What is data science?

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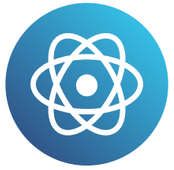

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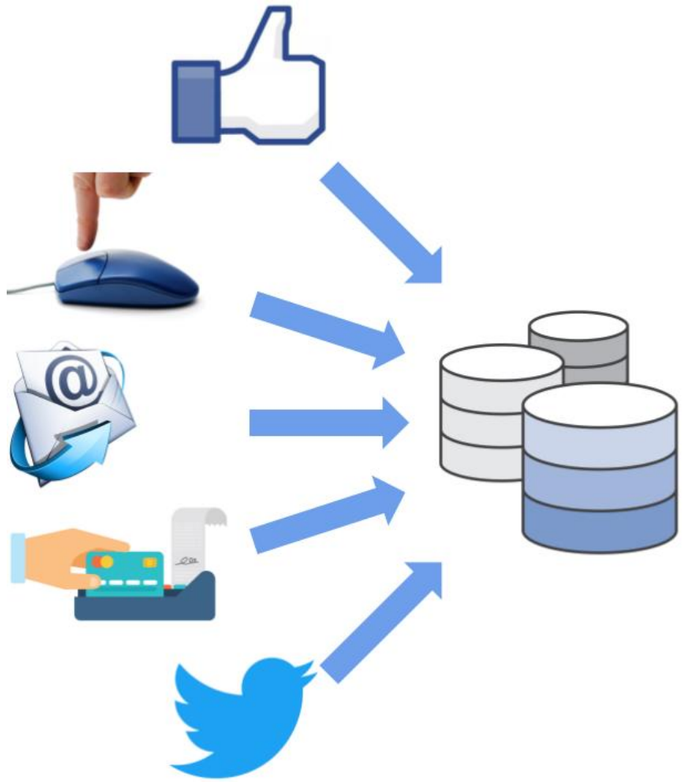
Let's ask Google!

Making data work for you



Use data to better describe the present or better predict the future

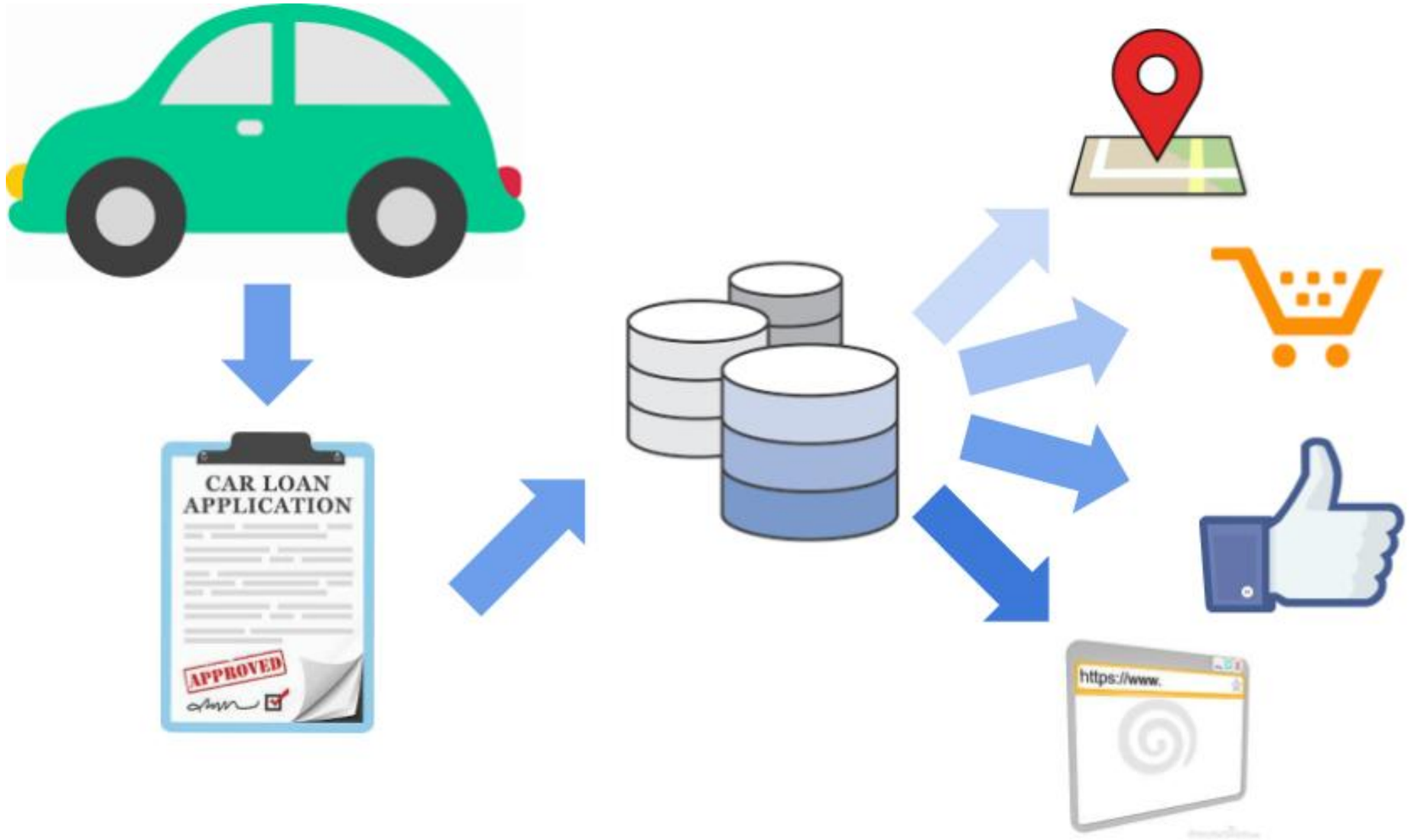
What can data do?

