R | Basic Text Analysis

Presented by Aviv Lo

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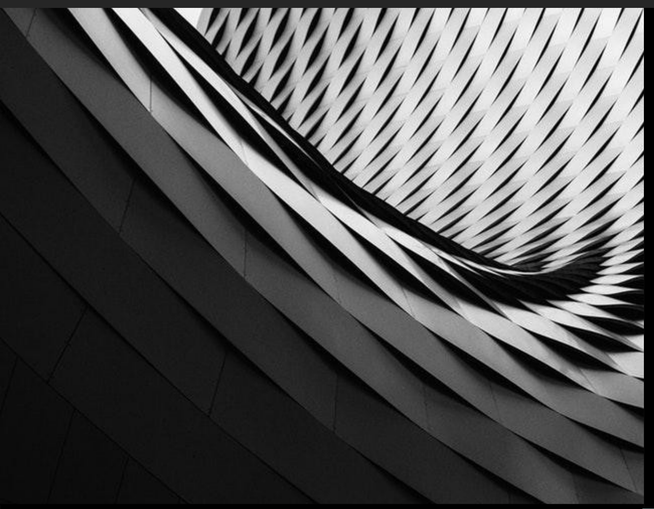
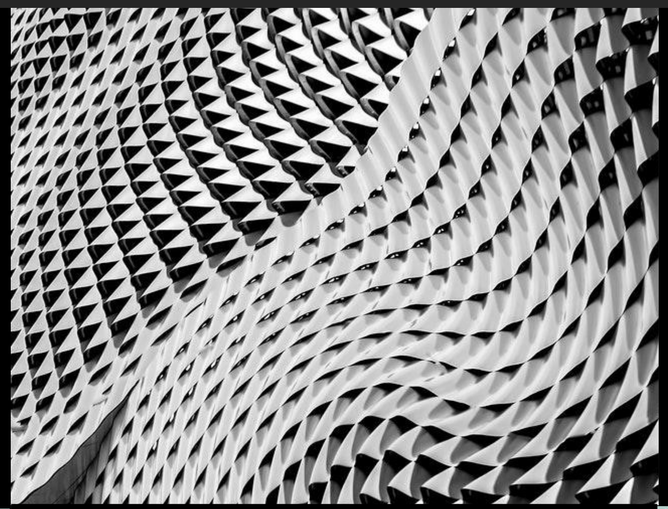


Topic 2

AI/ML/NLP Explained

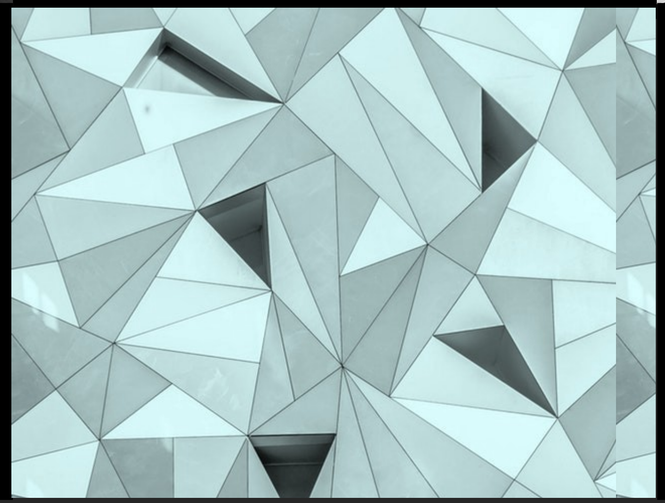


Topic 4

Data Gathering & Extraction

Topic 1

R vs. Python

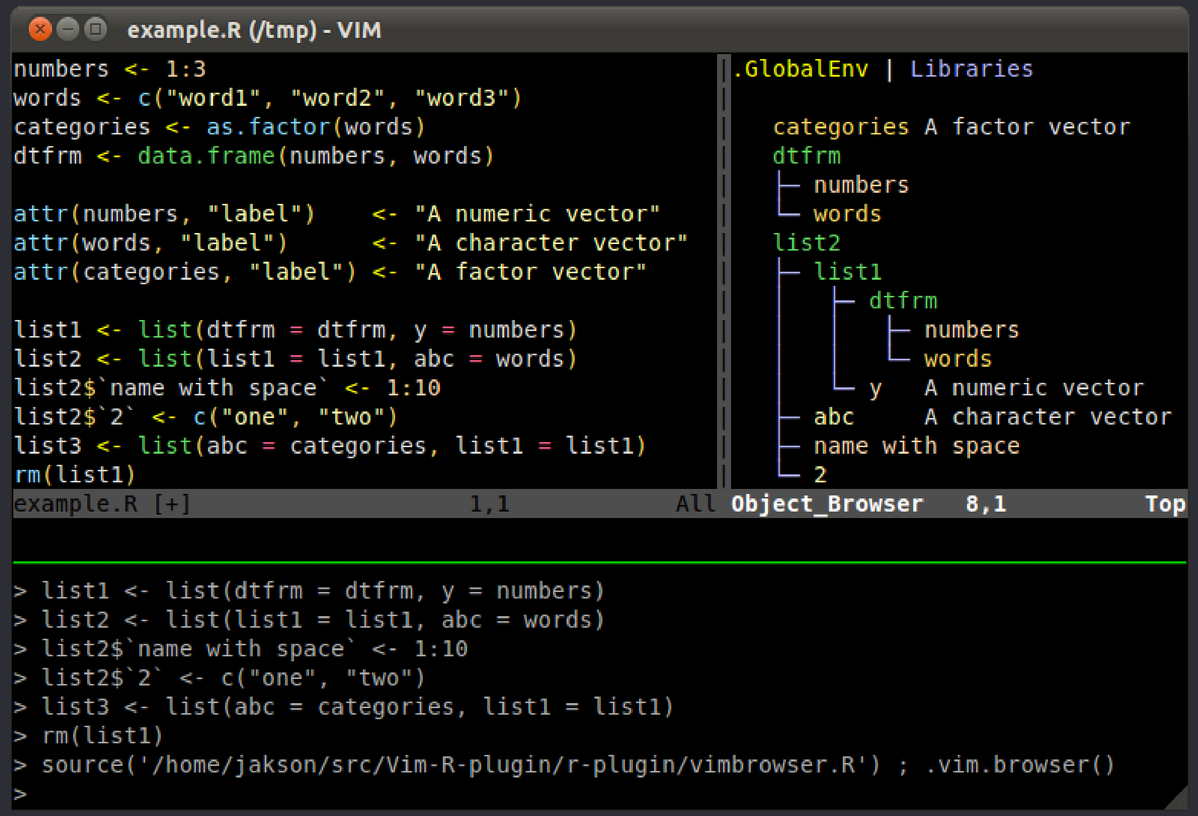


Topic 3

Text Analysis

1 R vs. Python

1. Developed by Ross Ihaka and Robert Gentleman in 1993
2. Hence the name “R”
3. Maintained by The R Foundation for Statistical Computing
4. Difficult for beginners + Steep learning curve
5. Rich and powerful visualization libraries
6. Support matrix / vectorized operations
7. It’s born for stats



1. Developed by Guido van Rossum in 1991
2. Naming was inspired by Monty Python
3. Successor to the ABC language
4. Maintained by the Python Software Foundation
5. Easy for beginners + Smooth learning curve
6. Good libraries for creating graphs
7. Support matrix / vectorized operations via external libs

concept_recaps.py > ...

```python
# Libraries
import pandas as pd

"""
Python Native Data Structures
"""
# List
# Create a list
list = ["Jan", "Feb", "Mar", "Apr", "May"]
list.append("Jun")
print(list)

# Tuple
# Create a tuple
tuple = ("Jan", "Feb", "Mar", "Apr", "May")
# tuple.append("Jun") # This will throw an error
print(tuple)

# Dictionary
# Create a dictionary
dictionary = {
    "Jan": 31,
    "Feb": 28,
    "Mar": 31,
    "Apr": 30,
    "May": 31
}
dictionary["Jun"] = 30
print(dictionary)

