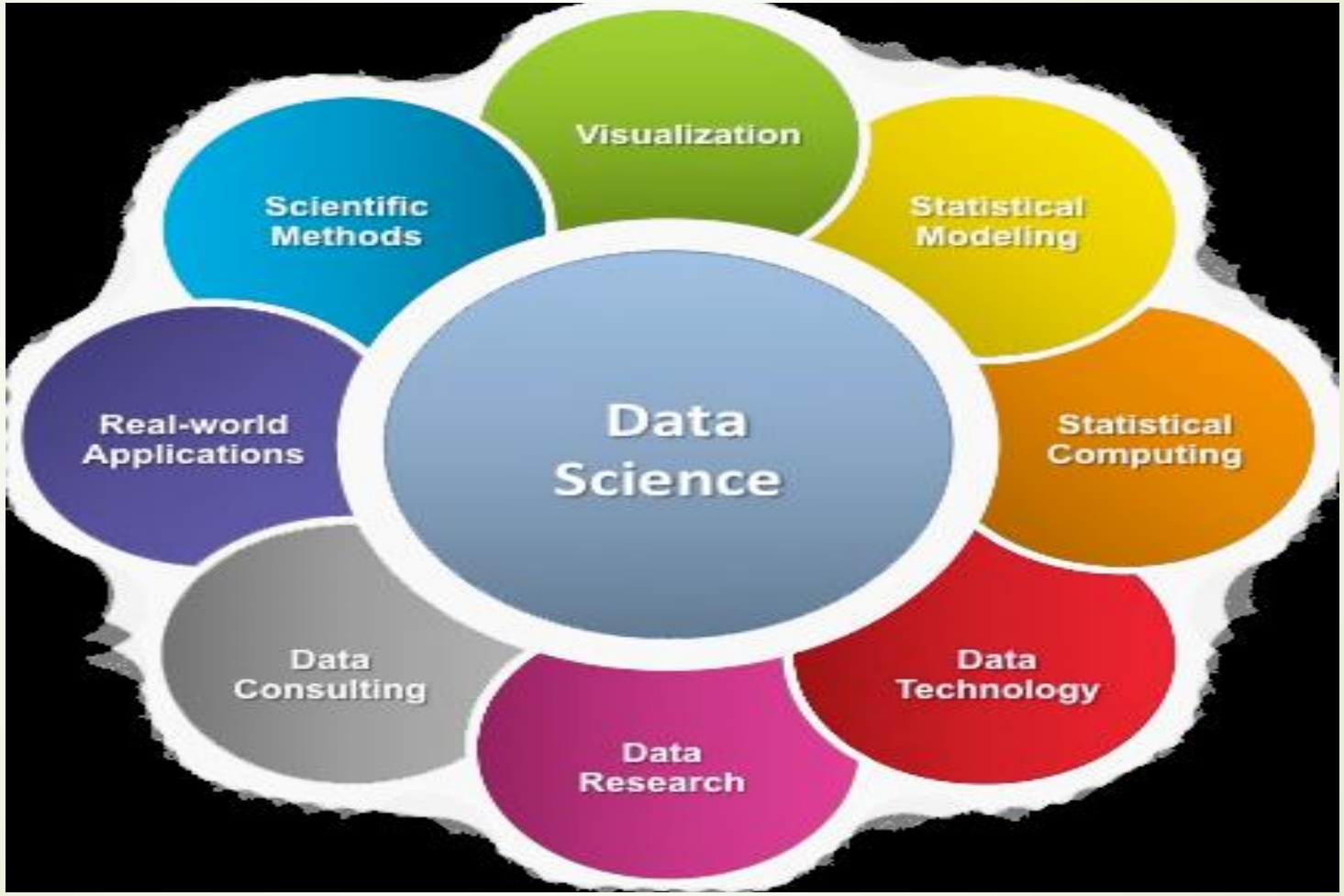
Monday	Tuesday	Wednesday	Thursday	Friday	10:00 AM – 12:00 PM

- Tuesday: R basics (Maxwell Theatre)
- Thursday: Python basics(Maxwell Theatre)
- 15min break?

Today's class

- What is data science?
- Quantitative Programming Environments: R and Python
- Expectations

What is Data Science?