- Describe the current state of an organization or process
- Detect anomalous events
- Diagnose the causes of events and behaviors
- Predict future events

Why now?

Why now?

Why now?



The data science workflow

Data Collection & Storage

Data Preparation

Exploration & Visualization

Experimentation & Prediction

Let's practice!

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Applications of data science

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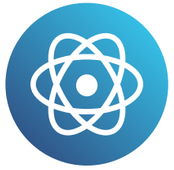

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More case studies

- Traditional machine learning
- Internet of Things (IoT)
- Deep Learning

Case study: fraud detection

Case study: fraud detection

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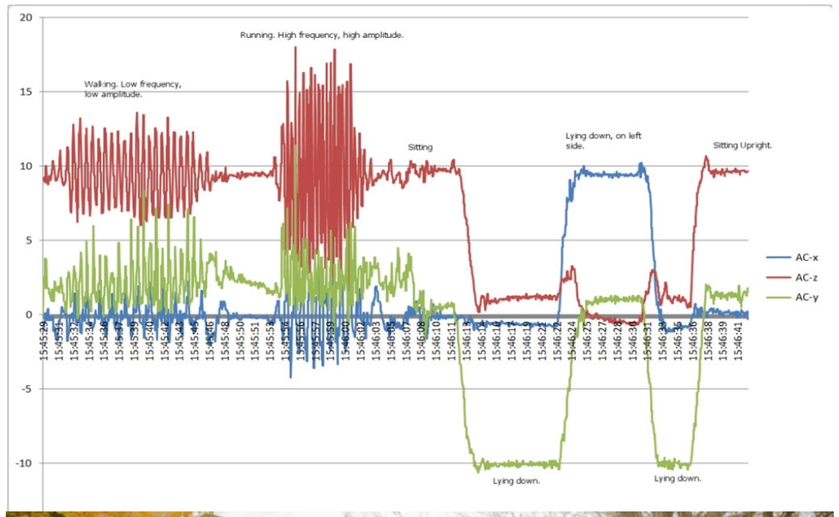
What do we need for machine learning?