```

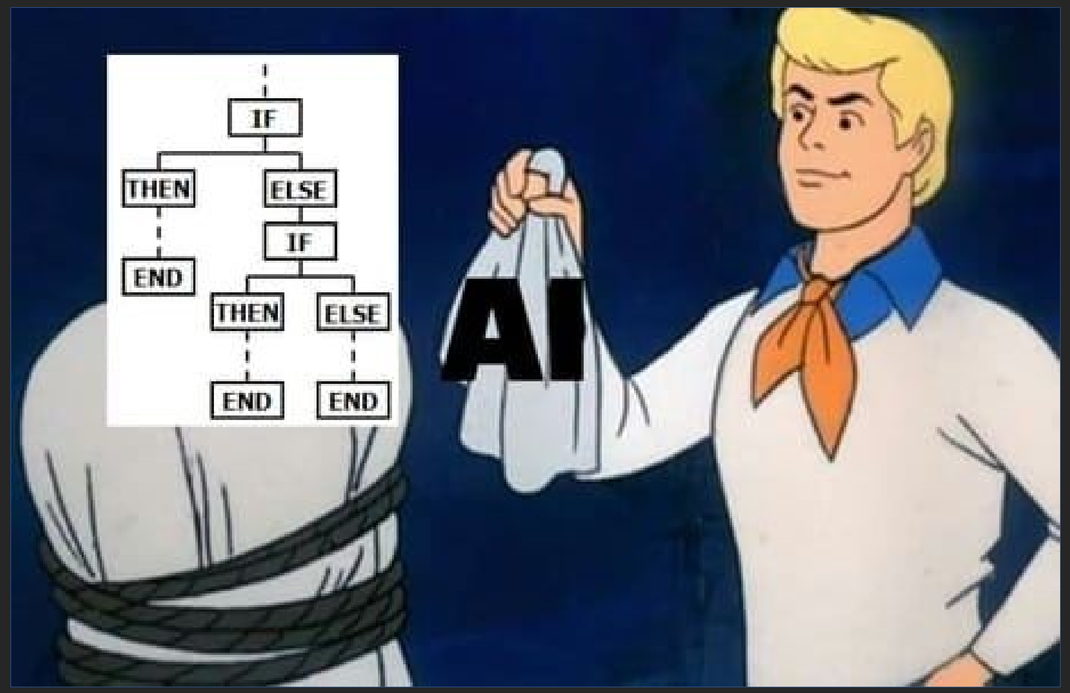
R vs. Python

	Python	R
General	Python is a general-purpose programming lanuage for data analysis and scientific computing.	R is a functional programming enviornment and language for statstical computing and graphics.
Objective	Data Science, Web Developoment, Embedded Systems	Data Science & Statistical Modeling
IDE	**iPython, Pycharm, Jupyter Notebook, Spyder**	**Rstudio, R GUI, R KWARD**
Data Collection	Supports CSV files, **SQL**, **JSON**, and webscraping with **BeautifulSoup.**	Can also import csv files with built-in **readr** library. R's library **RCurl** provides a simple way to make API requests, similar to Python's **requests** package.
Data Analysis	Orgnaize dataframes with **Pandas** filtering, sorting. Python takes a more streamlined approach for data science projects.	Complex data visualizaiton tools make the exploratory data analysis (EDA) process much more complex than Python.
Essential Packages & Libraries	**Numpy, Pandas, matplotlib, scipy, scikit-learn, TensorFlow**	**caret, stringr, ggplot2, knitr, tldyverse, markdown, shiny, forcats, haven**
Database Handling Capacity	Can easily handle large data because there are less constraints for memory usage	R computes everything in memory, so its capabilities are limited by RAM size. A major downfall of R is the inability to handle massive amounts of data
Data Visualization	Despite the capabilities of data visualization tools like **Matplotlb** and **Seaborn**, Python fails to measure up to data visualization features of R.	Developed by and for statisticians, R has complex data visualzatioon features.
Syntax	The 'zen of python' is that there's a proper way to write code.	R doesn't have this set of rules. Also indexing starts at 1, which can be considered unconventional for general programmers.
Learning Curve	Simple and readable code structure makes it easier for beginners to learn. It also allows for object-oriented programing. It also offers a wide range of data structures that you wouldn't expect from a general-purpose language.	R's functional syntax isn't easy for beginners, but not too challenging for those well versed in programming. It also offers a few data structures, but fails to handle large amounts of data.

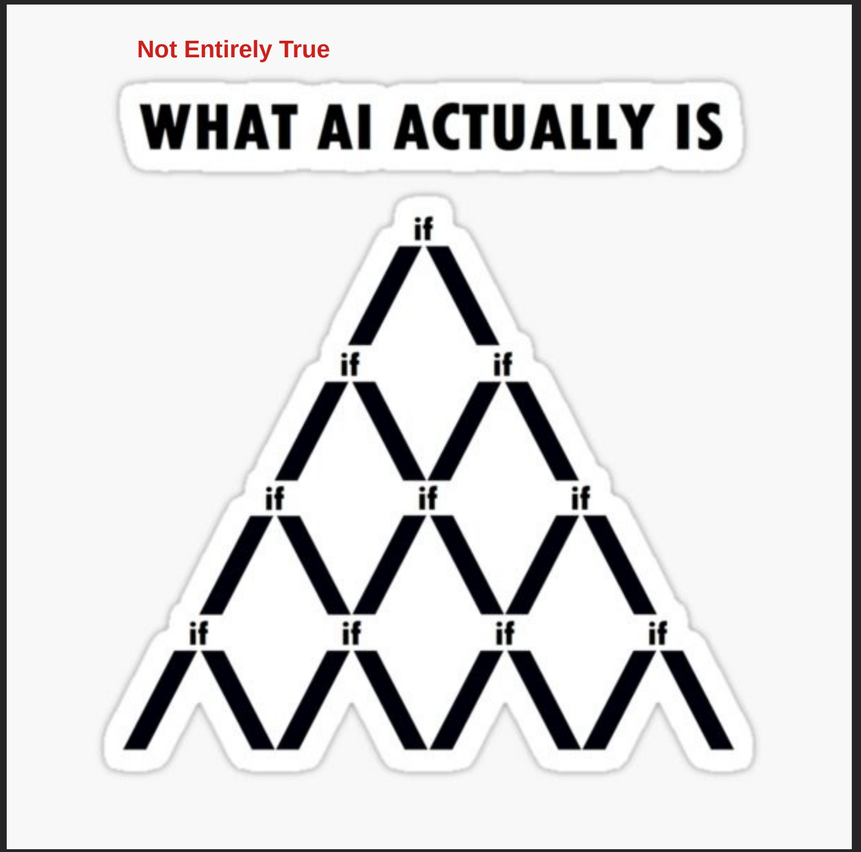
2 AI/ML/NLP Explained

AI?