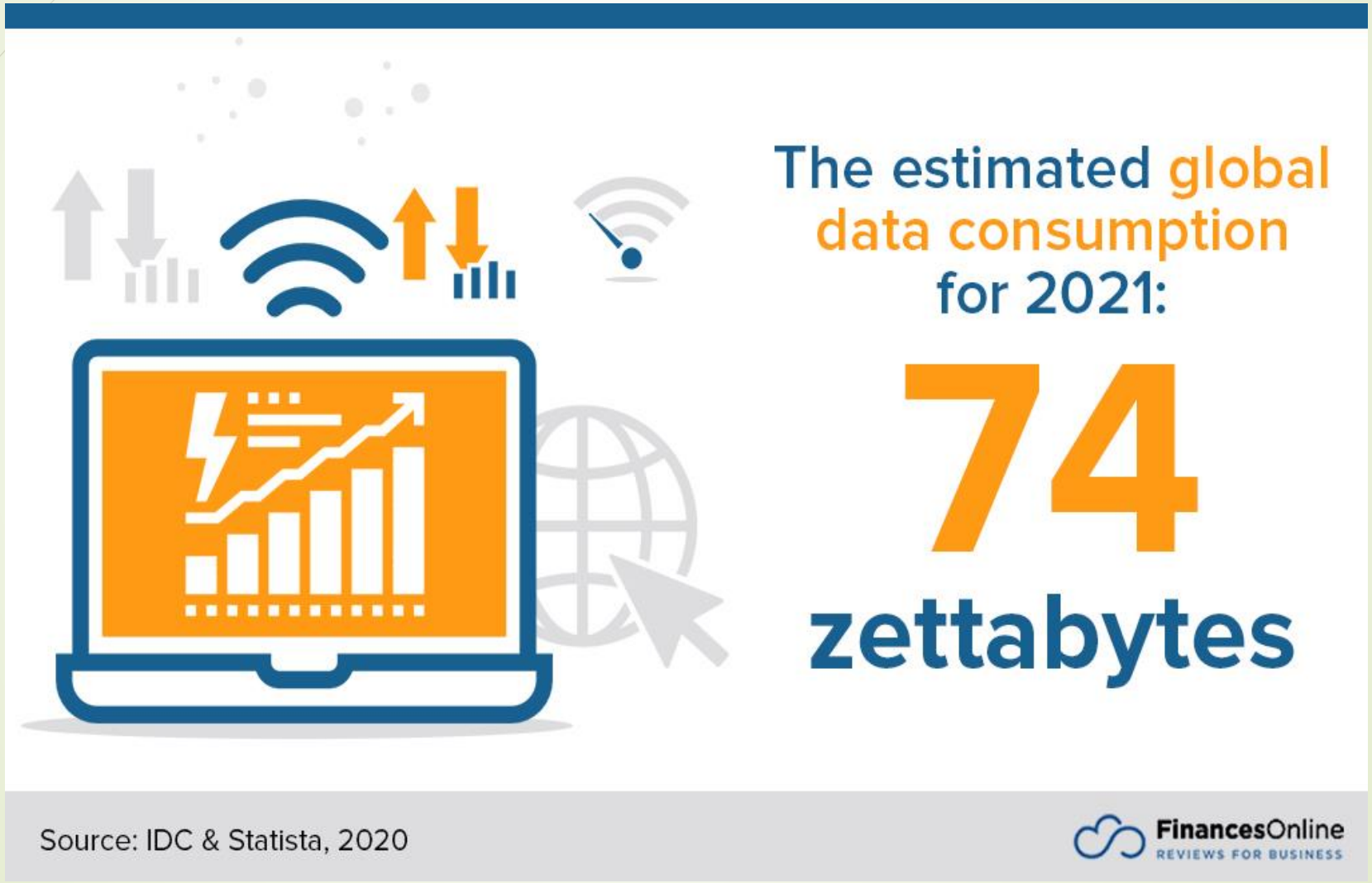
What is Data Science?

- ▶ ‘The science of learning from data’ Donoho, 2017.