- A well-defined question
  - *"What is the probability that this transaction is fraudulent?"*
- A set of example data
  - *Old transactions labeled as "fraudulent" or "valid"*
- A new set of data to use our algorithm on
  - *New credit card transactions*

Case study: smart watch



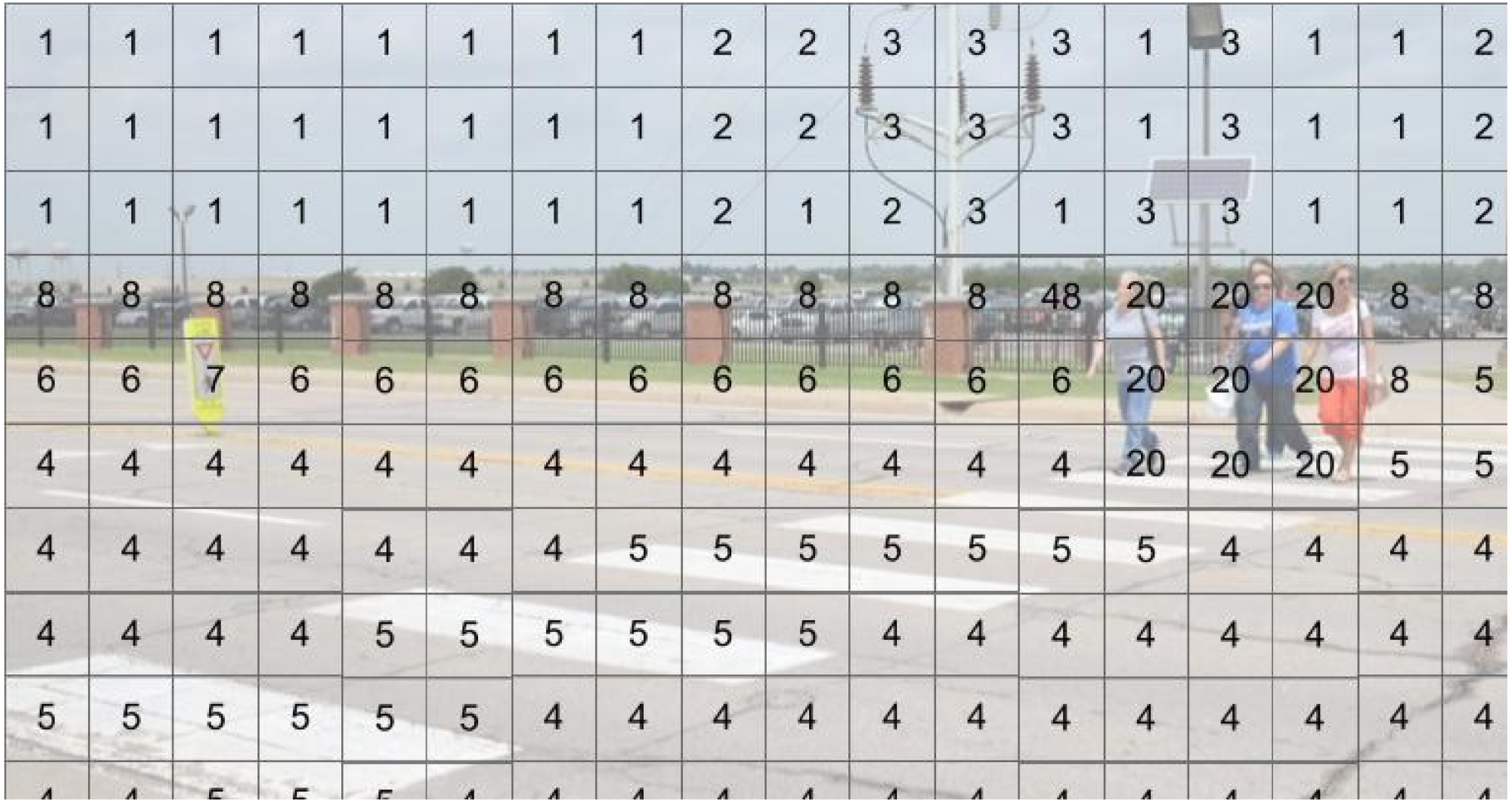
Internet of Things

Refers to gadgets that aren't standard computers

- Smart watches
- Internet-connected home security systems
- Electronic toll collection systems
- Building energy management systems
- Much, much more!

