Data sources

UNDERSTANDING DATA SCIENCE



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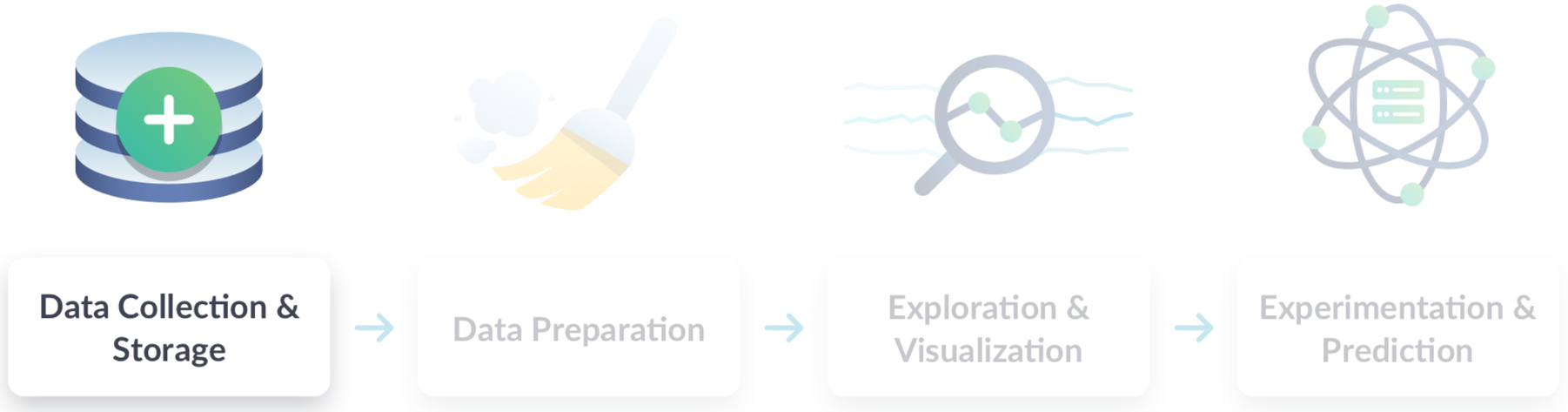
datacamp

The data science workflow



Sources of data

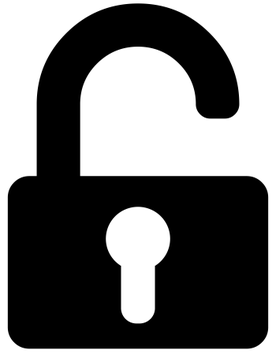
Company data

- Collected by companies
- Helps them make data-driven decisions



Open data

- Free, open data sources
- Can be used, shared, and built-on by anyone



Company data

- Web events
- Survey data
- Customer data
- Logistics data
- Financial transactions



Web data

event_name	timestamp	user_id
homepage_visit	2019-01-01 12:01:01	1234

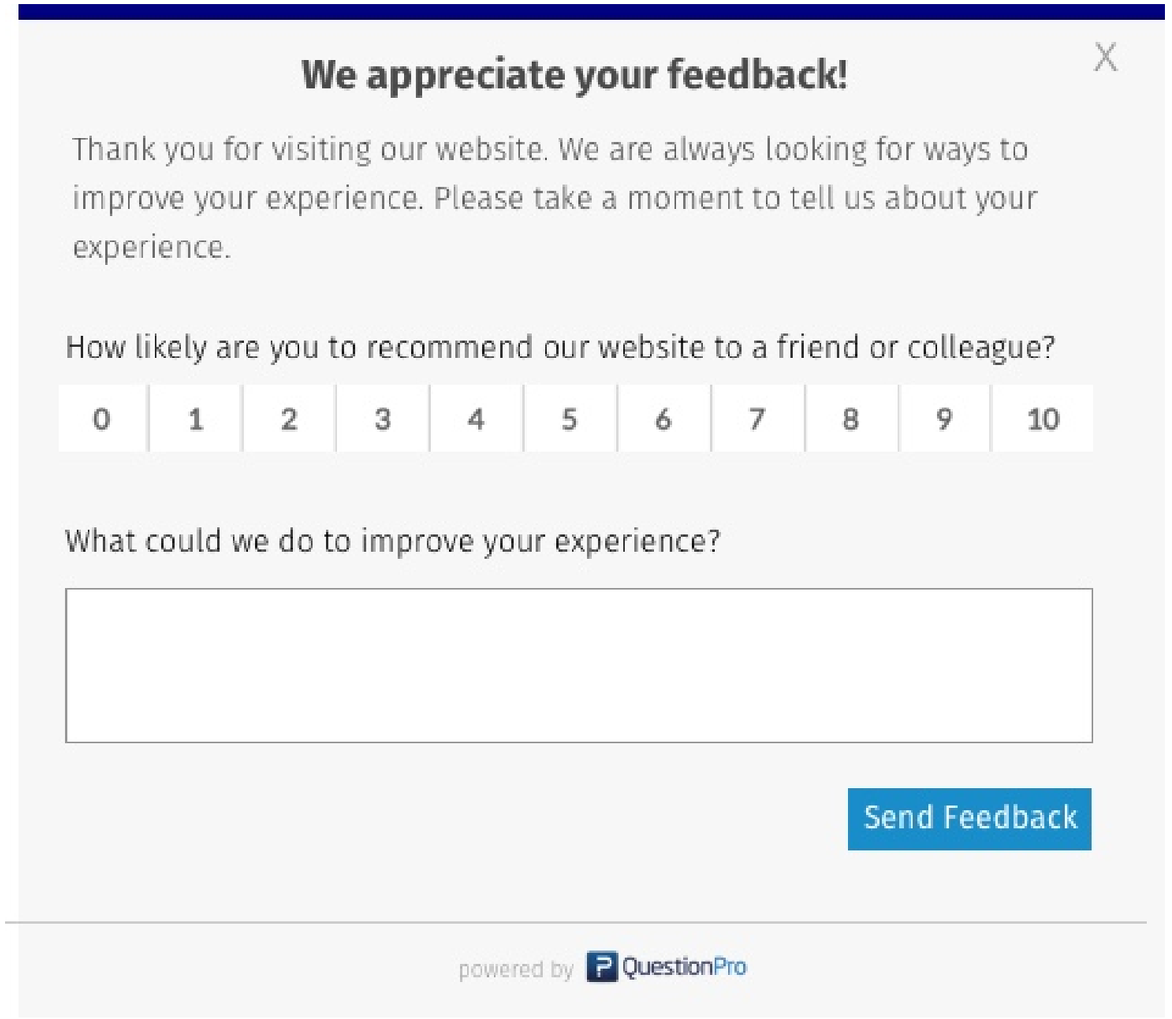
- Events
- Timestamps
- User information

