Data Pipeline in Practice

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Topics in Applied Data Science
for Social Scientists

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RECAP: A Data Science Project

- Three **aims** of a data science project
  a) **reproducibility**
     - anyone should be able to arrive to your **same results**
  b) **portability**
     - anyone should be able to **pick up where you left off** on any machine
- crucial tenets for **collaborative work**
  c) **scalability**
     - your project should also work for **larger data sets** and/or be on the path of **automation**

RECAP: Structuring DS projects

some basic principles...

1. use **scripts for everything** you do
   - **NEVER** do things **manually**
2. organize your scripts in a sequence
   - **separate activities** in sections
   - keep an early section for **definitions**
   - call **other scripts** when necessary
3. write **efficient** (aka lazy) code
   - turn code used multiple times into **functions**
   - **re-use functions:** make them generic enough
4. rely on **version control** (git)

RECAP: Structuring DS projects

a thin layer...

```
project\
|
| -- src
|      |-- data            <- code to read/munge raw data
|      |-- features        <- code to transform/append data
|      |-- models          <- code to analyze data
|      |-- visualizations  <- code to create visualizations
|
| -- data
|      |-- raw             <- original, immutable data dump
|      |-- external        <- data from third party sources
|      |-- interim         <- intermediate transformed data
|      |-- processed       <- final processed data set
|
| -- reports
|      |-- documents       <- documents synthesizing the analysis
|      |-- figures         <- images generated by the code
|
| -- references            <- data dictionaries, explanatory materials
|
| -- README.md             <- high-level project description
| -- TODO                  <- future improvements, bug fixes (opt)
| -- LabNotebook           <- chronological records of project (opt)
```

Sources: **Cookiecutter for Data Science**, **ProjectTemplate**

data collection

why is data collection important?

- understand your products and systems better
- provides means for organizations to make better data-informed decisions
- helps identify opportunities or gaps in a product or system
- measures how your consumers interact with your products or system
- understanding your potential market

In God we trust, all others bring data.

–William E. Deming

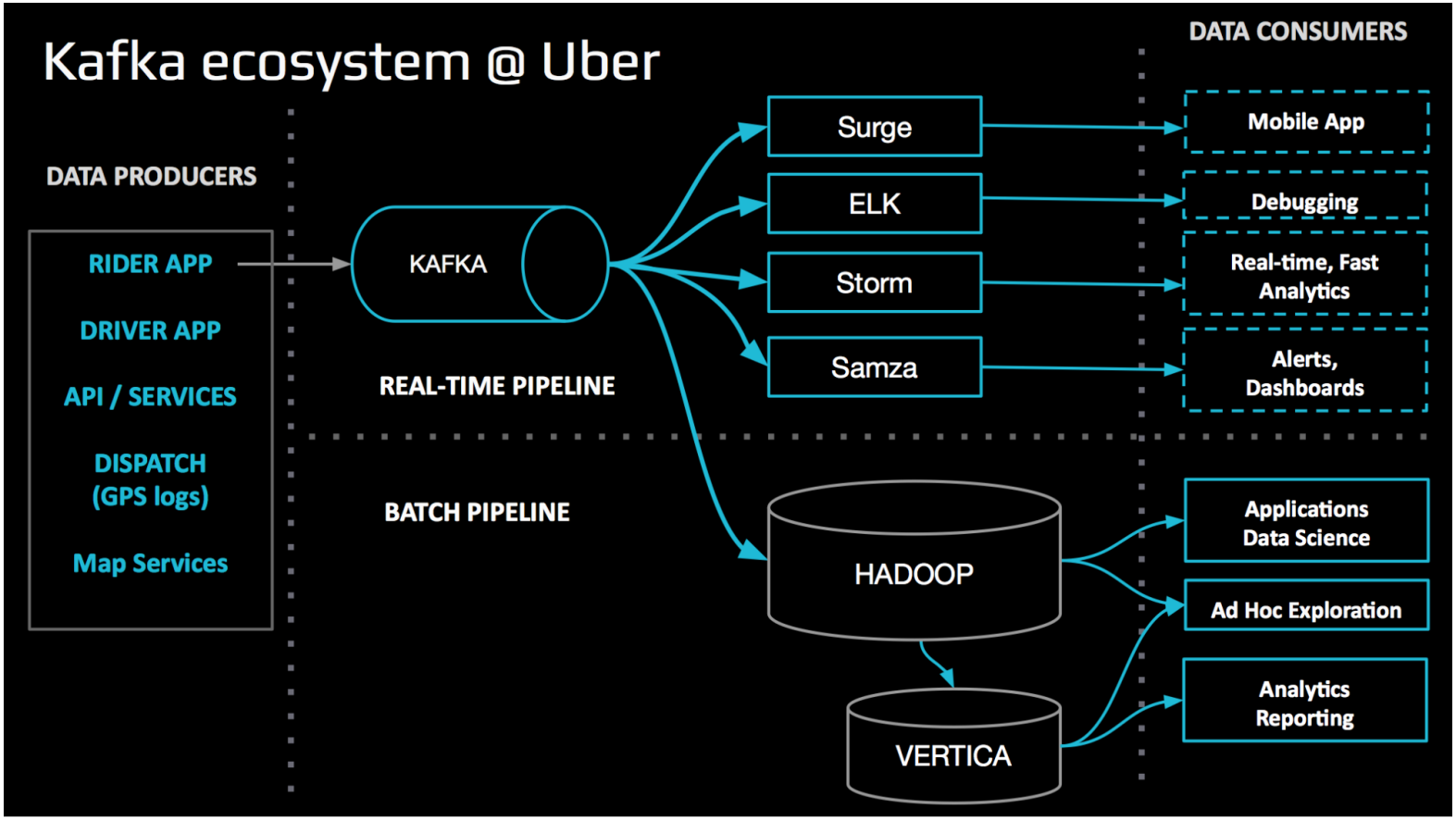
types of data

- unstructured data
  - does not have a predefined data model or is not organized in a pre-defined manner
  - examples of unstructured data include audio, video files or No-SQL databases.
- structured data
  - pre-defined data model and ready to analyze
  - examples of structured data are Excel files or SQL databases
  - most **traditional** form of data storage