Case study: image recognition

Case study: image recognition



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Deep learning

- Many neurons work together
- Requires much more training data
- Used in complex problems
  - Image classification
  - Language learning/understanding

Let's practice!

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Data science roles and tools

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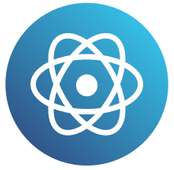

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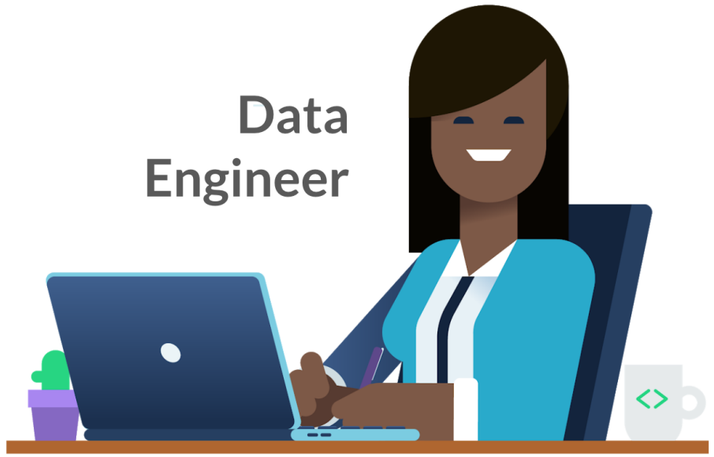
Data Engineer



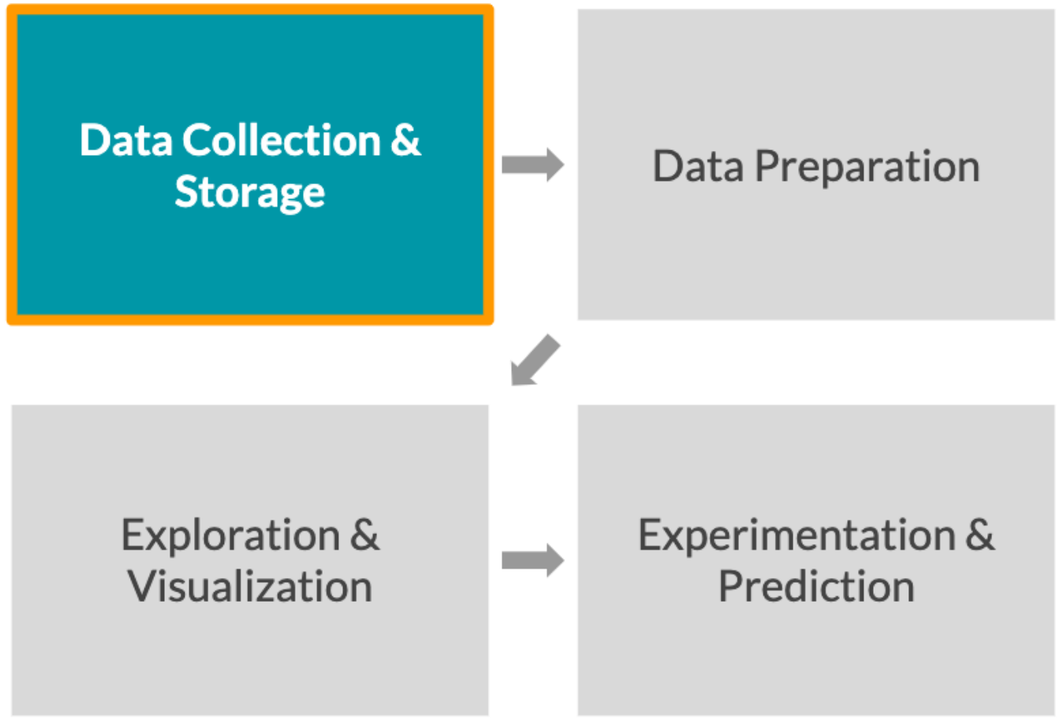
Data Analyst

Data Scientist

Machine Learning Scientist

Data engineer

- Information architects
- Build data pipelines and storage solutions
- Maintain data access