Survey data

- Asking people for their opinions
- Methods:
  - Face-to-face interview
  - Online questionnaire
  - Focus group

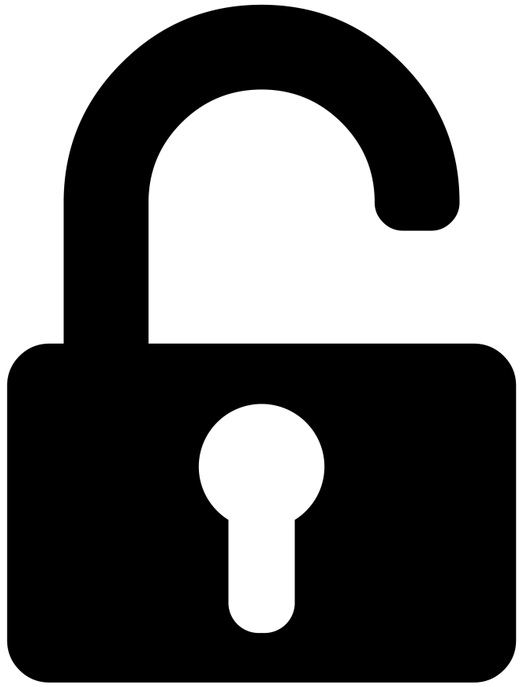


Net Promoter Score



Open data

- Data APIs
- Public records



Public data APIs

- **A**pplication **P**rogramming **I**nterface
- Request data over the internet

- Twitter
- Wikipedia
- Yahoo! Finance
- Google Maps
- Many more!

Tracking a hashtag

- All tweets with `#DataFramed` (DataCamp's podcast!)
- Use Twitter API



Public records

- International organizations
  - e.g.: World Bank, UN, WTO
- National statistical offices
  - e.g.: censuses, surveys
- Government agencies
  - e.g.: weather, environment, population



- For the US, **data.gov**
- For the EU, **data.europa.eu**



Let's practice!

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Data types

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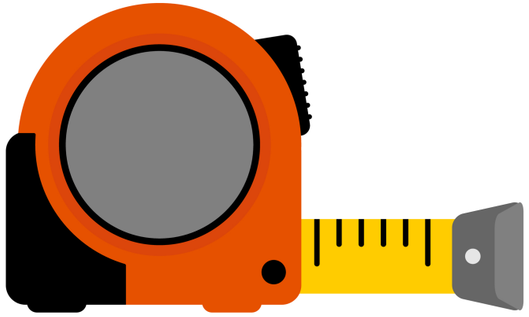
Why care about data types?

- Important later on when:
  - Storing the data
  - Visualizing/analyzing the data

Quantitative vs qualitative data

Quantitative data

- Deals with numbers
- Data can be measured



Qualitative data

- Deals with descriptions
- Data can be observed but not measured



Quantitative data



- Is 60 inches tall
- Has 2 apples in it
- Costs $1000

Qualitative data

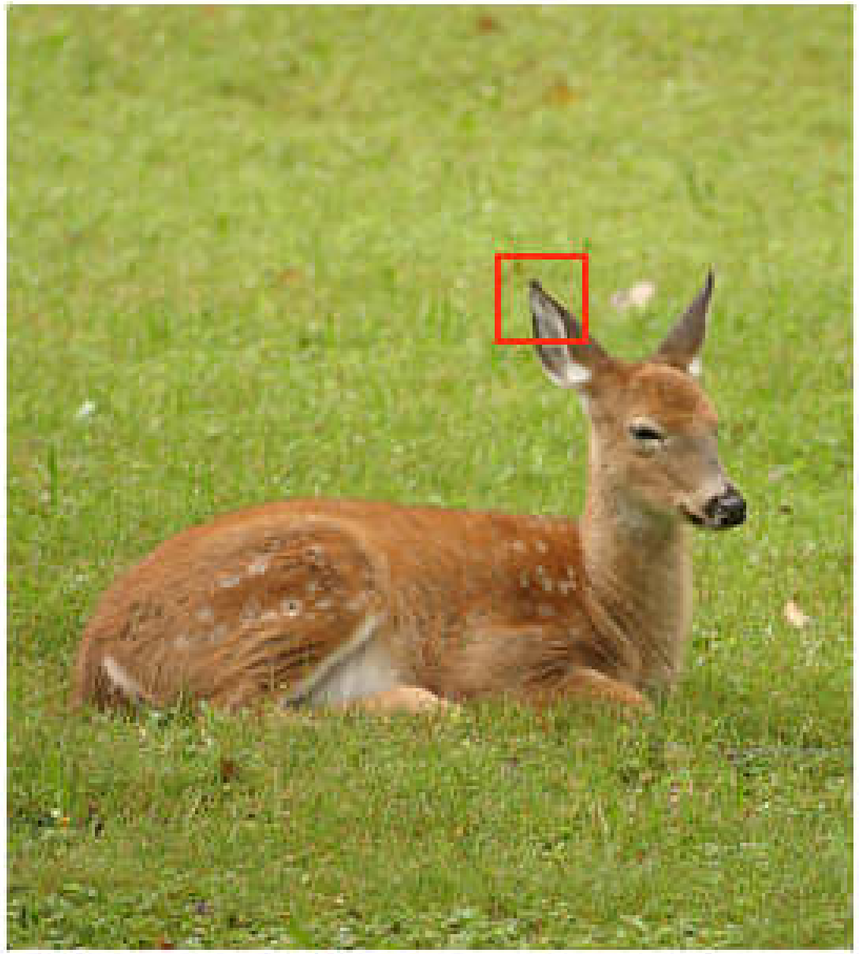


- Is red
- Was built in Italy
- Smells like fish

Other data types

- Image data
- Text data
- Geospatial data
- Network data
- ...