levels of datasets

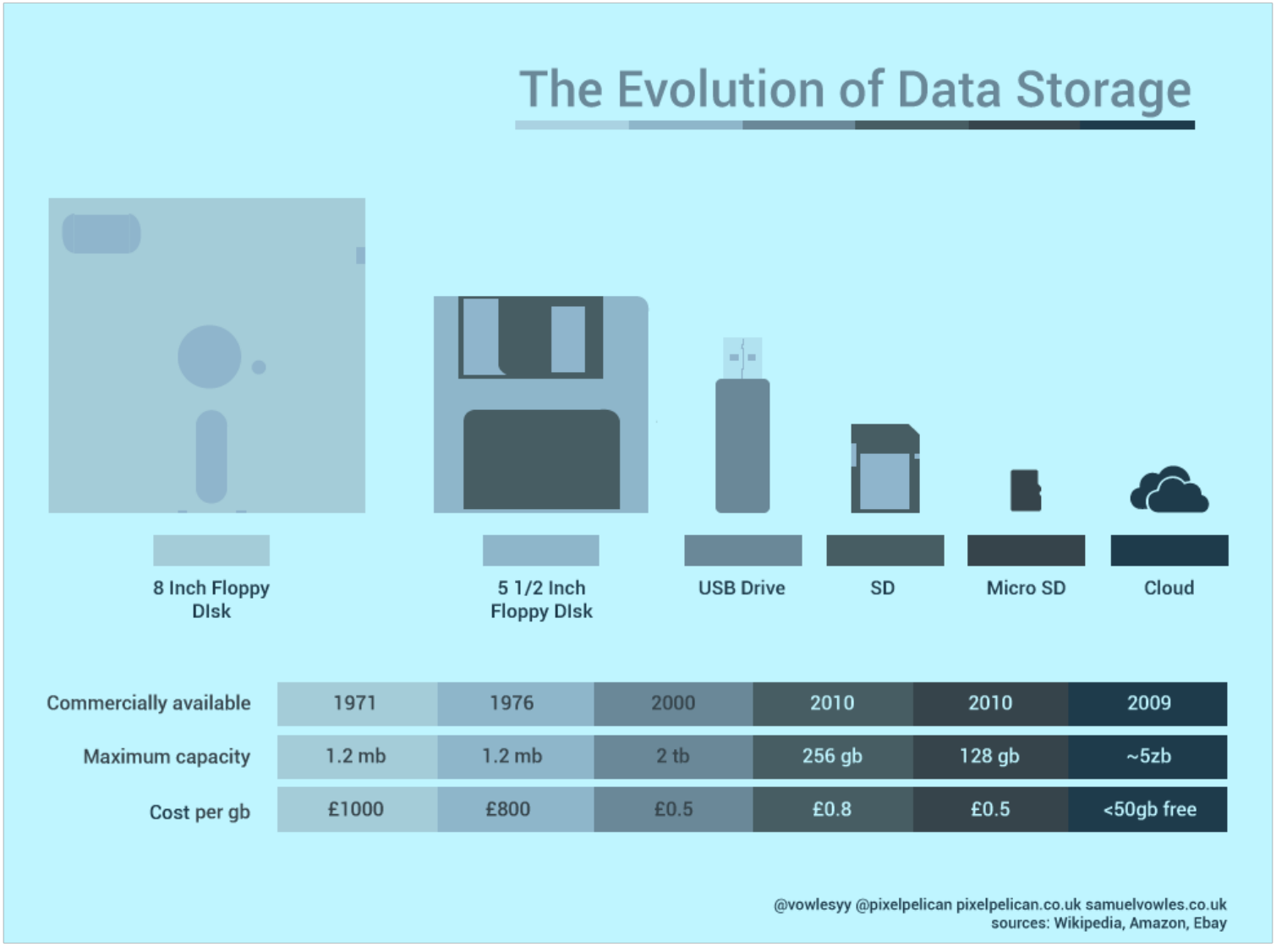
- first party datasets
  - data generated by your own product or systems
  - the most **useful** and **valuable** data you can collect about your consumers
- second party datasets
  - someone else's first-party data but useful to your organization
  - arrangement with trusted partners who are willing to share their customer data with you (and vice versa)
- third party datasets
  - data that is widely accessible to competitors, so you aren't gaining unique advantage
  - great for demographic, behavioral, and contextual targeting
  - data that you buy from outside sources that are not the original collectors of that data (data aggregators)

Data Ingestion Pipeline



data storage

evolution of data storage



ways of storing data

- object storage
  - is a way of structuring stored data so that it's characterized as objects that can be manipulated in different ways by hardware and network storage systems
  - the objects are not in a file-folder hierarchy
  - object stores are scalable, fast data retrieval and cost effective
- distributed file system
  - a file system with data stored on a server. The data is accessed and processed as if it was stored on the local client machine
  - convenient to share information and files among users on a network in a controlled and authorized way
- relational databases
  - uses a structure that allows us to identify and access data in relation to another piece of data in the database
  - data in a relational database is organized into tables

ways of storing data - cont'd

- NoSQL databases
  - a non-relational way of storing data
  - mostly used to store documents, key-value pair data
  - storing a large volume of data, and you don't want to lock yourself into a schema

hands-on workshop

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