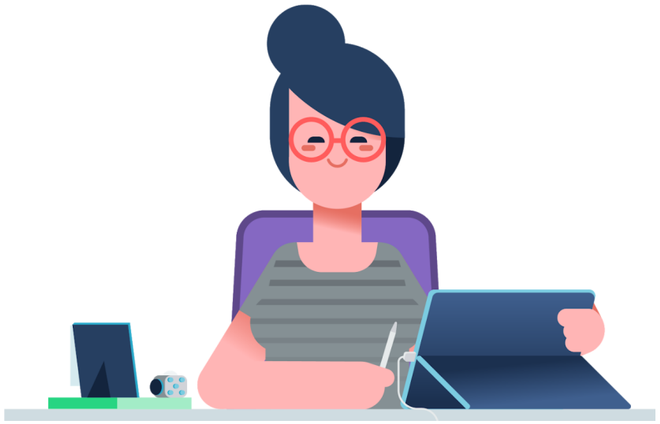


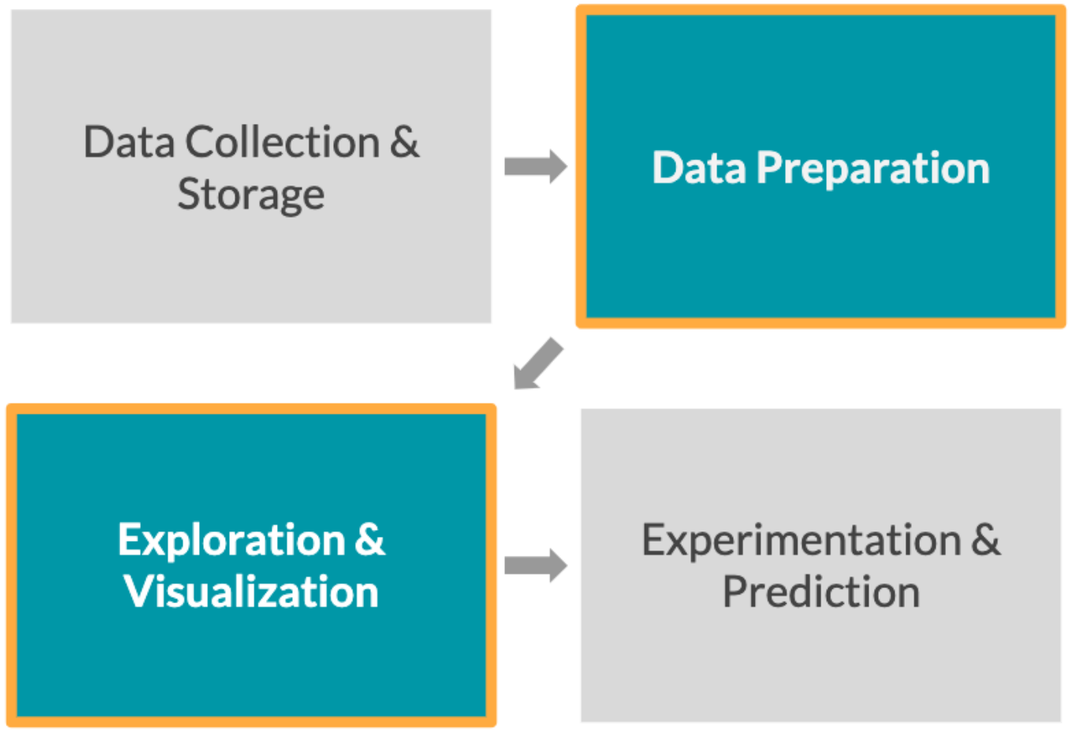
Data engineering tools

- **SQL**
  - To store and organize data
- **Java**, **Scala**, or **Python**
  - Programming languages to process data
- **Shell**
  - Command line to automate and run tasks
- **Cloud computing**
  - AWS, Azure, Google Cloud Platform