Other data types: Image data





Other data types: Text data

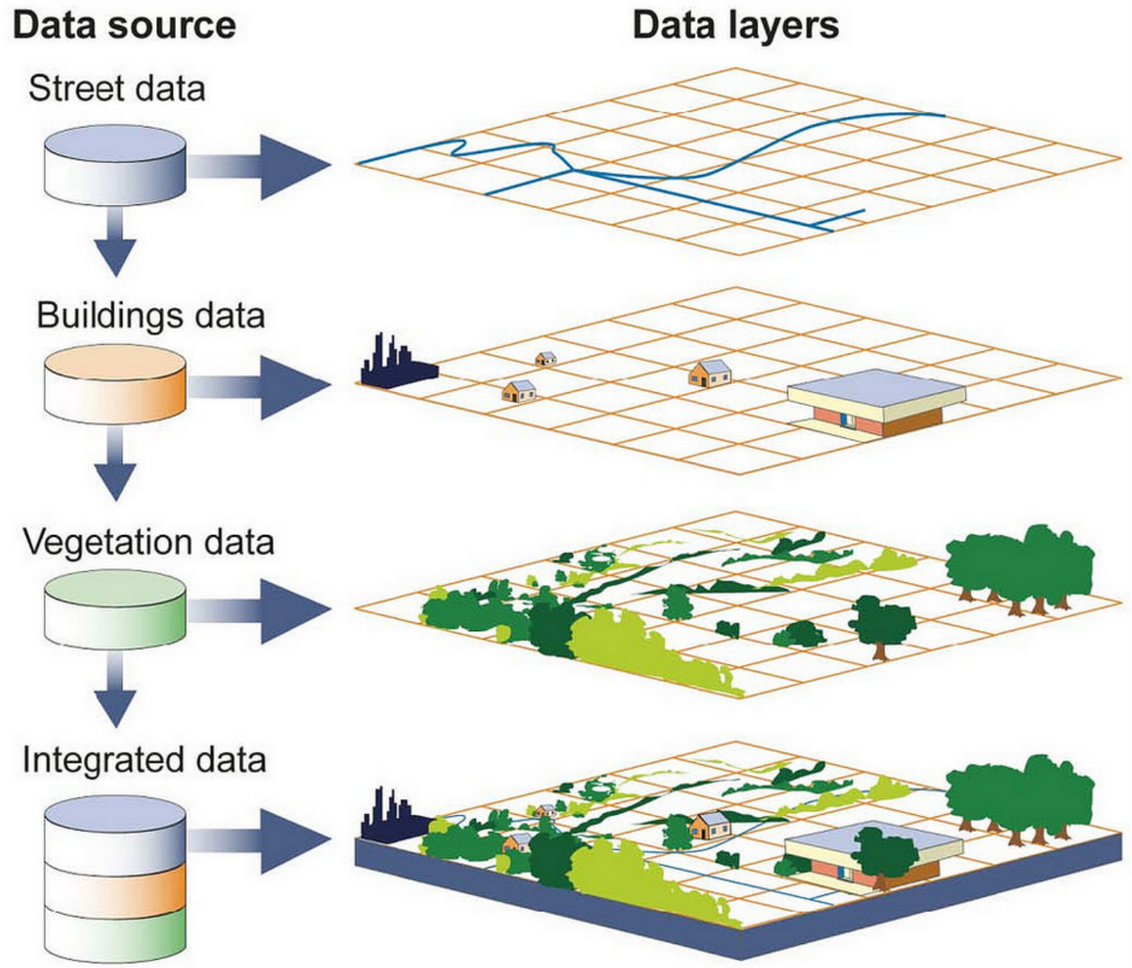
"Great evening, extremely good value"

 Review of L'Ange 20 Restaurant

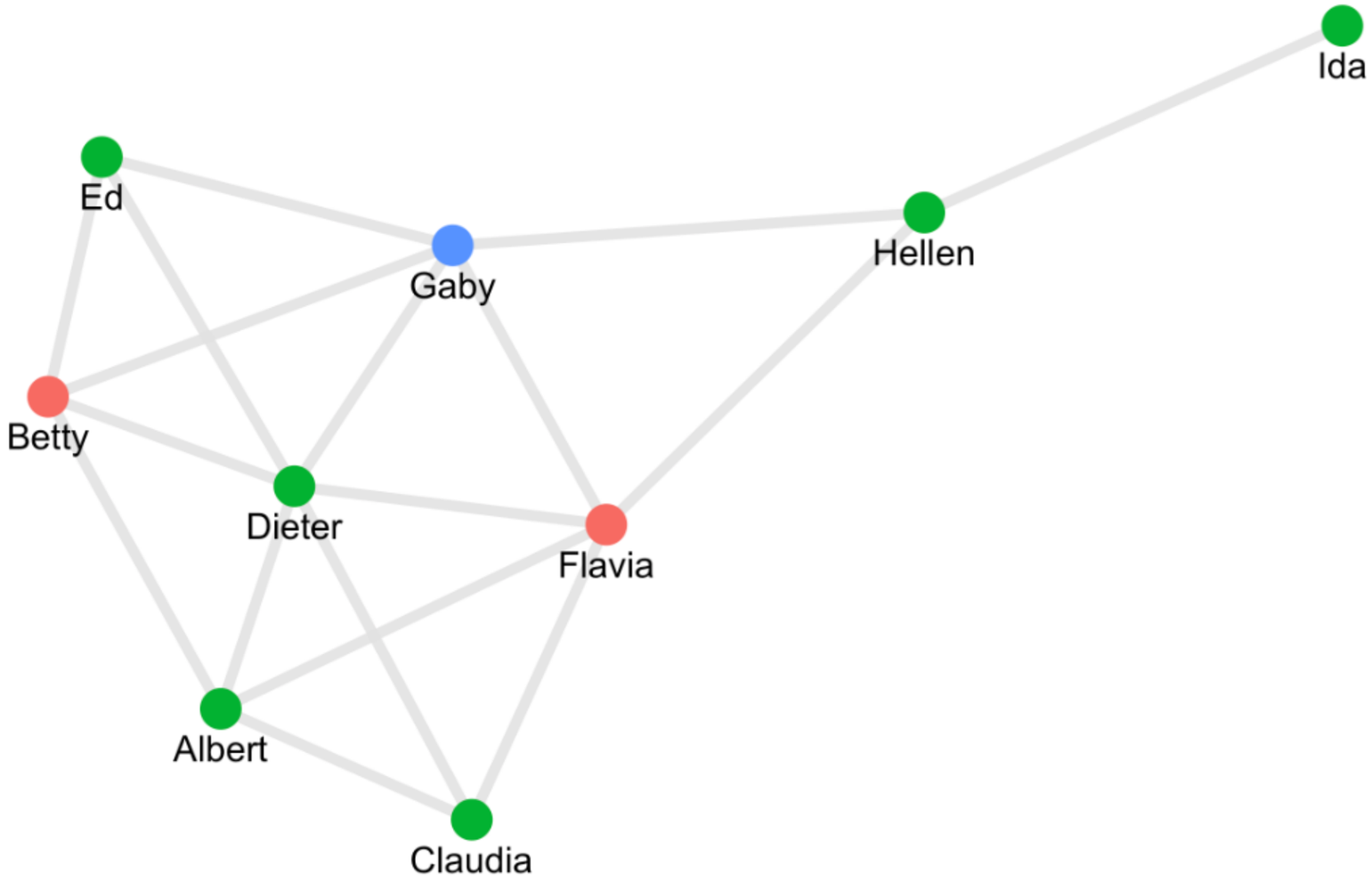
I went to this place with my boyfriend for a special occasion and we were not disappointed. We were greeted warmly by Christopher who guided us through the menu and wine. The food was delicious and I only wish that we could have had room for three courses. The value was excellent compared to other prices we had seen and we found the quality/value and atmosphere hard to match during the rest of our stay.