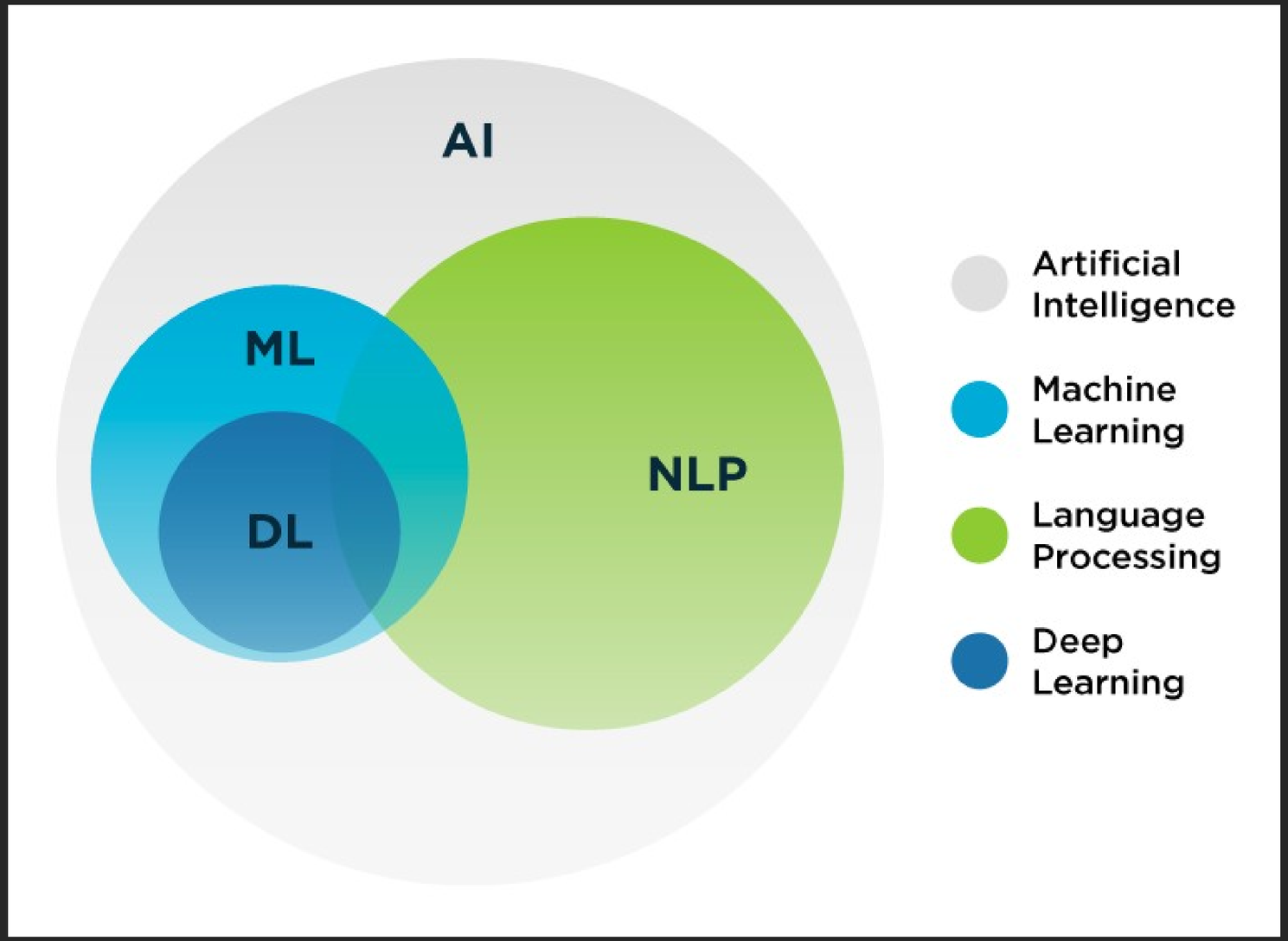
Artificial Intelligence



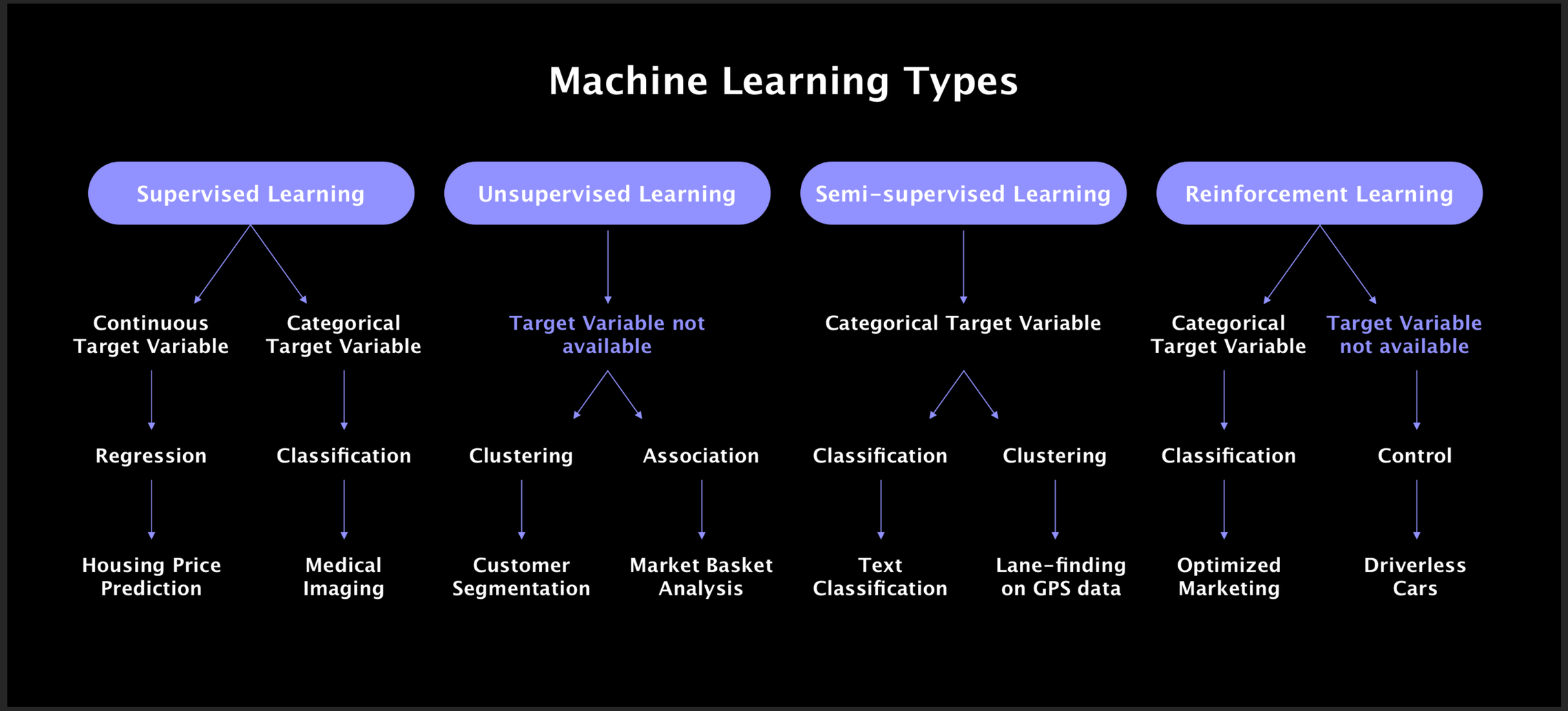
Not Entirely True



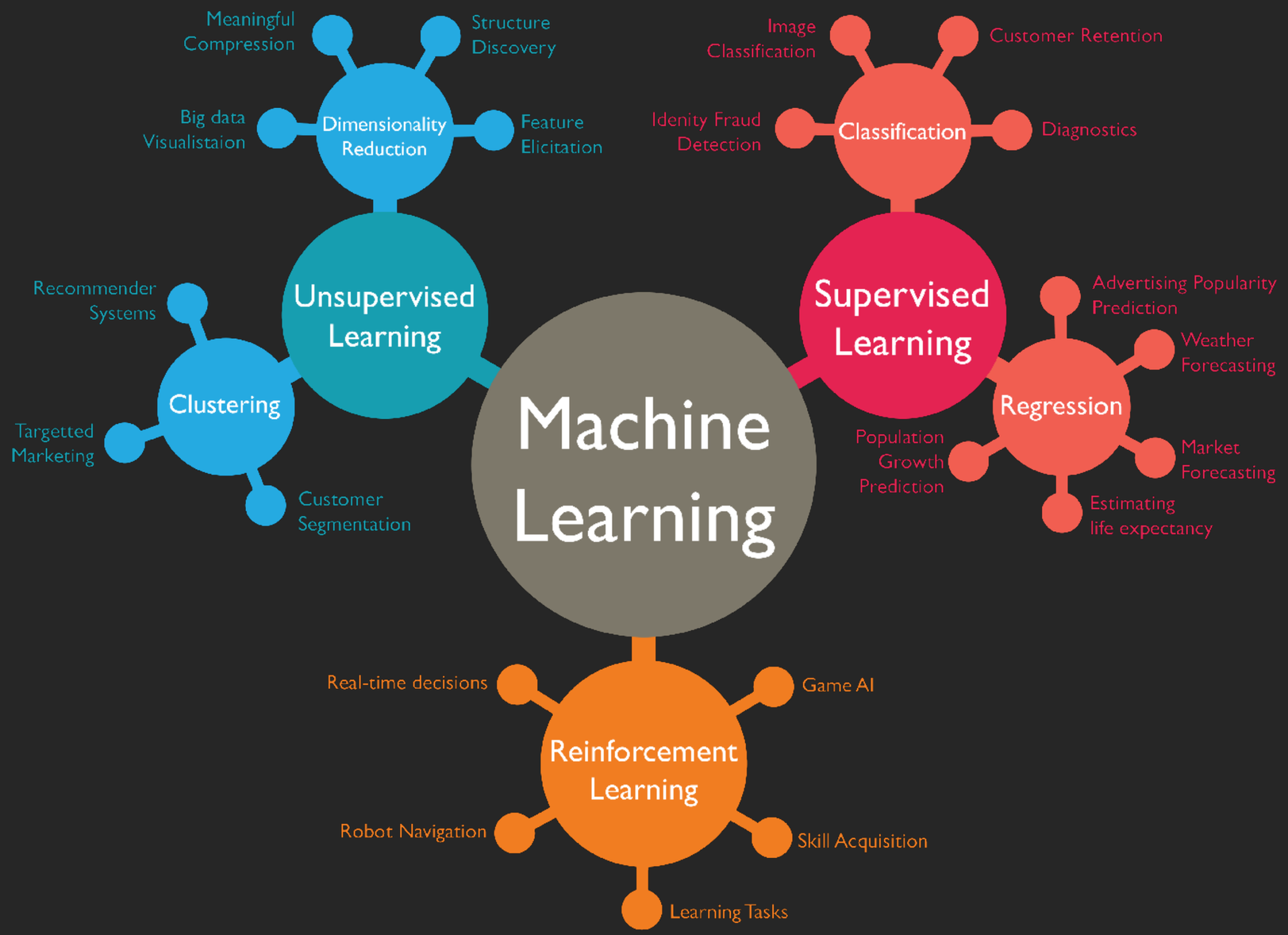
AI Domains


AI
ML
DL
NLP
Artificial Intelligence
Machine Learning
Language Processing
Deep Learning