Data analyst

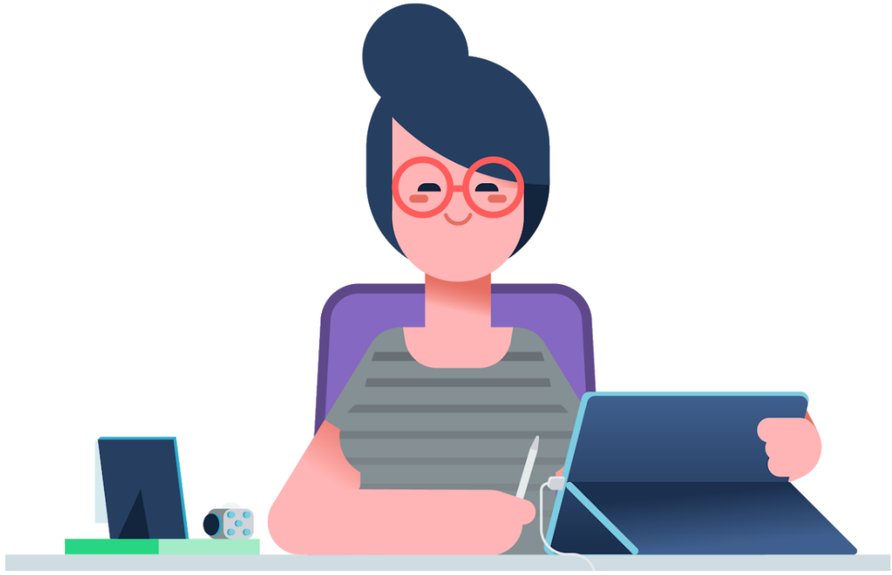
- Perform simpler analyses that describe data
- Reports and dashboards to summarize data
- Clean data for analysis