I had the lamb which I can highly recommend. When we return to Paris we will go back!

Other data types: Geospatial data



Other data types: Network data



Recap

- Quantitative data
- Qualitative data
- Image data
- Text data
- Geospatial data
- Network data

Let's practice!

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Data storage and retrieval

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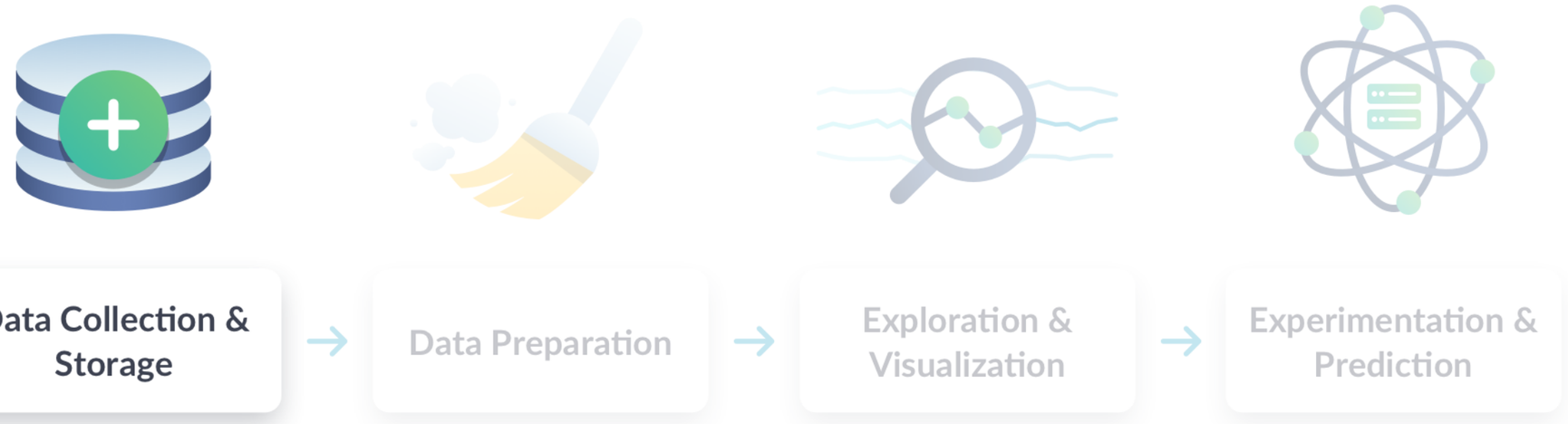


