

DSCI 560 – Laboratory Assignment 1

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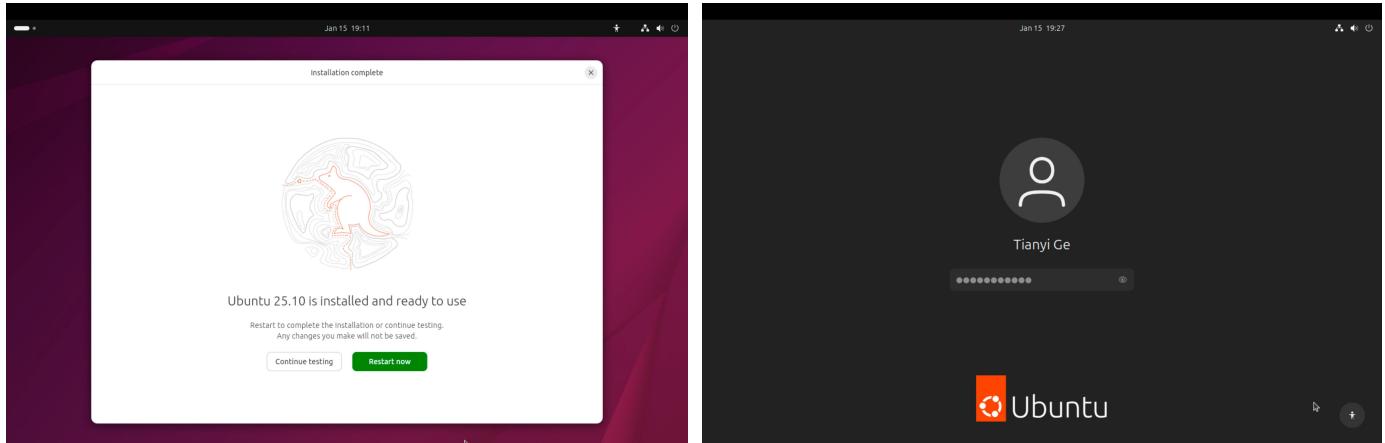
Github Link:<https://github.com/Mia0403/DSCI560-Lab1.git>

Youtube Link:<https://youtu.be/4peSgunoNGo>

1. Installation and Setup

● VMware & Ubuntu Installation

I installed VMware Fusion on macOS and created an Ubuntu 64-bit virtual machine. The virtual machine was successfully launched and used throughout this lab.