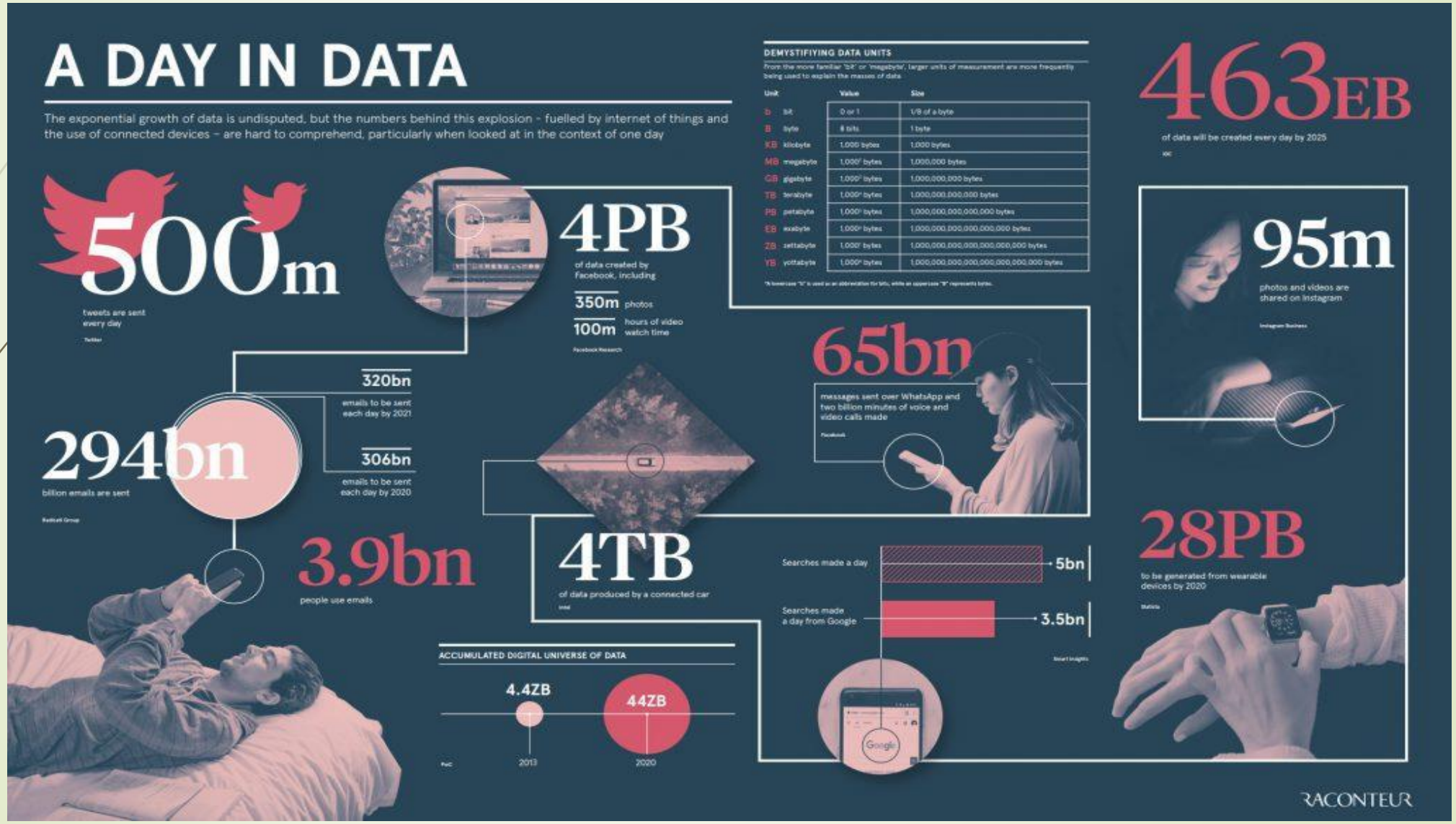
- ▶ statistics + computer science
- ▶ data mining, data analysis, knowledge discovery…
- ▶ Involves principles, processes, and methods for identifying and
- understanding phenomena via the automated or
- semi-automated analysis of data.

- ▶ Used for:
- – Better decisions
- – Predictive analysis
- – Pattern discoveries, etc

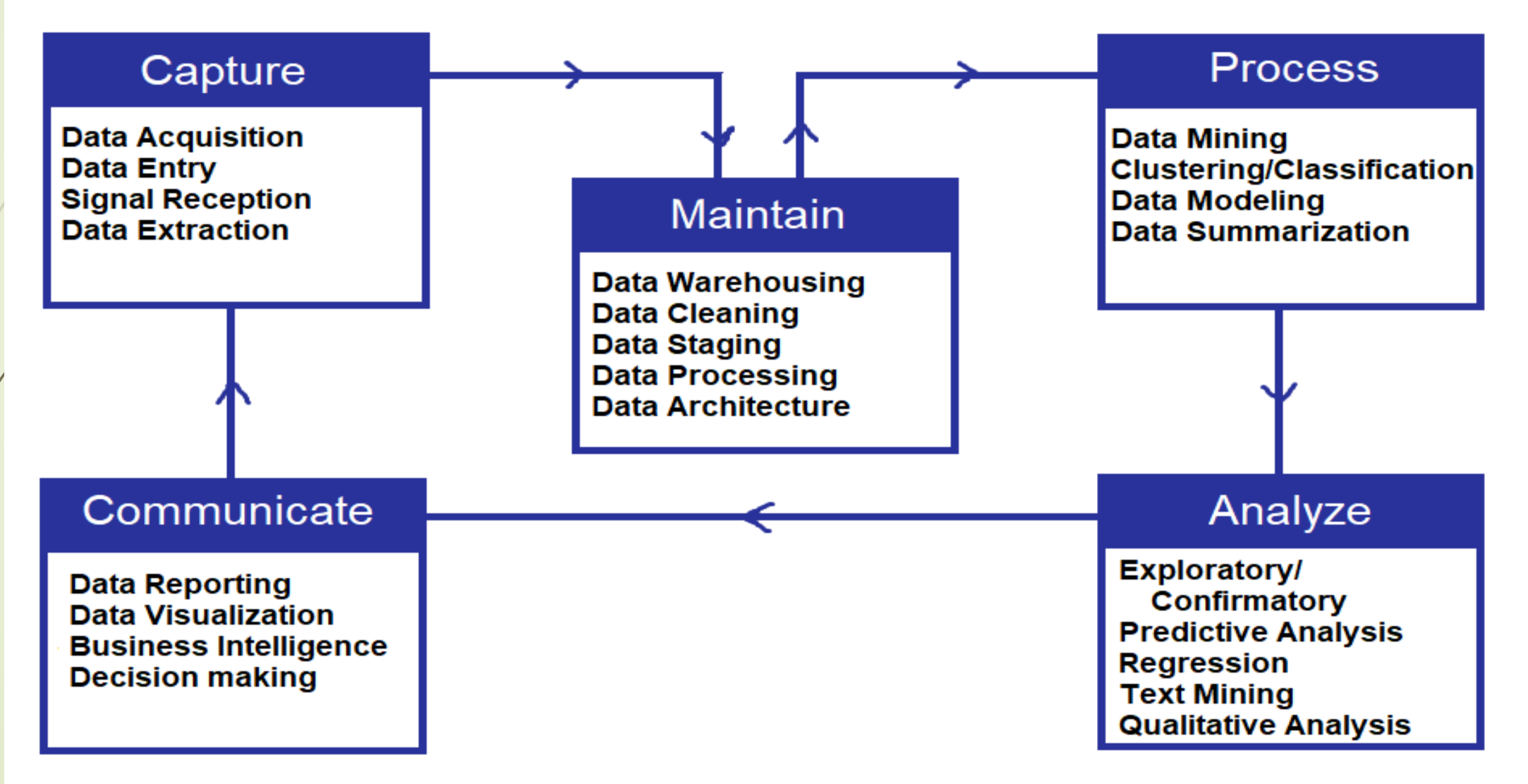
Big Data?!