Things to consider when storing data

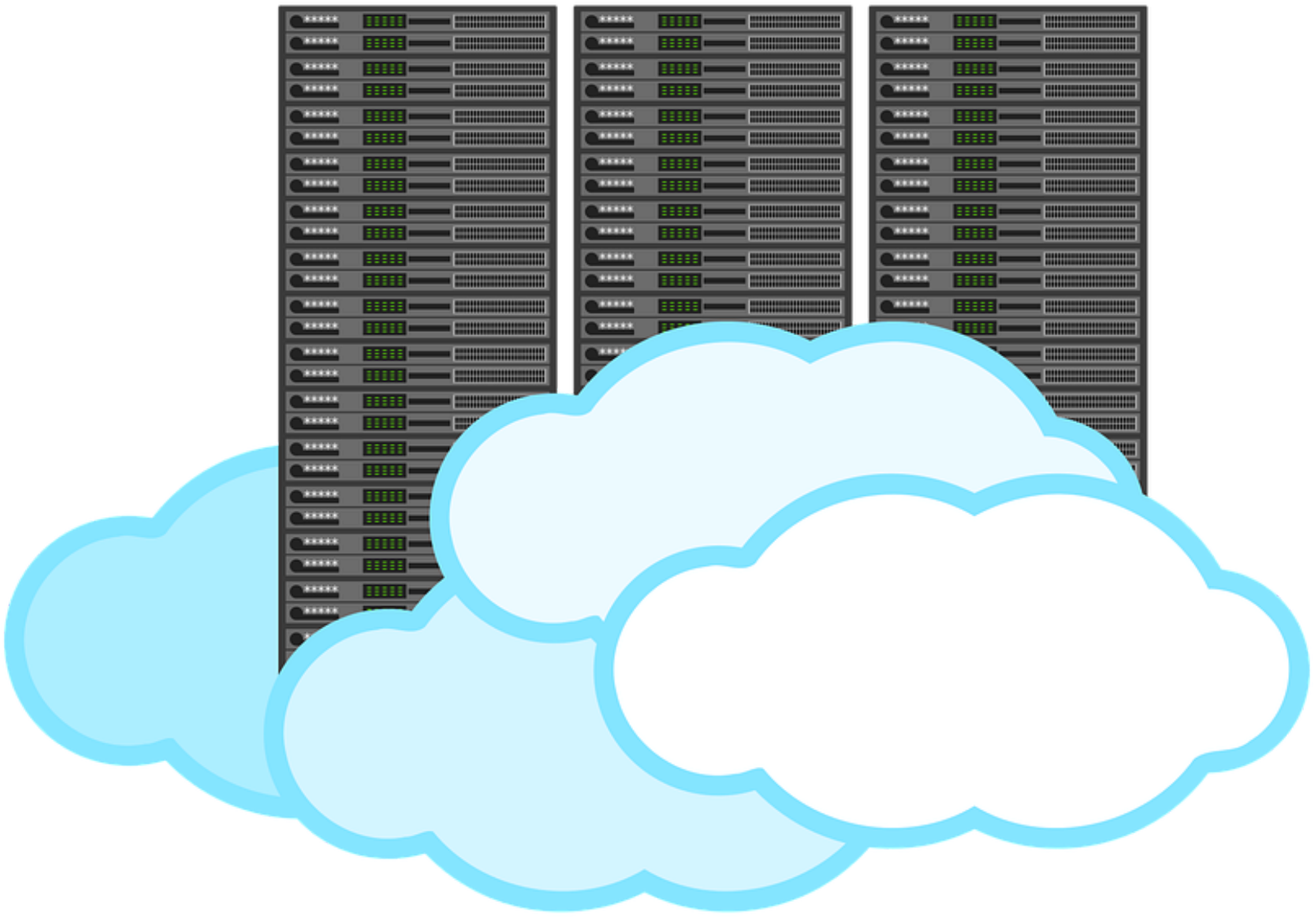
- Location
- Data type
- Retrieval

Location: Parallel storage solutions





Location: The cloud



Types of data storage

Unstructured

- Email
- Text
- Video and audio files
- Web pages
- Social media

Document Database

Types of data storage

Unstructured

- Email
- Text
- Video and audio files
- Web pages
- Social media

Document Database

Tabular

Customer Name	Customer Address	...
Jane Doe	123 Maple St.	...

Relational Database

Retrieval: Data querying



Retrieval: Data querying



Data Type	Query Language
Document Database	NoSQL
Relational Database	SQL

Putting it all together: Location



- On-premises cluster
- Cloud provider:
  - Azure
  - AWS
  - Google Cloud

Putting it all together: Data type



Putting it all together: Data type

Data Type	Storage Solution
Unstructured	Document Database
Tabular	Relational Database



Putting it all together: Queries



Putting it all together: Queries



Data Type	Query Language
Document Database	NoSQL
Relational Database	SQL

Let's practice!

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Data Pipelines

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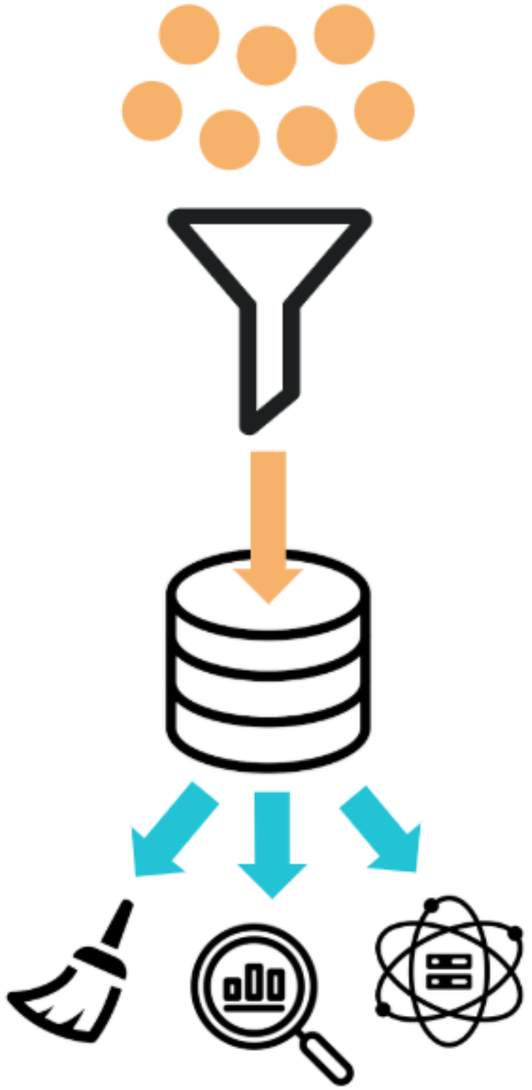
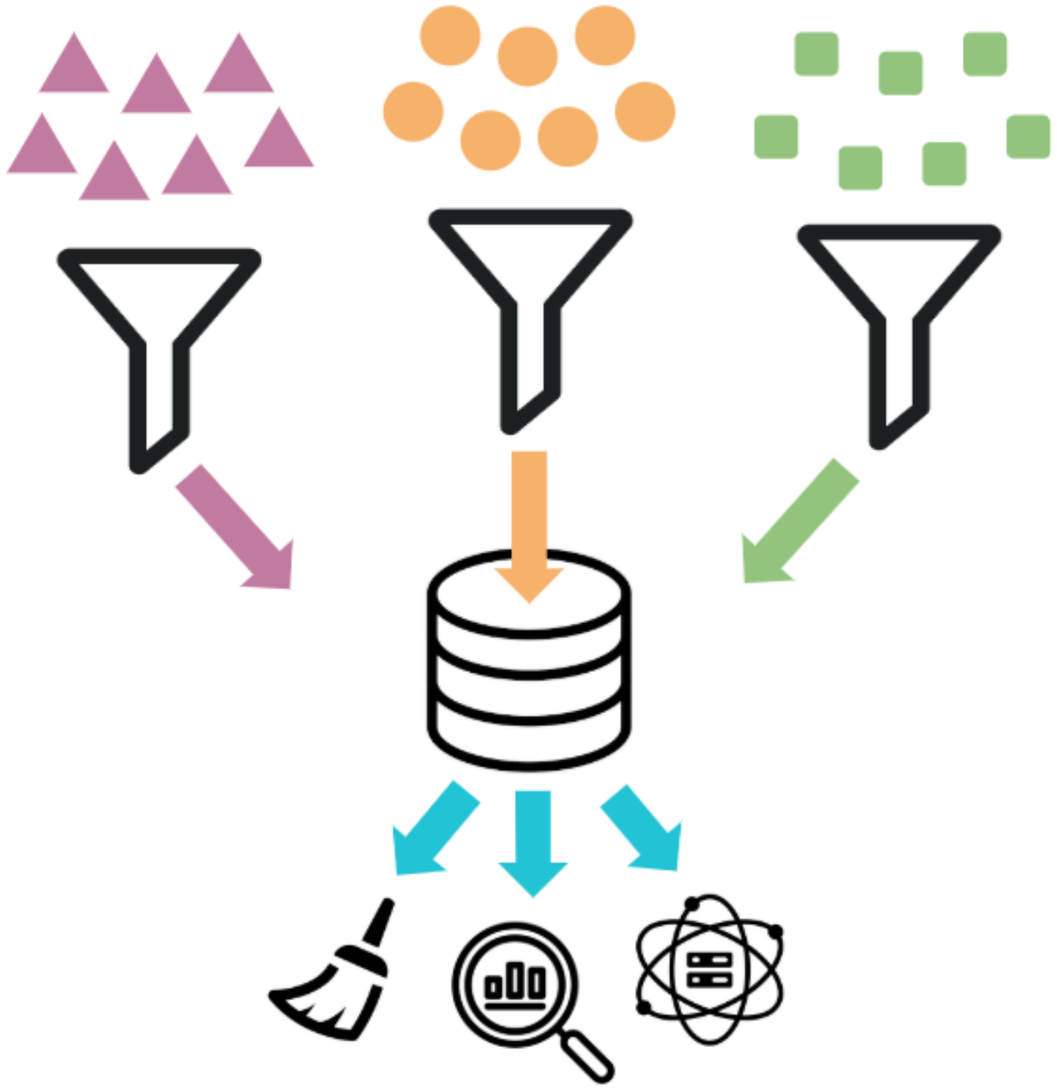