Machine Learning Family Tree



Machine Learning Family Tree



Deep Learning: Fundamental Architecture

Feature / Architecture	ANN/MLP	RNN	CNN	Transformer
What is it?	Basic neural network	Neural network with “memory”	Neural network for grid-like data	Neural network with self-attention mechanism
Advantages	Typically easier to train	Captures sequential information and preserves dependency	Captures spatial features and relationships	Captures long-range dependencies. Parallel processing of sequences.
Challenges	Overfit easily even in simple networks	“Error” amplification (gradual or exponential)	Requires large amount of data	Requires large amount of data / very computationally intensive
Typical Use	Classification Non-linear regressions	Time series Texts and audios	Image Recognition Video Processing	LLMs & Generative AIs

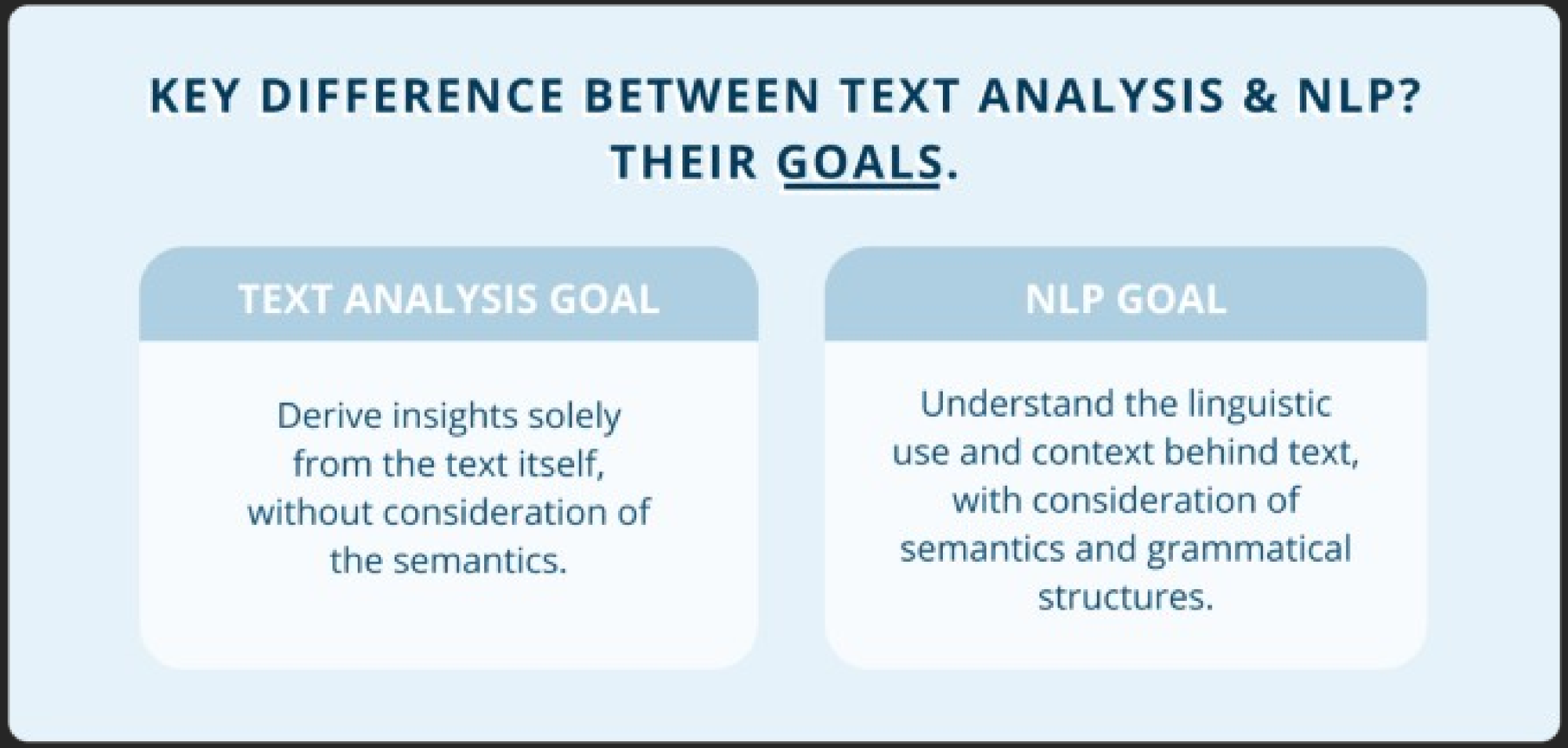
Recent Example: ChatGPT

Version	Parameters Count	Dataset
GPT-1	0.12 Billion	BookCorpus
GPT-2	1.5 Billion	WebText
GPT-3	175 Billion	CommonCrawl, WebText, English Wikipedia, Books 1 and Books 2 Corpora
GPT-4	1.76 Trillion	All of the above + YouTube + Twitter + Textbooks (fine tuned by Scale AI)