The estimated global data consumption for 2021:
74
zettabytes
Source: IDC & Statista, 2020
FinancesOnline
REVIEWS FOR BUSINESS

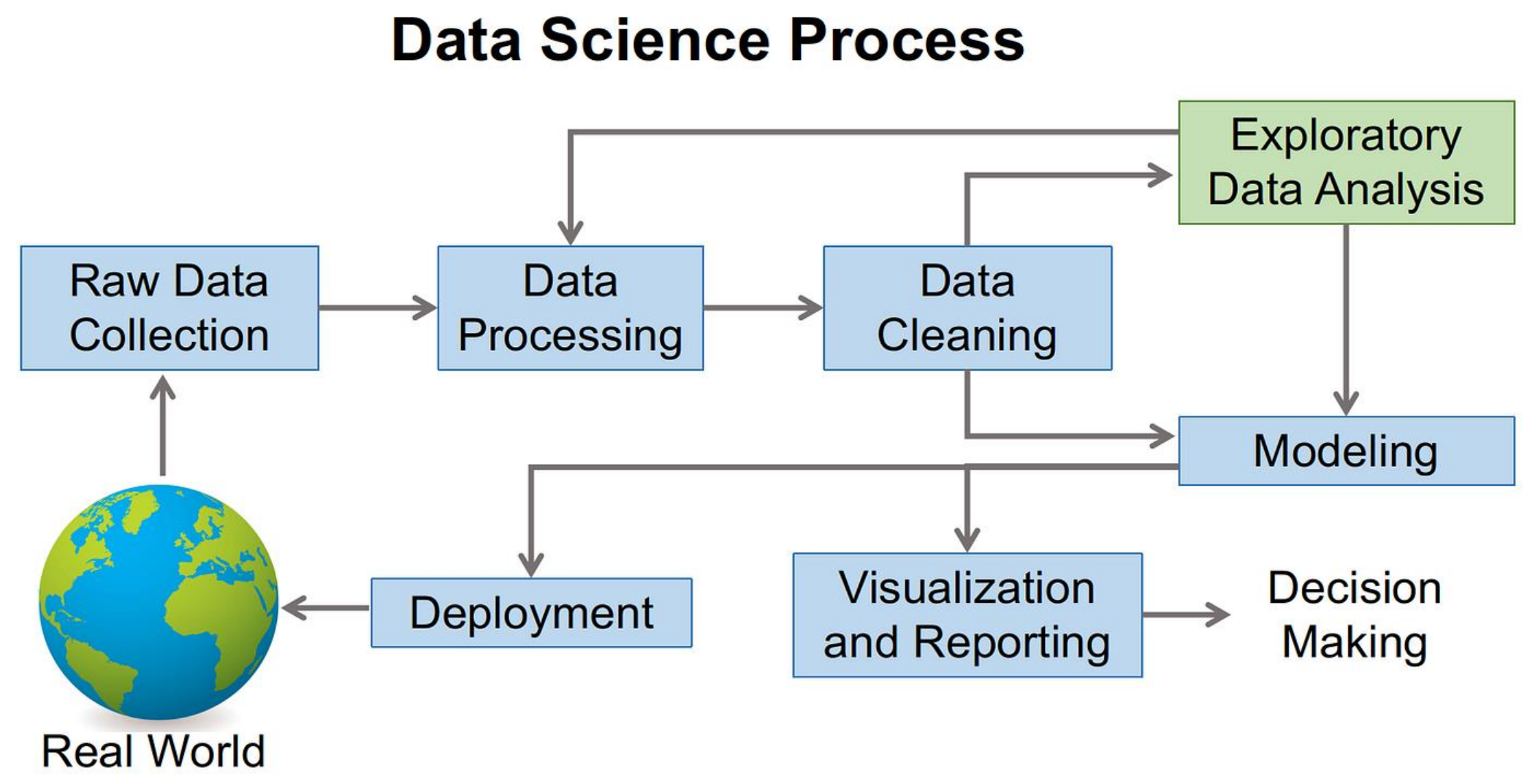
Really big data



Data Science



Data Science Process



A brief history…

- ‘All in all, I have come to feel that my central interest is in data analysis, which I take to include, among other things: procedures for analyzing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more accurate, and all the machinery and results of (mathematical) statistics which apply to analyzing data.’