How do we scale?

More than one data source:

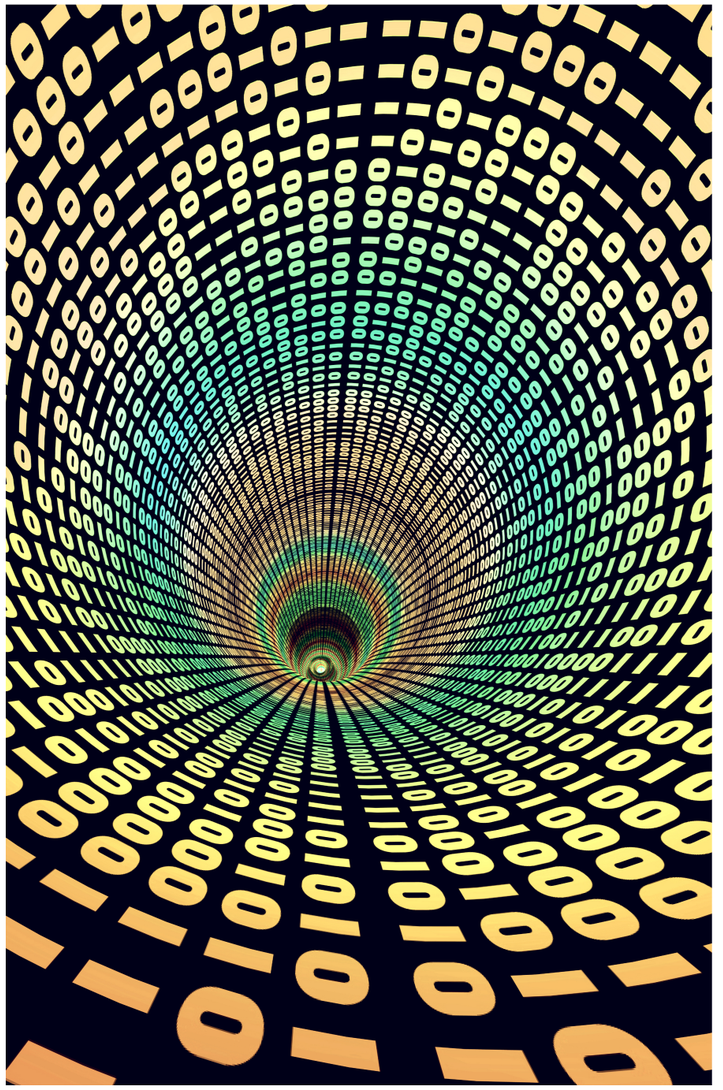
- Public records
- APIs
- Databases

Different data types:

- Unstructured data
- Tabular data
- Real-time streaming data *e.g., tweets*

What is a data pipeline?