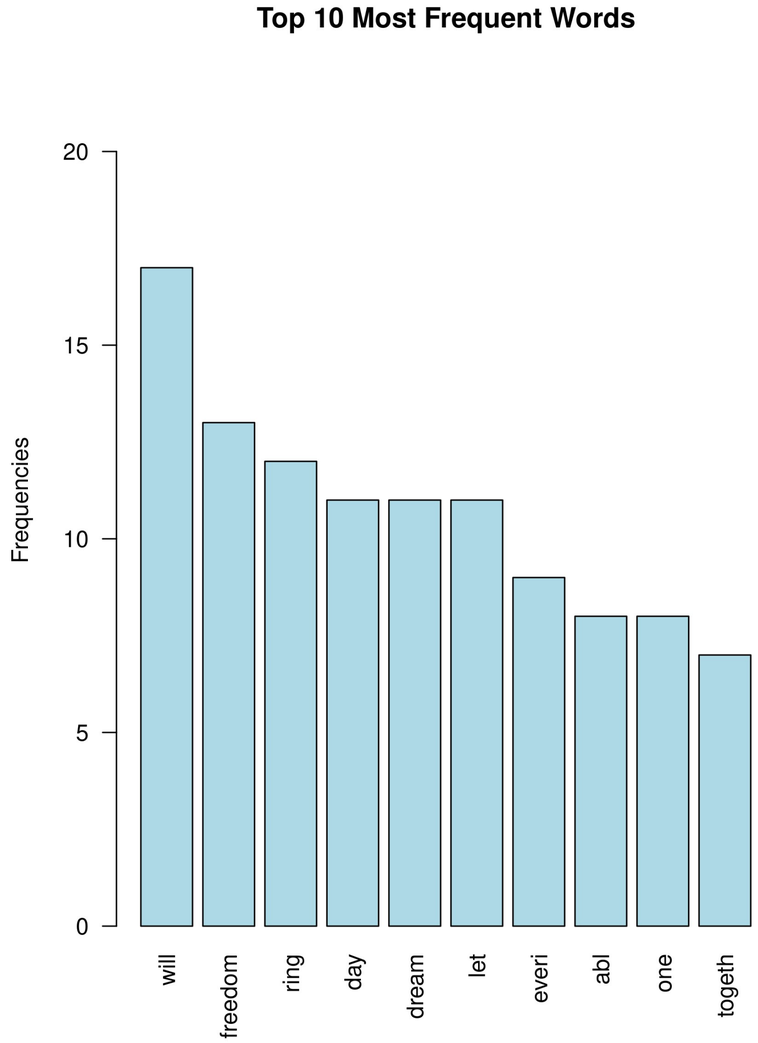
Tech Steamroller

3 Text Analysis

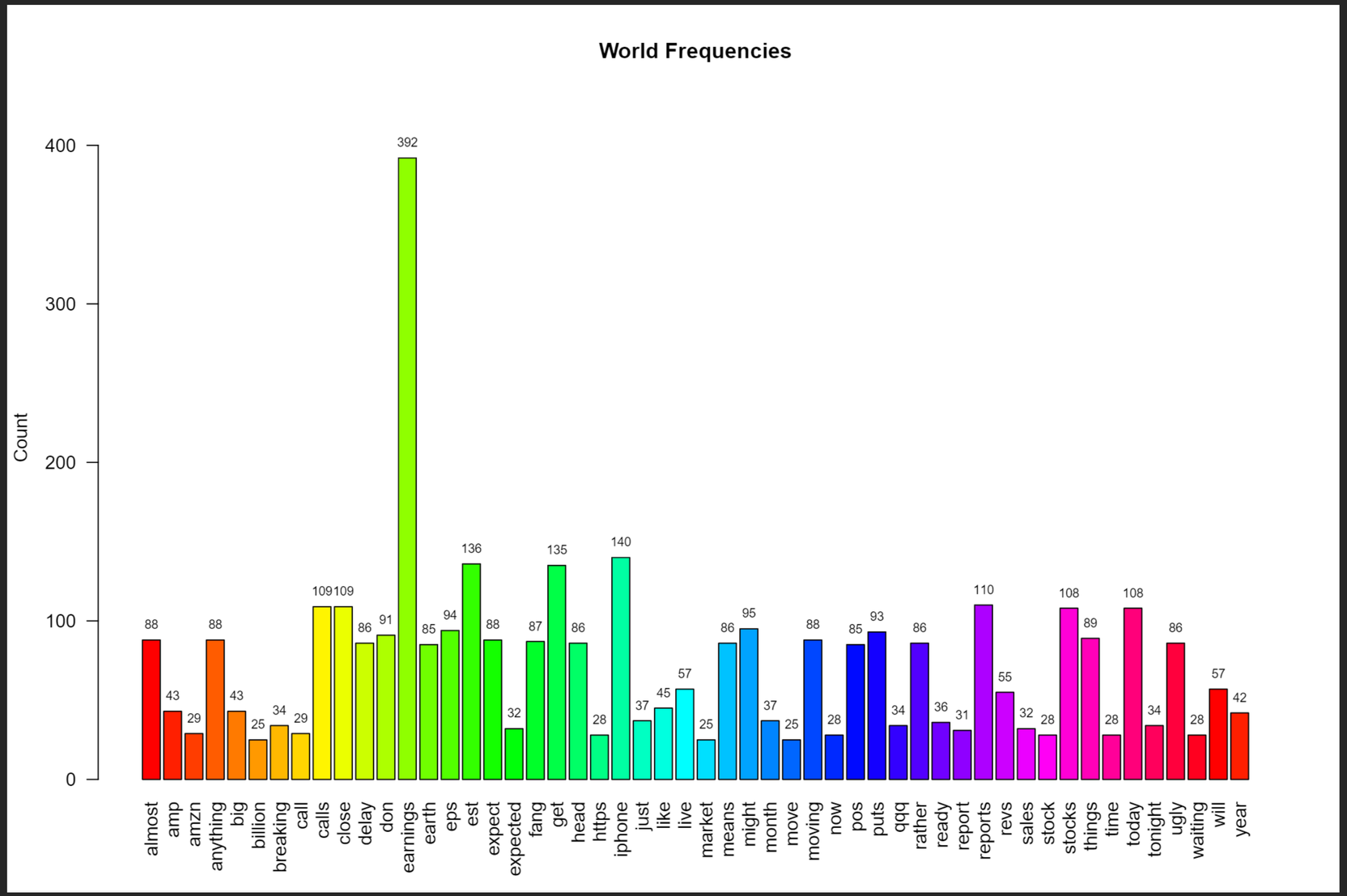
Goals


KEY DIFFERENCE BETWEEN TEXT ANALYSIS & NLP?
THEIR GOALS.
TEXT ANALYSIS GOAL
Derive insights solely from the text itself, without consideration of the semantics.
NLP GOAL
Understand the linguistic use and context behind text, with consideration of semantics and grammatical structures.