- The Future of Data Analysis, 1962.

Figure: John Tukey, 1915-2000

A brief history

- ’Four major influences act on data analysis today:
- 1. The formal theories of statistics
- 2. Accelerating developments in computers and display devices
- 3. The challenge, in many fields, of more and ever larger bodies of data
- 4. The emphasis on quantification in an ever wider variety of disciplines’
- (Tukey, 1962!)

Timeline:

- 1960s - 1980s: advances in computer technology allow for new methods in processing and analysing data
- 1977: Exploratory Data Analysis, John Tukey
- 1990s: ‘data mining’ and ‘knowledge discovery’ emerge as terms for finding patterns in increasingly large datasets
- 1996: ‘data science’ included for first time in International Federation of Classification Societies (IFCS) conference title
- 2000s: analytics becomes increasingly important to businesses, ‘big data’ becomes a thing

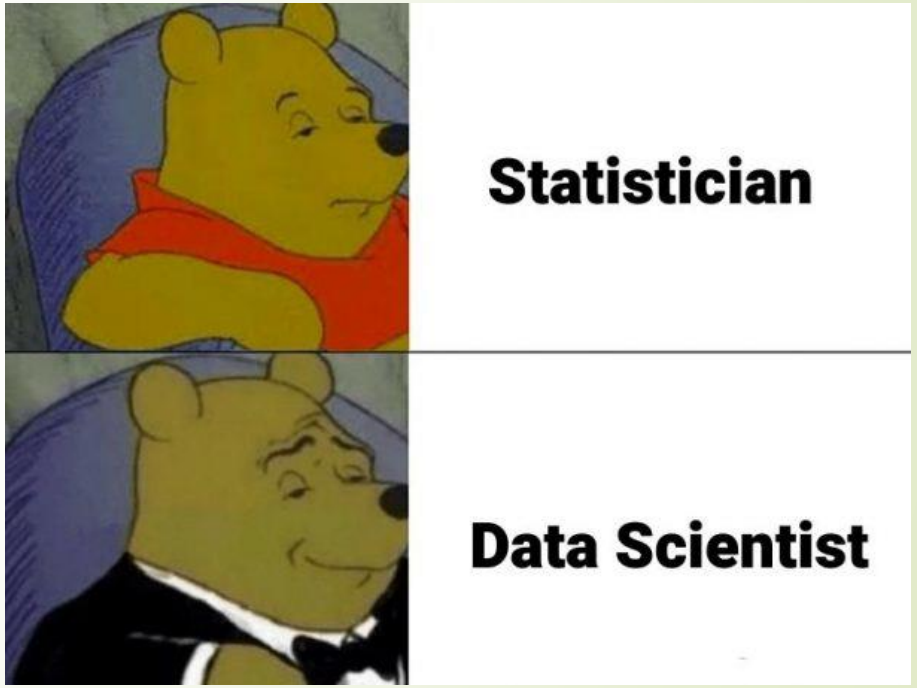
The job market

- ‘I keep saying the sexy job in the next ten years will be statisticians [...] The ability to take data—to be able to understand it, to process it, to extract value from it, to visualize it, to communicate it—that’s going to be a hugely important skill in the next decades.