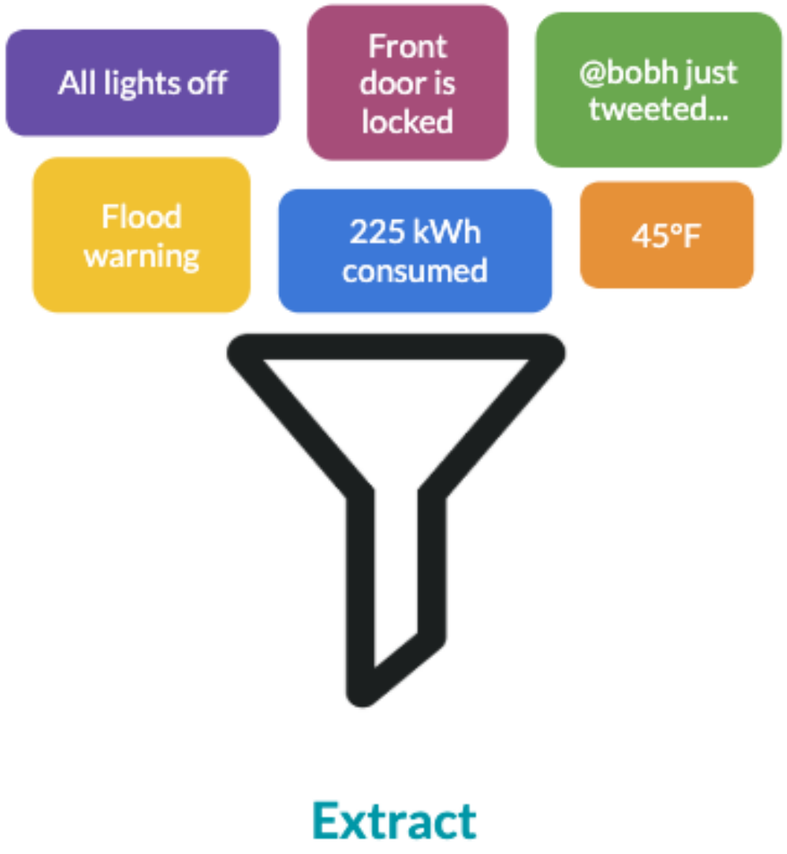
- Moves data into defined stages
- Automated collection and storage
  - *Scheduled hourly, daily, weekly, etc*
  - *Triggered by an event*
- Monitored with generated alerts
- Necessary for big data projects
- Data engineers work to customize solutions
- **E**xtract **T**ransform **L**oad (ETL)



Case study: smart home

Data	Source	Frequency
Weather conditions	National Weather Service API	Every 30 minutes
Tweets in your area	Twitter API	Real-time stream
Indoor temperature	Smart home thermostat	Every 5 minutes
Status of lights	Smart light bulbs	Every minute
Status of locks	Smart door locks	Every 15 seconds
Energy consumption	Smart meter	Weekly

Extract



Source	Frequency
National Weather API	Every 30 minutes
Twitter API	Real-time stream
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Smart light bulbs	Every minute
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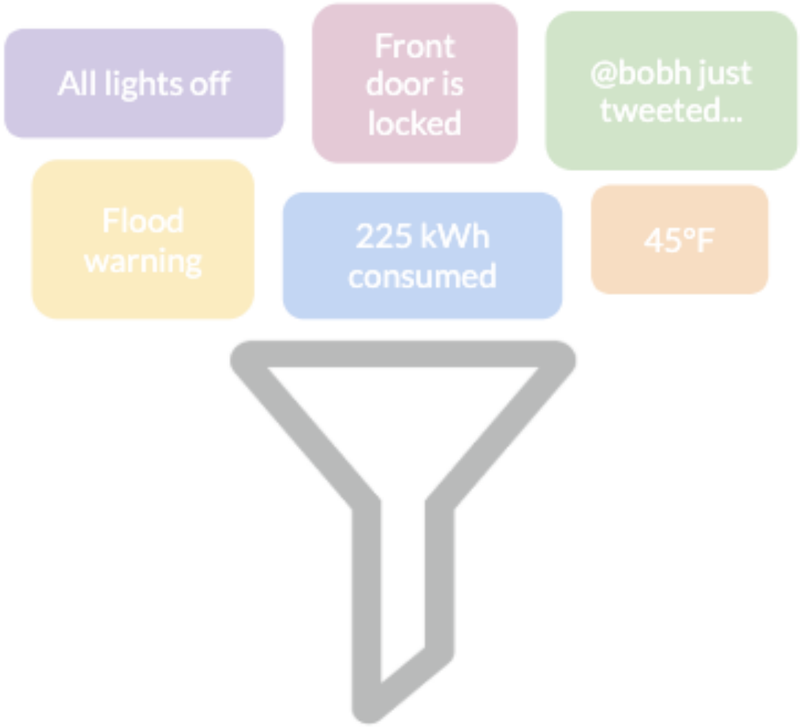
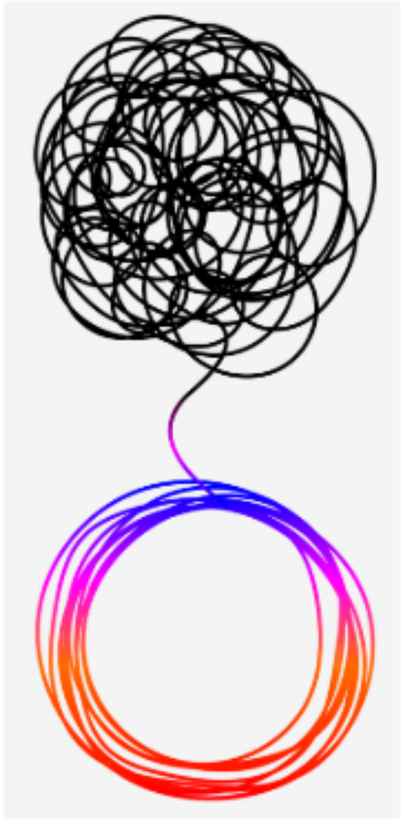
Smart meter	Weekly

Transform



Extract



Transform

Transform

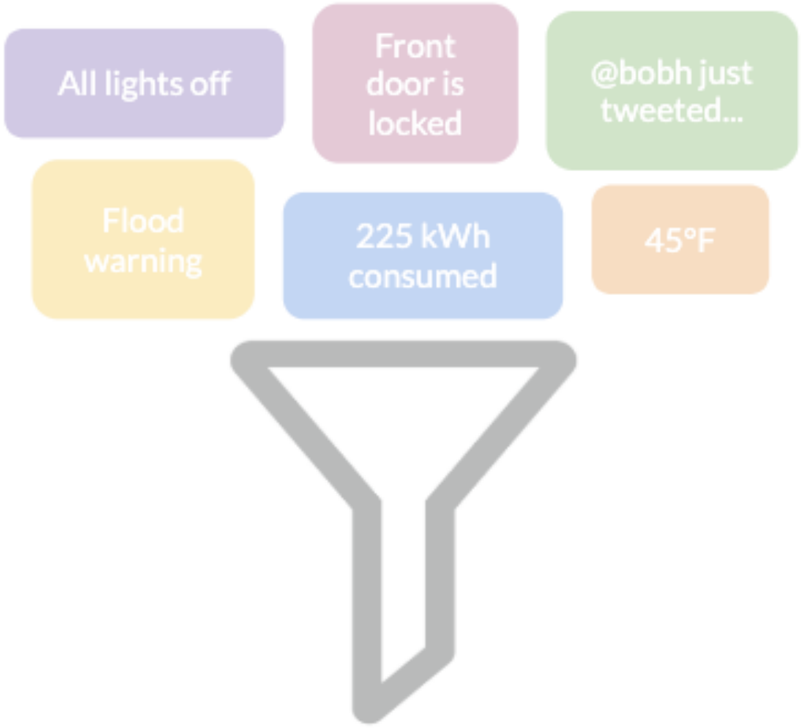
With all the data coming in, how do we keep it organized and easy to use?