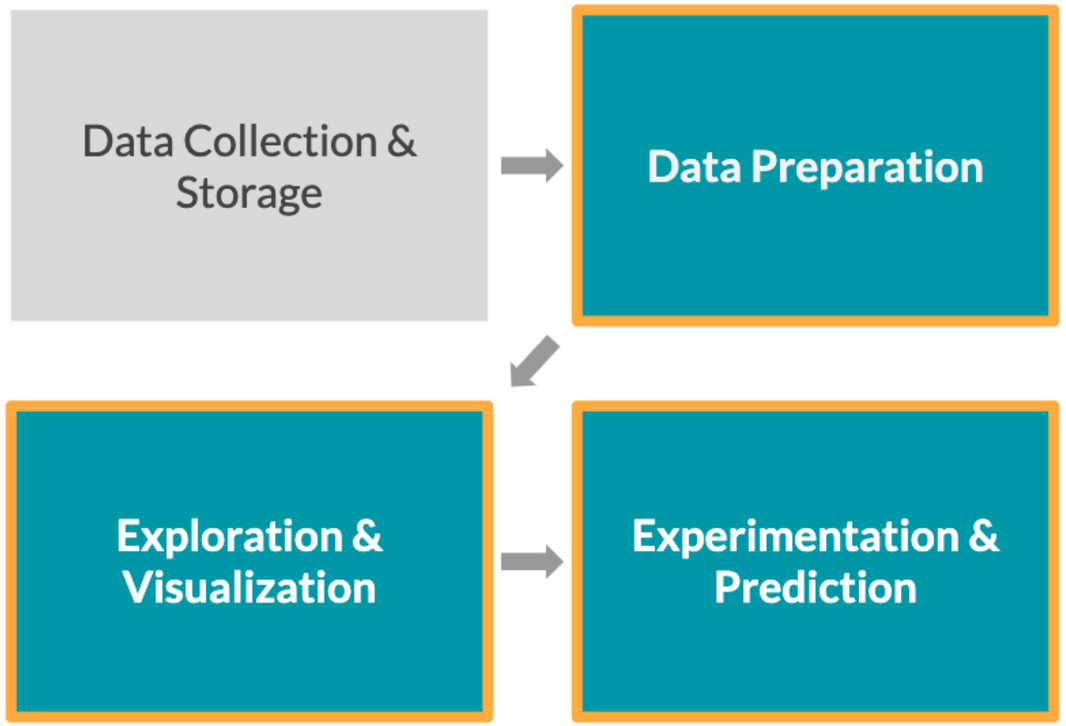
Data analyst tools

- **SQL**
  - Retrieve and aggregate data
- **Spreadsheets (Excel or Google Sheets)**
  - Simple analysis
- **BI Tools (Tableau, Power BI, Looker)**
  - Dashboards and visualizations
- *May have:* R and Python
  - Clean and analyze data



Data scientist

- Versed in statistical methods
- Run experiments and analyses for insights
- Traditional machine learning

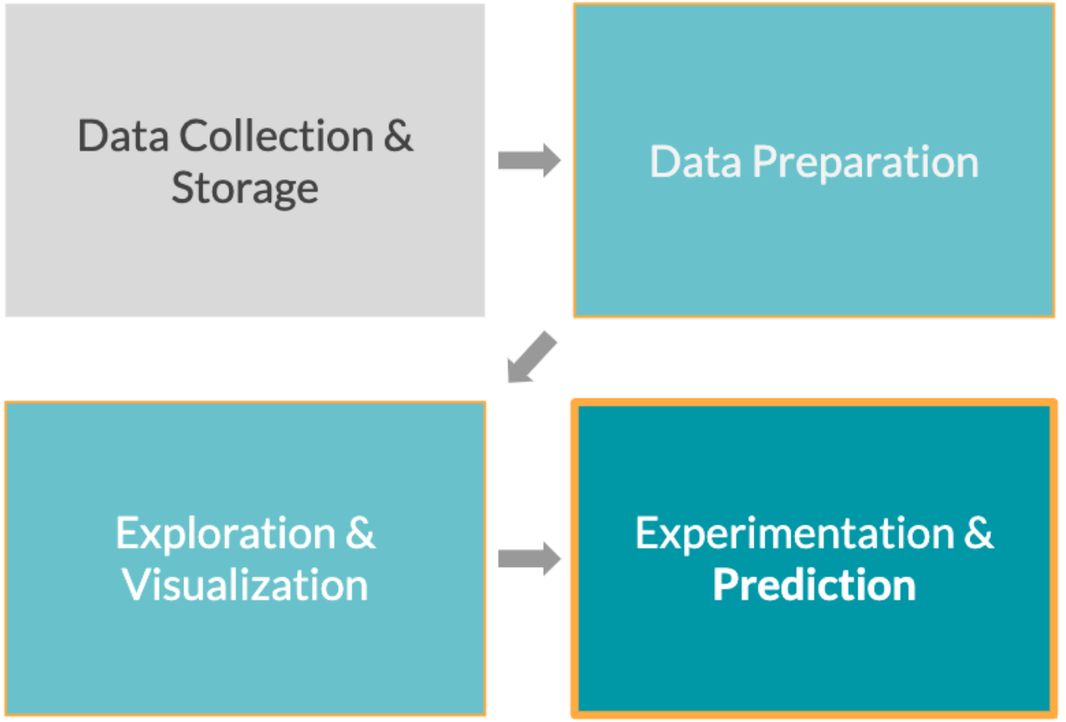


Data scientist tools

- **SQL**
  - Retrieve and aggregate data
- **Python and/or R**
  - With associated data science libraries, e.g., `pandas` (Python) and `tidyverse` (R)

Machine learning scientist

- Predictions and extrapolations
- Classification
- Deep Learning
  - Image processing
  - Natural language processing



Machine learning tools

- **Python and/or R**
  - With associated machine learning libraries, e.g., `TensorFlow` or `Spark`

Data Engineer	Data Analyst	Data Scientist	Machine Learning Scientist
Store and maintain data	Visualize and describe data	Gain insights from data	Predict with data
SQL + Java/Scala/Python	SQL + BI Tools + Spreadsheets	Python/R	Python/R

Let's practice!

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