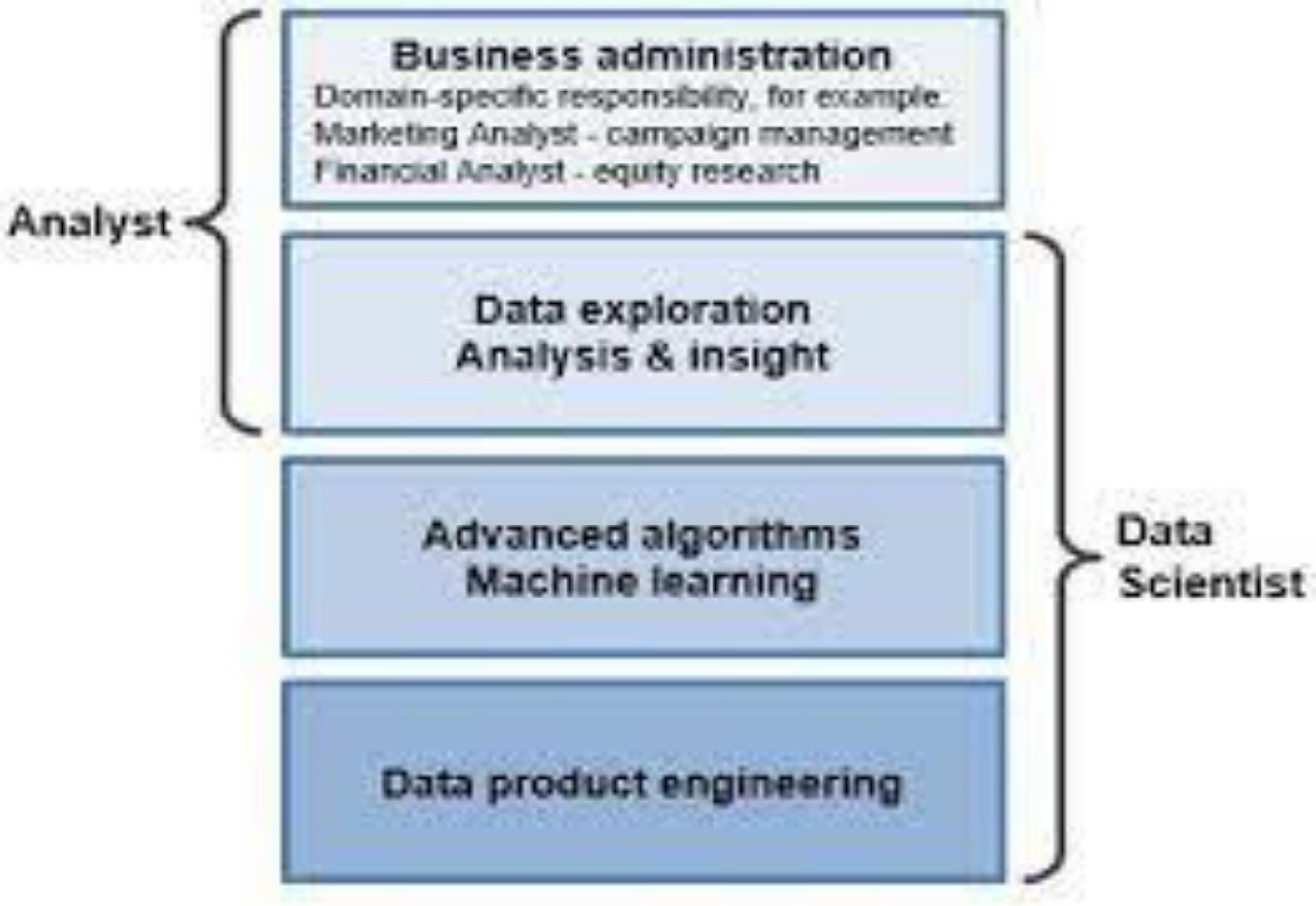
- Hal Varian, Google Chief Economist, Jan. 2009

Things to keep in mind

- Statistics: the mathematics associated with inference
- Data science: the practices associated with working with data
- Not everyone agrees with this distinction…
- Data science and statistics are essentially the same, but in practice they are coming to mean different things



Analyst vs. Data Scientist



Data Science vs Data Analytics

- ▶ Data Science

Involves principles and methods for identifying and understanding phenomena via the automated or semi-automated analysis of data - predict future outcomes (broader field)

- Programming, statistics, machine learning and algorithms towards combining, preparing and examining large datasets

- ▶ Data Analytics

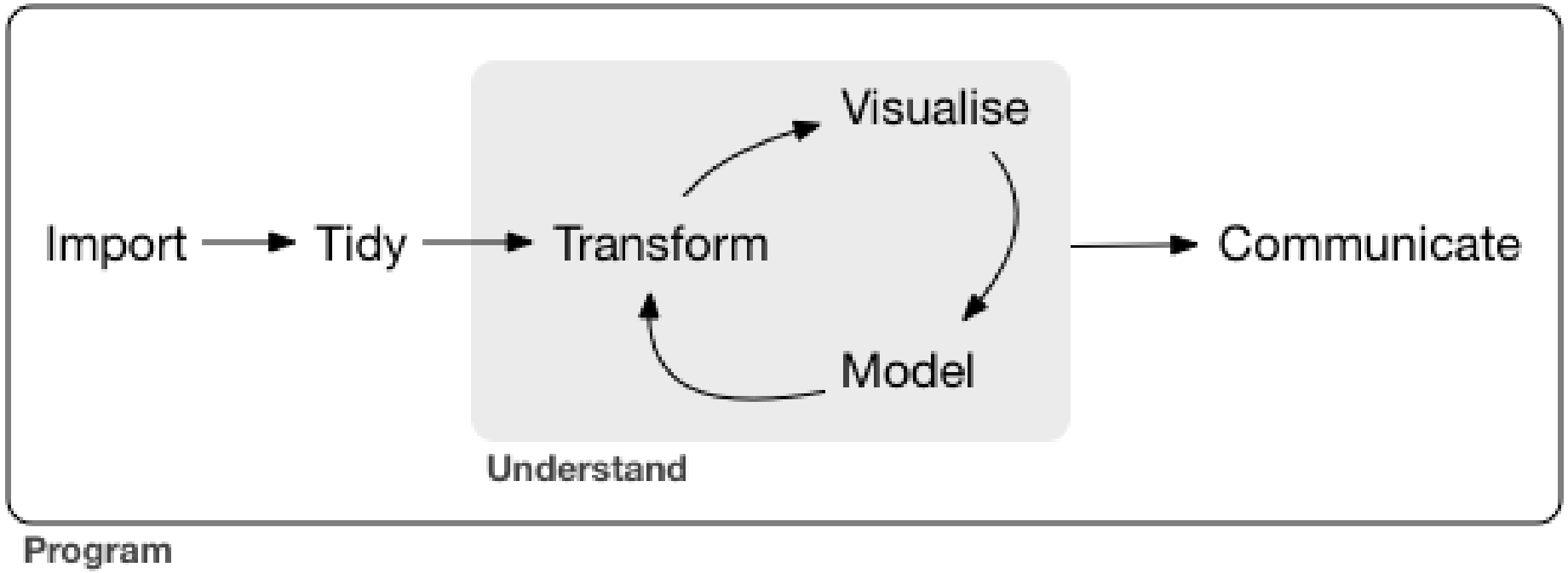
Analyses data to gain insights and inform decisions - past data for present decisions, specific questions.