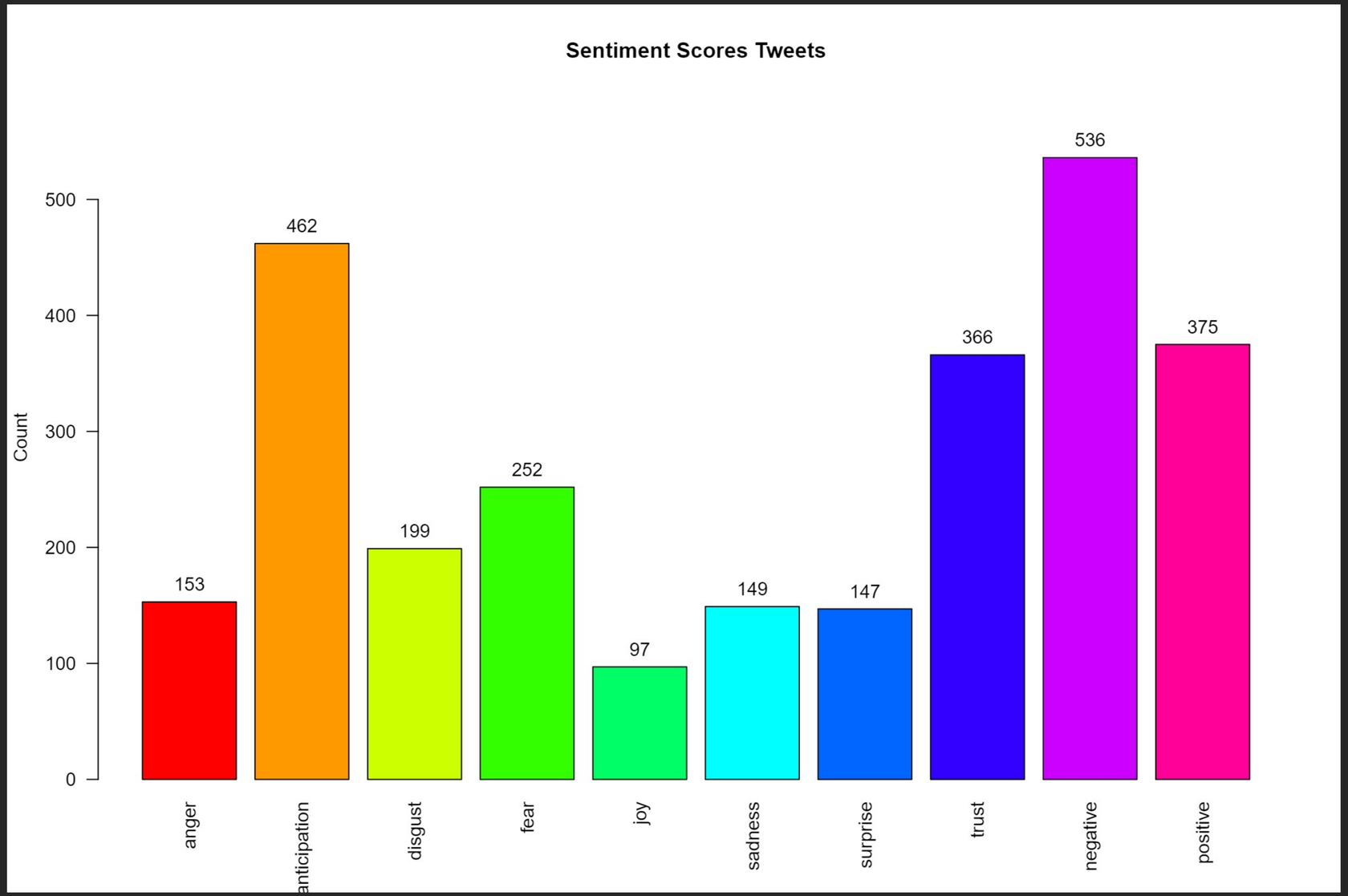
Example: Word Cloud & Word Frequency



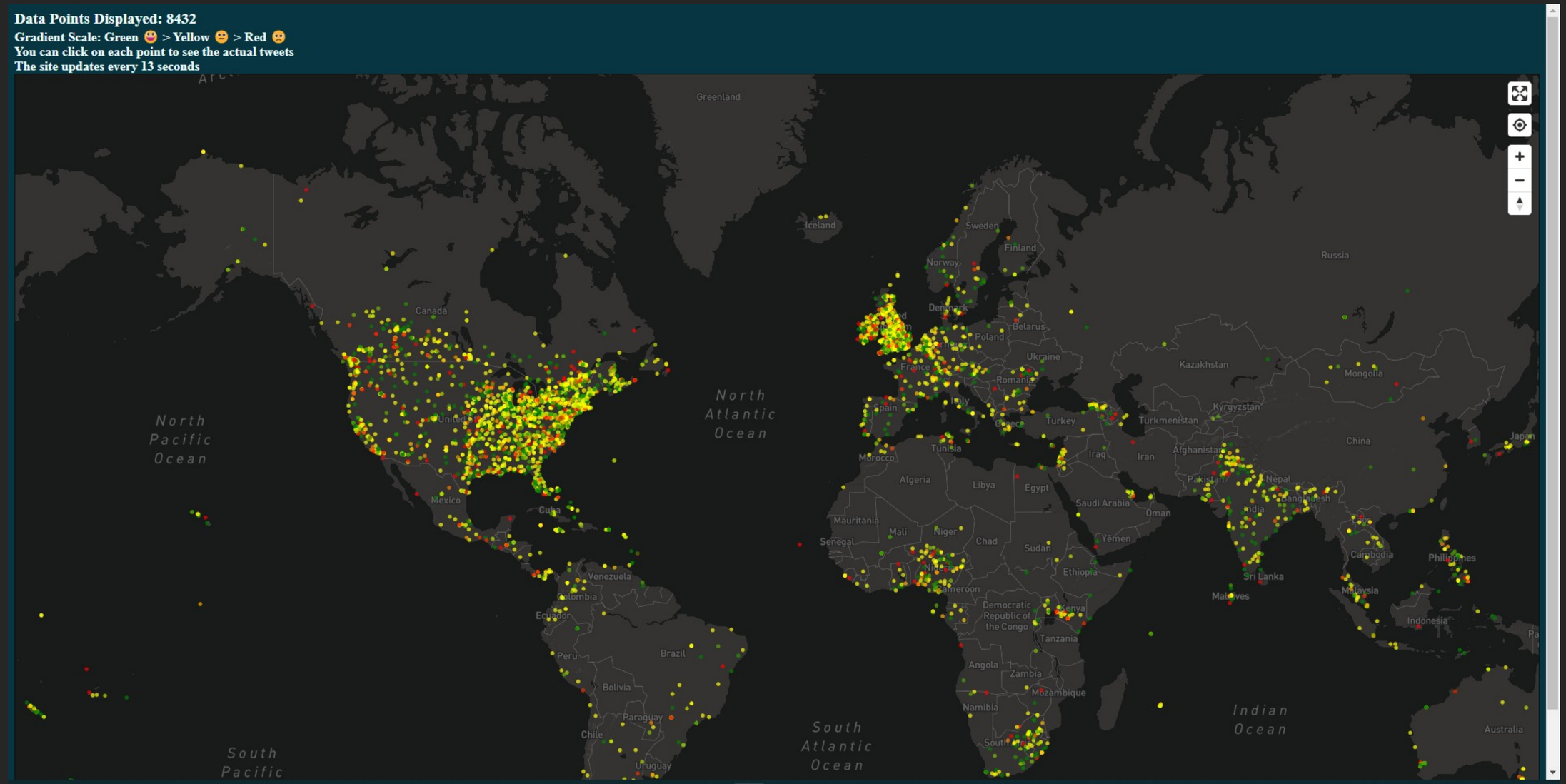
Example: Word Frequency



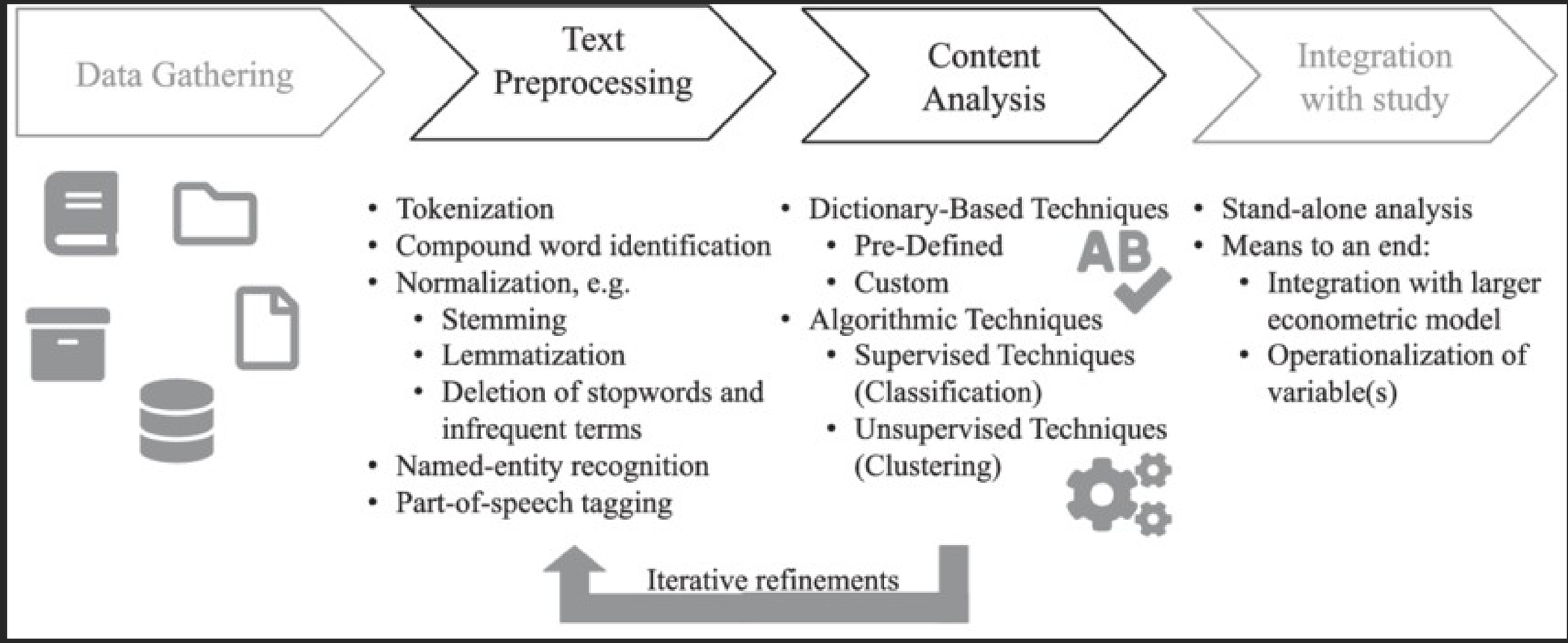
Example: Tweet Sentiment



Examples: Covid Sentiment Map



Process & Techniques



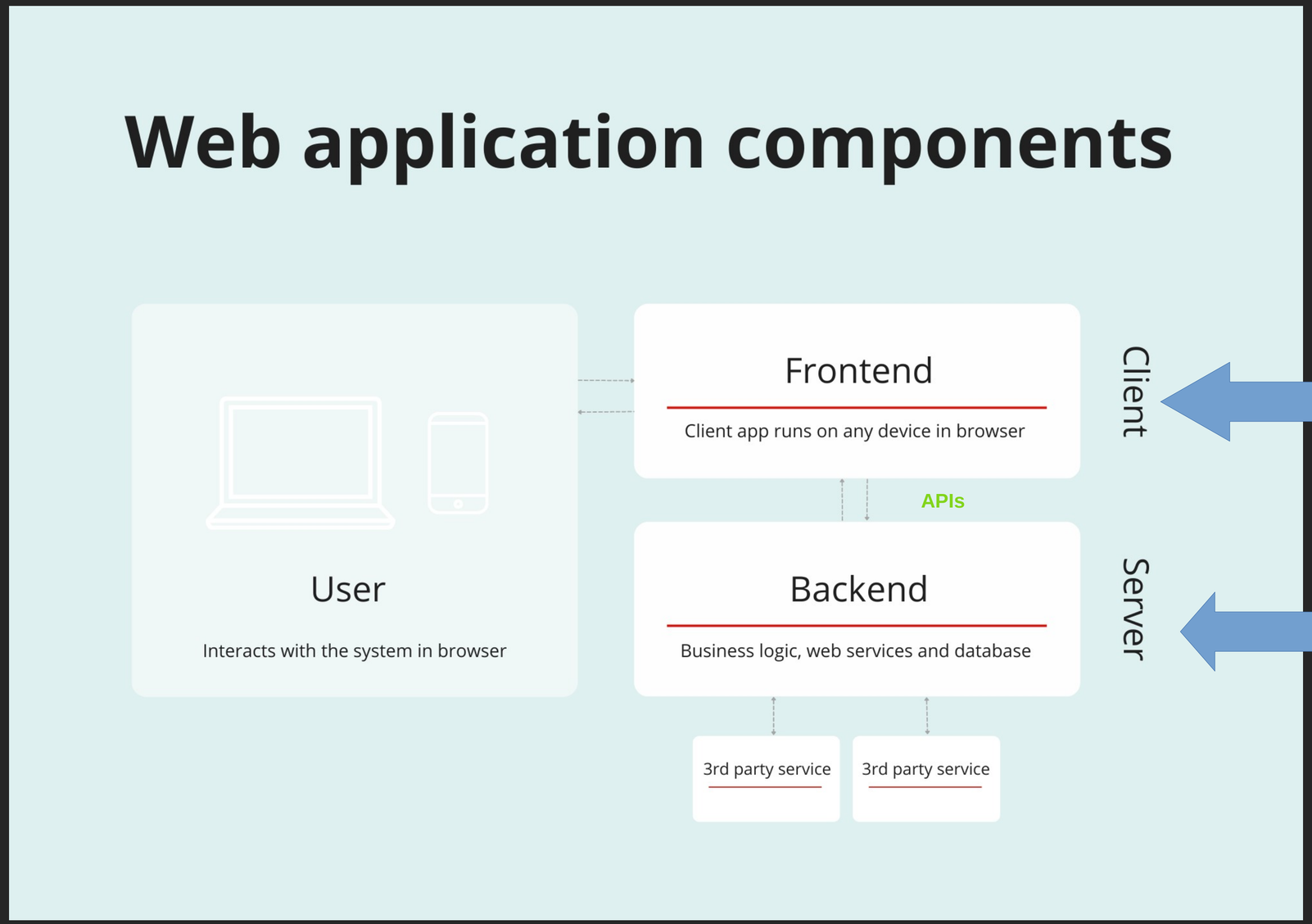
Data Gathering and Extraction

1. Google Dataset Search
2. Kaggle
3. GitHub
4. Government Sources
5. The World Wide Web (scraping)

4

Data Gathering & Extraction

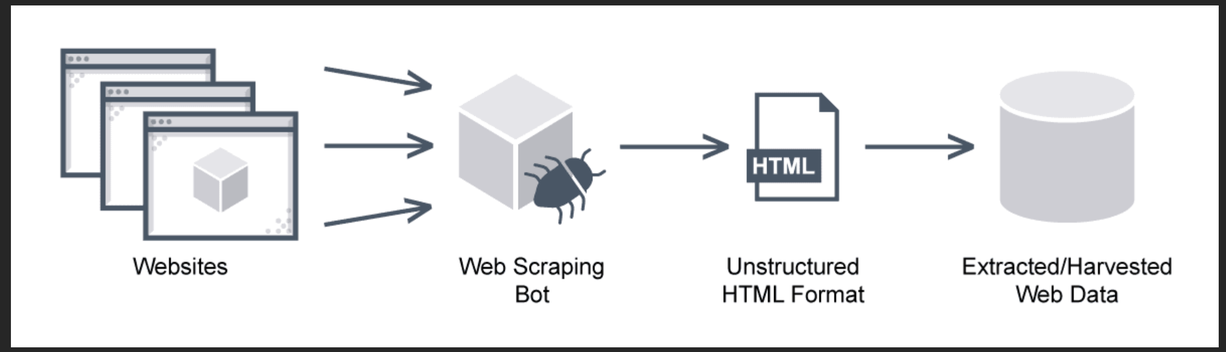
Data Extraction



DOM
(Document Object Model)
Parsing

API
(Application Programming Interface)
Scraping

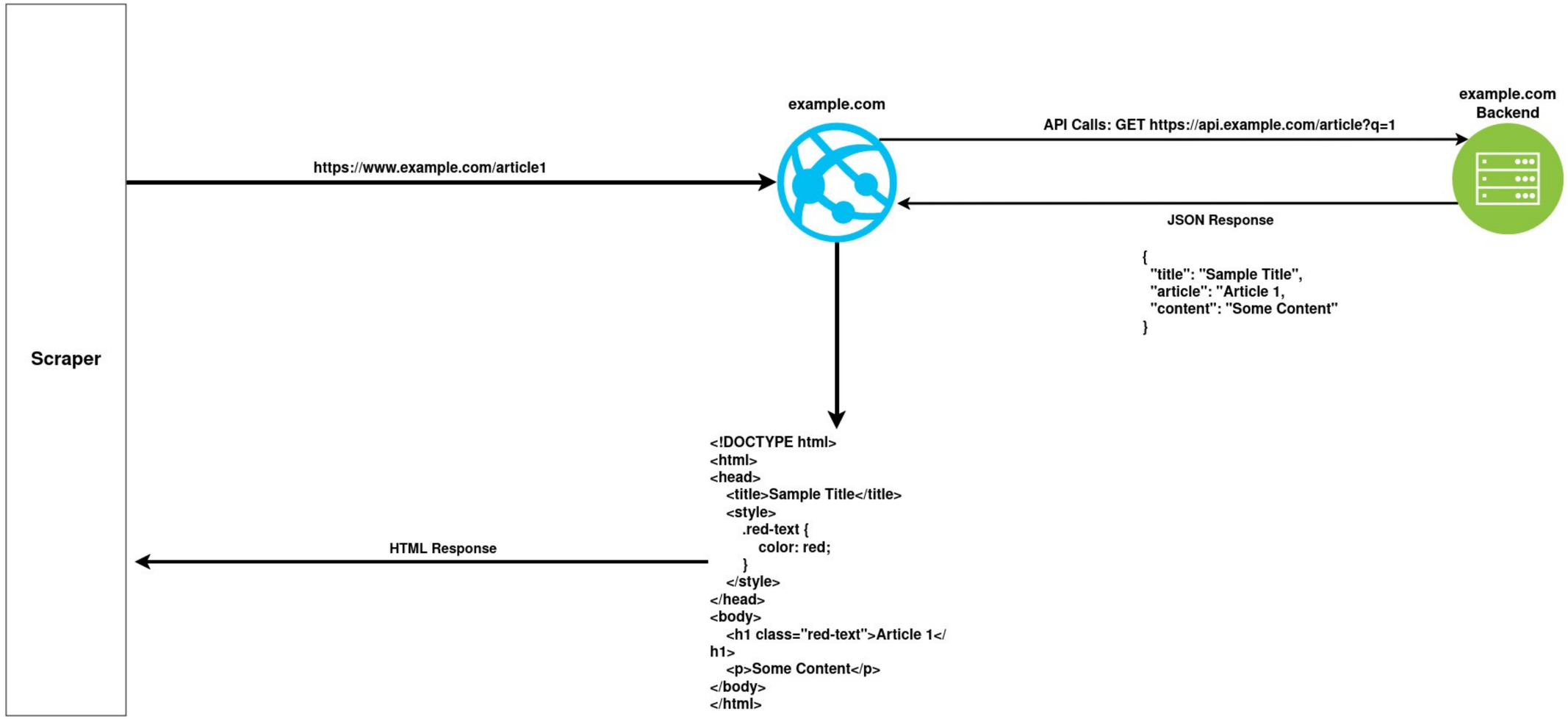
Web Scraping - DOM Parsing



HTML Page Structure

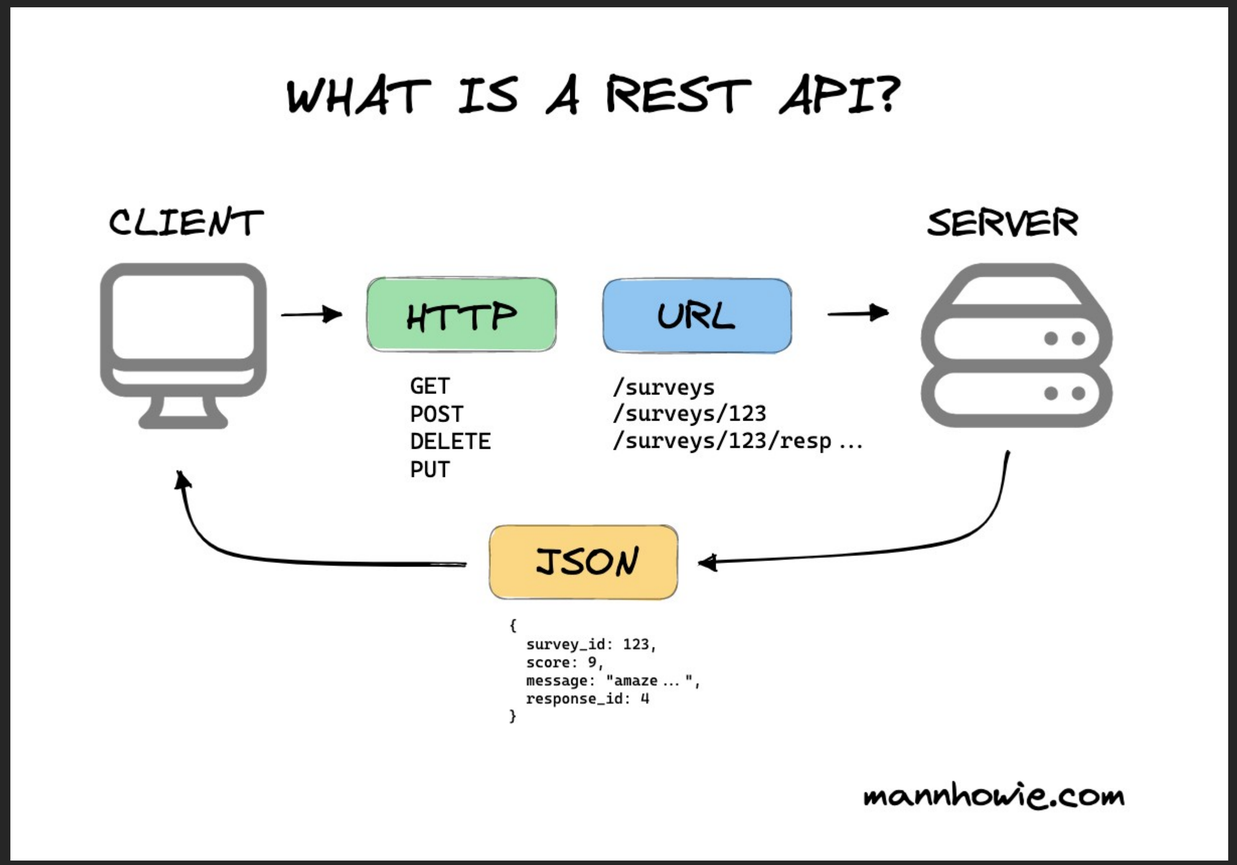
