Day 3

Web scraping is the process of **extracting data** from websites. It involves using code or tools to automatically collect information from web pages, typically by accessing the HTML structure of the page.

How Does Web Scraping Work?

1. **Send a Request**: A scraping script sends a request to the website's server, asking for the web page content (HTML).
2. **Retrieve the Web Page**: The server responds by sending back the HTML code of the requested page.
3. **Parse the HTML**: The script parses (analyzes) the HTML code to locate and extract the desired data, such as text, tables, images, or links.
4. **Store the Data**: The extracted data is saved in a structured format like CSV, Excel, JSON, or directly into a database.

Common Tools and Libraries for Web Scraping

- **Python Libraries**:
    - **BeautifulSoup**: For parsing HTML and XML documents.
    - **Selenium**: Automates web browsers, useful for scraping dynamic content (JavaScript-rendered pages).
    - **Scrapy**: A powerful framework for large-scale web scraping projects.
    - **Pandas**: To manipulate and store extracted data in tabular formats.

Applications of Web Scraping

- **Price Monitoring**: Tracking product prices across e-commerce websites.
- **Data Analysis**: Collecting large datasets from various online sources for analysis.
- **Market Research**: Gathering competitive intelligence, reviews, or trends.
- **Content Aggregation**: Compiling data from multiple sites (like news or job postings).
- **Academic Research**: Extracting data for studies and reports.

Legal and Ethical Considerations

- **Check Terms of Service**: Some websites prohibit scraping in their terms of service.
- **Respect Robots.txt**: This file tells web crawlers which parts of the website can be accessed.
- **Avoid Overloading Servers**: Sending too many requests in a short time can harm the website's performance.
- **Use Publicly Available Data**: Scraping private or sensitive information without permission can lead to legal issues.

different types using web scraping

Web scraping can be categorized based on the **methods** used and the **type of data** being extracted. Here's a breakdown of the different types of web scraping:

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1. Static Web Scraping

- **What It Is**: Extracting data from web pages with **static content**, where the HTML doesn't change after loading.
- **Tools**:
    - **BeautifulSoup** (for parsing HTML)

    - **Requests** (for sending HTTP requests)
- **Example**: Scraping article titles or product listings from a simple HTML page.

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2. Dynamic Web Scraping

- **What It Is**: Scraping data from web pages that use **JavaScript** to load content dynamically after the initial page load.
- **Tools**:
    - **Selenium** (automates browser interaction)
    - **Playwright** (for headless browser automation)
    - **Puppeteer** (JavaScript equivalent)
- **Example**: Scraping stock prices or social media posts that update without refreshing the page.

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3. API-Based Scraping

- **What It Is**: Instead of scraping the website, you **directly access data** via the website's **API** (if available). This is faster, more efficient, and often more reliable.
- **Tools**:
    - **Requests** (to interact with REST APIs)
    - **JSON** library (to parse the API response)
- **Example**: Pulling weather data from an open weather API.

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4. Headless Browser Scraping

- **What It Is**: Using **headless browsers** (browsers without a graphical interface) to simulate human browsing behavior and scrape complex web pages.
- **Tools**:
    - **Selenium with Headless Chrome/Firefox**

    - **Playwright** (modern and faster alternative)
- **Example**: Scraping sites that require login or complex navigation.

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5. Scraping Hidden Data

- **What It Is**: Extracting **hidden tables, dropdowns, or modals** that require user interaction (like clicks) to become visible.
- **Tools**:
    - **Selenium** (to interact with hidden elements)
    - **JavaScript Execution** (to trigger events)
- **Example**: Scraping data from dropdown menus or expandable FAQ sections.

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6. Incremental Scraping (Pagination)

- **What It Is**: Scraping data across **multiple pages** by navigating through pagination links.
- **Tools**:
    - **Requests/BeautifulSoup** (for static sites)
    - **Selenium** (for dynamic sites)
- **Example**: Scraping all product reviews from an e-commerce site across multiple pages.

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7. Real-Time Scraping

- **What It Is**: Continuously scraping data at **frequent intervals** to monitor changes in real-time (like stock prices or sports scores).
- **Tools**:
    - **Selenium/Playwright** with scheduling (like **cron jobs**)
    - **WebSockets** (for live data streams)
- **Example**: Monitoring live scores or cryptocurrency prices.

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8. Scraping Data Behind Login

- **What It Is**: Extracting data from sites that require **user authentication** (like logging into your account).
- **Tools**:
    - **Selenium** (to automate login)
    - **Session Handling** in **Requests**
- **Example**: Scraping data from your Gmail inbox or LinkedIn connections.

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9. Image/Media Scraping

- **What It Is**: Downloading **images, videos, or other media** files from websites.
- **Tools**:
    - **BeautifulSoup** (to find image tags)
    - **Requests** (to download files)
- **Example**: Scraping product images from an e-commerce site.

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10. Cloud-Based Scraping

- **What It Is**: Using **cloud platforms** or **web scraping services** to perform scraping without running code locally.
- **Tools**:
    - **Scrapy Cloud**
    - **Octoparse**
    - **ParseHub**
- **Example**: Large-scale data extraction projects without worrying about infrastructure.

web scraping using selenium

Web Scraping Using Selenium in Python

Selenium is a powerful tool used to automate web browsers. It's particularly useful for scraping dynamic websites where content is loaded using JavaScript.

When to Use Selenium for Web Scraping?

- Dynamic Content: When data is loaded dynamically (via JavaScript) and can't be accessed through simple HTML parsing tools like BeautifulSoup.
- Interacting with Web Elements: When you need to click buttons, fill forms, or scroll to load more content.
- Handling Complex Websites: When dealing with pop-ups, iframes, or websites that require logins.

Common Challenges & Solutions

1. **Page Loads Slowly?**
    - Use **explicit waits** instead of `time.sleep()` for better performance.
2. **Elements Not Found?**
    - Check if the content is inside **iframes** or **dynamically loaded**.
3. **Blocked by Website?**
    - Randomize **user-agent strings** and add **delays** between requests.

Web Scraping Using BeautifulSoup in Python

BeautifulSoup is a Python library designed for **parsing HTML and XML documents**. It is ideal for scraping **static web pages** where the data is already available in the page source.

When to Use BeautifulSoup for Web Scraping?

- **Static Content**: When the website content is directly available in the HTML (no JavaScript rendering needed).
- **Simple Web Pages**: For straightforward tasks like extracting **tables**, **lists**, **headings**, etc.
- **Speed**: Faster than Selenium because it doesn't open a browser.