Scientific vs. Engineering mindsets

- the scientific mindset seeks to understand the underlying process (generative modeling)

- the engineering mindset looks to find the best prediction (predictive modeling)

- In the social sciences, we often want to understand what's inside the 'black box', but not all data science methods are designed for this.



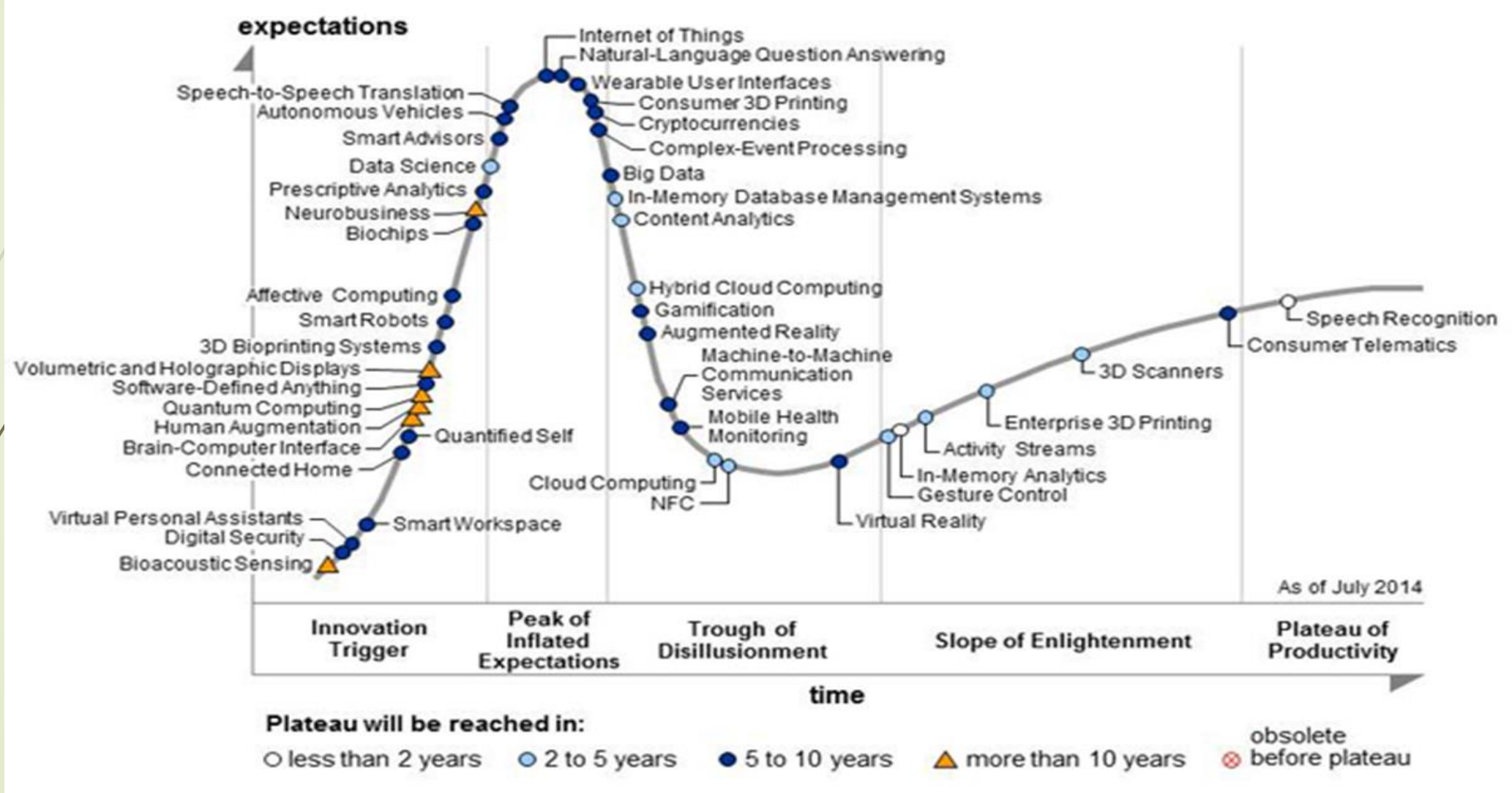
Data science is a process

- Figure: Data science tools and workflow, c/o Hadley Wickham (R for Data Science)