```
<!DOCTYPE html>          ← Tells version of HTML
<html>                   ← HTML Root Element

<head>                   ← Used to contain  page HTML metadata
  <title>Page Title</title>  ← Title of HTML page
</head>

<body>                   ← Hold content of HTML
  <h2>Heading Content</h2>   ← HTML headling tag
  <p>Paragraph Content</p>   ← HTML paragraph tag
</body>

</html>
```

Web Scraping - DOM Parsing



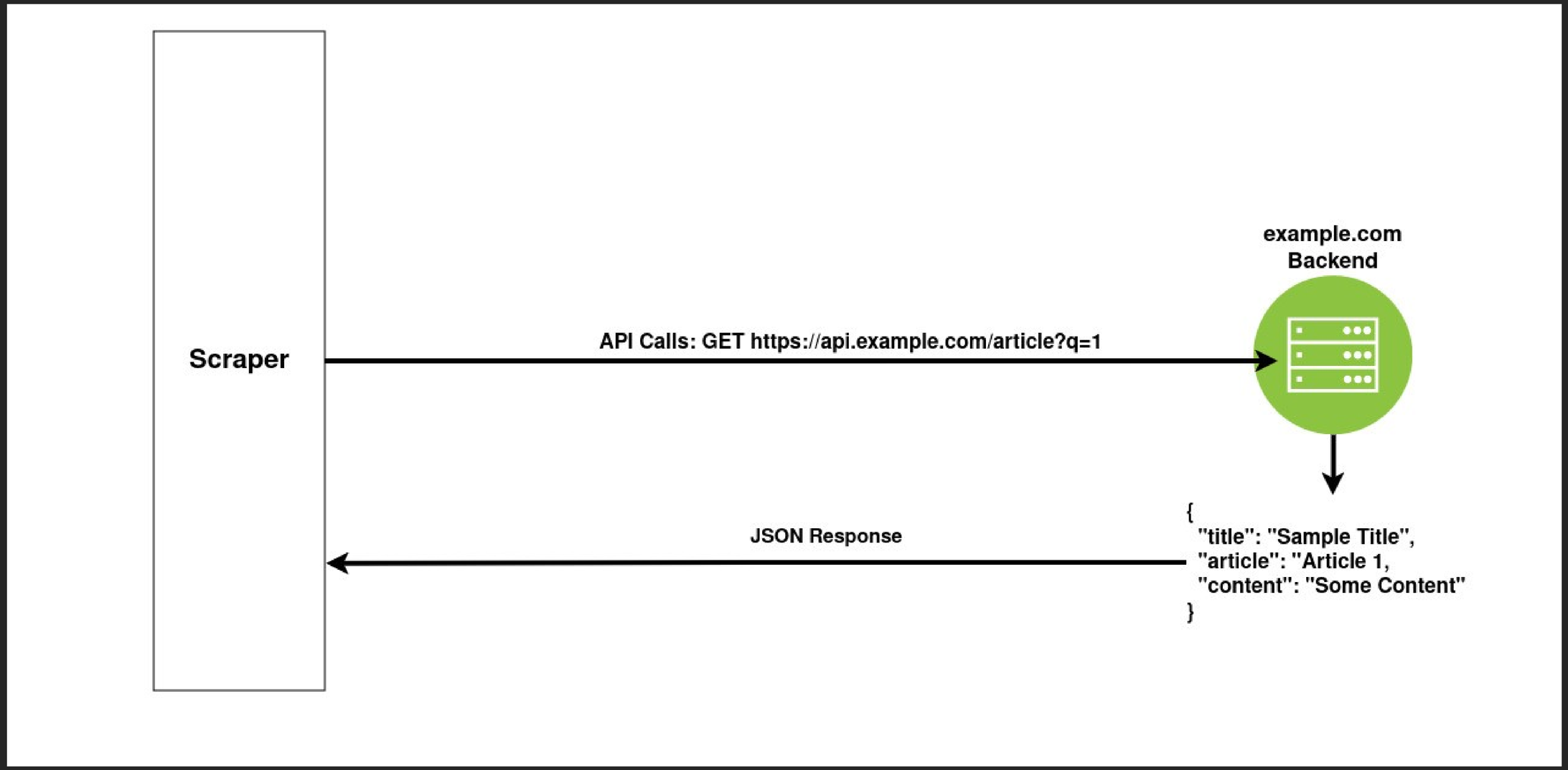
Web Scraping – API Scraping

Web Scraping – API Scraping



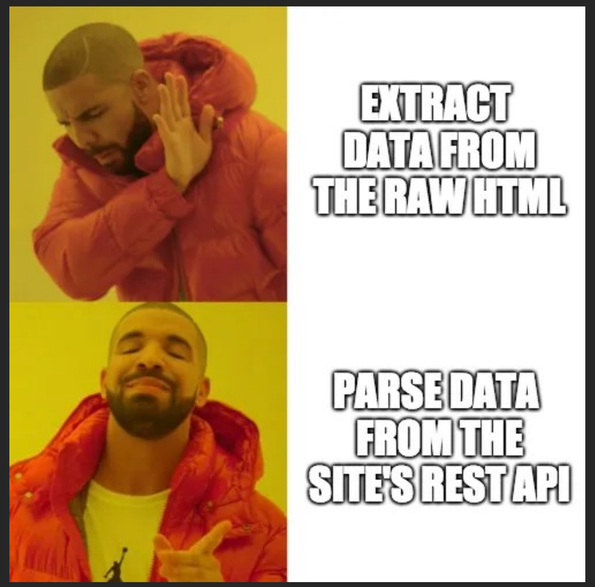

```
{
  "DocumentType": 1,
  "No.": "S-ORD101001",
  "SellToCustNo": "10000",
  "PostingDate": "2023-04-02",
  "Lines": [
    {
      "LineNo": 10000,
      "Type": 2,
      "No": "1996-S",
      "Quantity": 12,
      "UnitPrice": 1397.3
    },
    {
      "LineNo": 20000,
      "Type": 2,
      "No": "1900-S",
      "Quantity": 4,
      "UnitPrice": 192.8
    }
  ]
}
```

Web Scraping - API Scraping



Summary

	DOM Parsing	API Scraping
Format	Unstructured	Structured
Processing Cost	High Results mixed with irrelevant information	Low
Stability	Prone to changes	Relatively static
Availability	Always	Close sourced or paid



Available Tools

ScrapingBee

zyte

Roll Your Own

JS

Playwright

Puppeteer

Cheerio

Selenium

Beautiful Soup

Scrapy

APIFY

Custom Tooling

https://github.com/search?q=scarping&type=repositories

https://github.com/topics/web-scraper

https://scraper.algo7.tools

Let’s Code

Thank You