Example transformations:

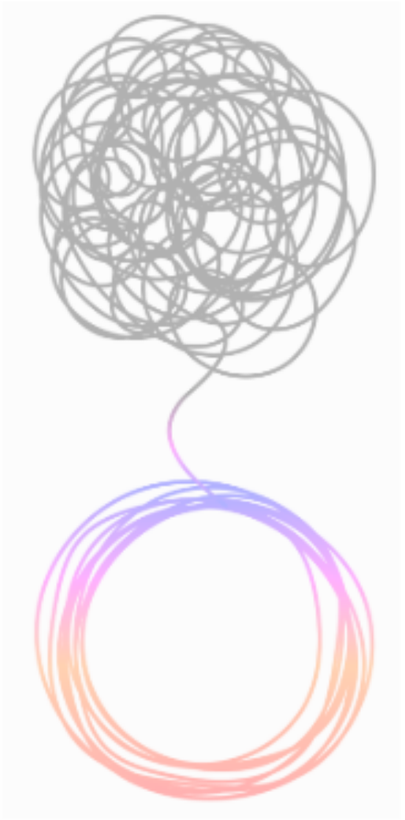
- Joining data sources into one data set
- Converting data structures to fit database schemas
- Removing irrelevant data

Data preparation and exploration does not occur at this stage

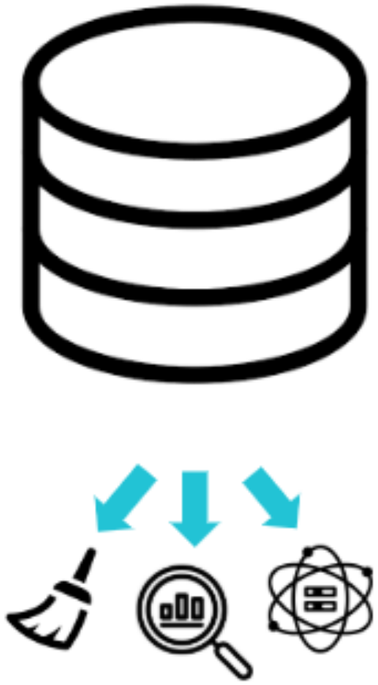
Load



Extract

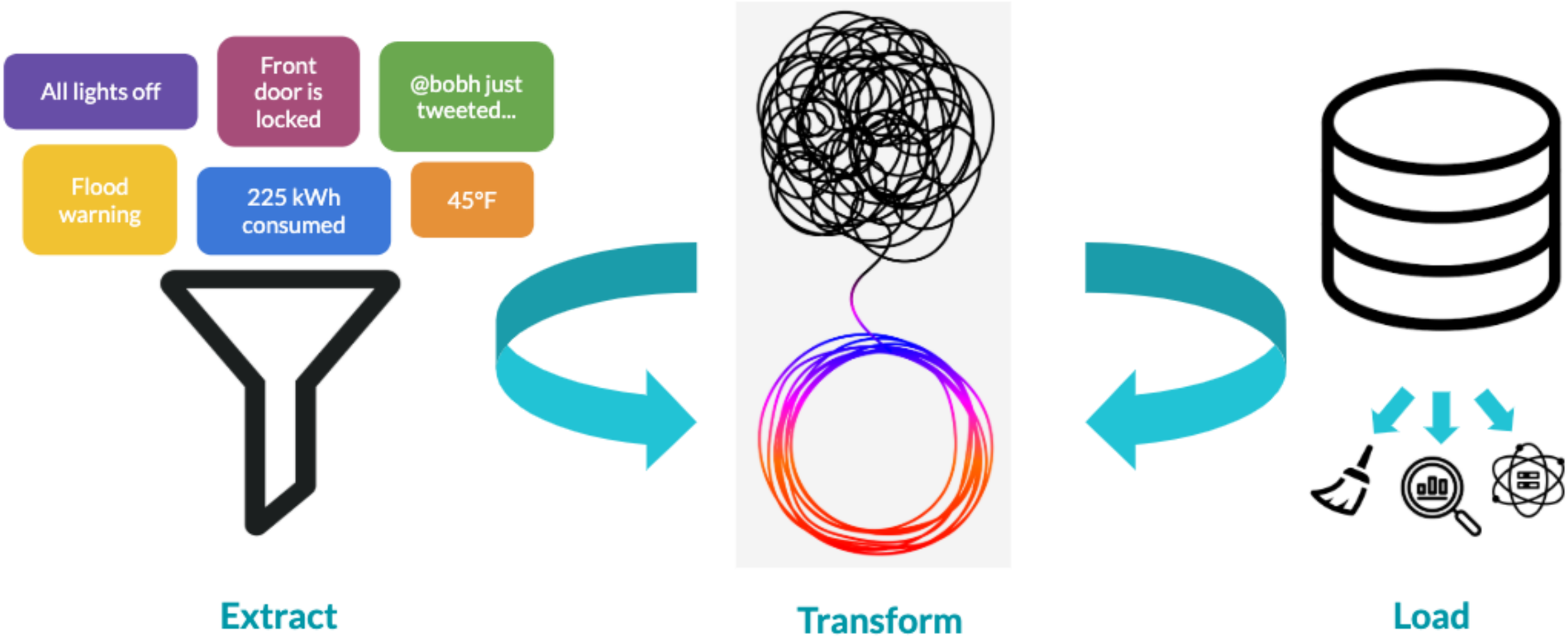


Transform



Load

Automation


All lights off
Front door is locked
@bobh just tweeted...
Flood warning
225 kWh consumed
45°F
Extract
Transform
Load

Let's practice!

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