Six Divisions

- The activities of 'Greater Data Science' are classified into six divisions (Donoho,2017):
- 1. Data Gathering, Preparation, and Exploration
- 2. Data Representation and Transformation
- 3. Computing with Data (several languages!)
- 4. Data Modeling (generative vs. predictive models)
- 5. Data Visualization and Presentation
- 6. Science about Data Science

Gartner's 2014 Hype Cycle



Data Scientists

The Sexiest Job of the 21st Century

- They find stories, extract knowledge. They are not reporters

DSperson

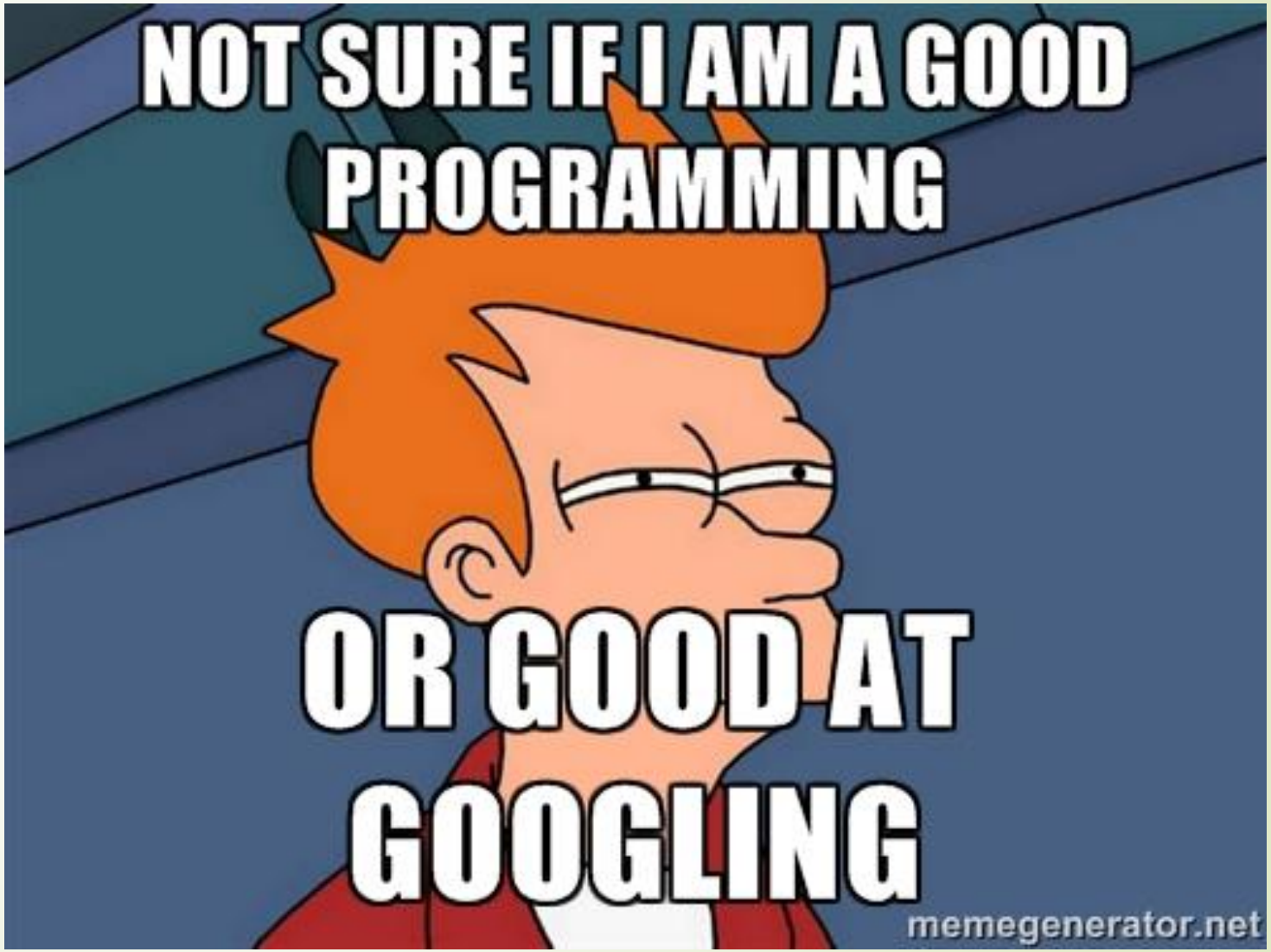
- Data scientists are the key to realizing the opportunities presented by big data. They bring structure to it, find compelling patterns in it, and advise executives on the implications for products, processes, and decisions

Concentration in Data Science

- Mathematics and Applied Mathematics
- Applied Statistics/Data Analysis
- Solid Programming Skills (R, Python, Julia, SQL)
- Data Mining
- Data Base Storage and Management
- Machine Learning and discovery

Expectations?!

- There is a lot to learn
- There is a steep learning curve
- Slow and steady wins the race
- We are here to help



Useful Resources

- R for Data Science (2e): https://r4ds.hadley.nz/
- Python for Data Analysis (3e): https://wesmckinney.com/book/
- GitHub: https://docs.github.com/en/get-started/quickstart/hello-world
- Posit Primers: https://posit.cloud/learn/primers

Thank you for your attention!

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