● Python Installation

Python 3 and pip were installed and verified in the Ubuntu virtual machine.

```
tianyi-ge@tianyi-ge-VMware20-1:~$ sudo apt update
[sudo: authenticate] Password:
Hit:1 http://ports.ubuntu.com/ubuntu-ports questing InRelease
Hit:2 http://ports.ubuntu.com/ubuntu-ports questing-updates InRelease
Hit:3 http://ports.ubuntu.com/ubuntu-ports questing-backports InRelease
Hit:4 http://ports.ubuntu.com/ubuntu-ports questing-security InRelease
72 packages can be upgraded. Run 'apt list --upgradable' to see them.
tianyi-ge@tianyi-ge-VMware20-1:~$ sudo apt install python3
python3 is already the newest version (3.13.7-1).
python3 set to manually installed.
The following packages were automatically installed and are no longer required:
  linux-headers-6.17.0-5      linux-tools-6.17.0-5
  linux-headers-6.17.0-5-generic  linux-tools-6.17.0-5-generic
  linux-modules-6.17.0-5-generic
Use 'sudo apt autoremove' to remove them.

Summary:
  Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 72
tianyi-ge@tianyi-ge-VMware20-1:~$ python3--version
python3--version: command not found
tianyi-ge@tianyi-ge-VMware20-1:~$ python3 --version
Python 3.13.7
tianyi-ge@tianyi-ge-VMware20-1:~$
```



```
tianyi-ge@tianyi-ge-VMware20-1:~$ sudo apt install python3.13
Setting up dpkg-dev (1.22.21ubuntu3.1) ...
Setting up libstdc++-15-dev:arm64 (15.2.0-4ubuntu4) ...
Setting up libpython3.13-dev:arm64 (3.13.7-1ubuntu0.2) ...
Setting up python3-pip (25.1.1+dfsg-1ubuntu2) ...
Setting up libjs-sphinxdoc (8.2.3-1ubuntu2) ...
Setting up gcc-15-aarch64-linux-gnu (15.2.0-4ubuntu4) ...
Setting up libpython3.13-dev:arm64 (3.13.7-1) ...
Setting up python3.13-dev (3.13.7-1ubuntu0.2) ...
Setting up gcc-15 (15.2.0-4ubuntu4) ...
Setting up g++-15-aarch64-linux-gnu (15.2.0-4ubuntu4) ...
Setting up python3-dev (3.13.7-1) ...
Setting up g++-15 (15.2.0-4ubuntu4) ...
Setting up gcc-aarch64-linux-gnu (4:15.2.0-4ubuntu1) ...
Setting up gcc (4:15.2.0-4ubuntu1) ...
Setting up g++-aarch64-linux-gnu (4:15.2.0-4ubuntu1) ...
Setting up g++ (4:15.2.0-4ubuntu1) ...
update-alternatives: using /usr/bin/g++ to provide /usr/bin/c++ (c++) in auto mode
Setting up build-essential (12.12ubuntu1) ...
Processing triggers for man-db (2.13.1-1) ...
Processing triggers for libc-bin (2.42-0ubuntu3) ...
tianyi-ge@tianyi-ge-VMware20-1:~$ pip3 --version
pip 25.1.1 from /usr/lib/python3/dist-packages/pip (python 3.13)
```

2. Get Familiar with Linux and Python

● Playing around with Linux Terminal

A new directory named d "<your name>_<your USC ID>" (A new directory named "TianyiGe_5804514679" was created on the desktop.) was created on the desktop. Inside the directory, two subdirectories named data and scripts were created, and an empty Python file named task_1.py was added to the scripts folder.

```
tianyi-ge@tianyi-ge-VMware20-1:~$ cd Desktop
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop$ mkdir Yourname_YourUSCID
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop$ cd ^
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop$ cd Yourname_YourUSCID
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID$ mkdir data scripts
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID$ cd scripts
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ touch task_
1.py
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ ls
```

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ cd ~/Desktop
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop$ mv Yourname_YourUSCID TianyiGe_5804514679
```

● A basic Python Script

The task_1.py file was edited using a terminal text editor. The script prompts the user to enter their name and prints a greeting message in the format “Hello, [name]!”.

The script was executed successfully in the terminal.

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID$ mkdir data scripts
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID$ cd scripts
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ touch task_
1.py
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ ls
task_1.py
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ nano task_1
.py
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ python3 tas
k_1.py
Please enter your name: Mia
Hello, Mia!
```

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ nano task_1.py
GNU nano 8.4
name=input("Please enter your name: ")
print("Hello, ",name + "!")
```

● Python Web-scraping Task

(1) Installed required Python libraries (requests and beautifulsoup4) using the Ubuntu package manager due to system-managed Python environment.

```
error: externally-managed-environment
x This environment is externally managed
↳ To install Python packages system-wide, try apt install
  python3-xyz, where xyz is the package you are trying to
  install.

If you wish to install a non-Debian-packaged Python package,
create a virtual environment using python3 -m venv path/to/venv.
Then use path/to/venv/bin/python and path/to/venv/bin/pip. Make
sure you have python3-full installed.

If you wish to install a non-Debian packaged Python application,
it may be easiest to use pipx install xyz, which will manage a
virtual environment for you. Make sure you have pipx installed.

See /usr/share/doc/python3.13/README.venv for more information.

note: If you believe this is a mistake, please contact your Python installation
or OS distribution provider. You can override this, at the risk of breaking your
Python installation or OS, by passing --break-system-packages.

hint: See PEP 668 for the detailed specification.
```

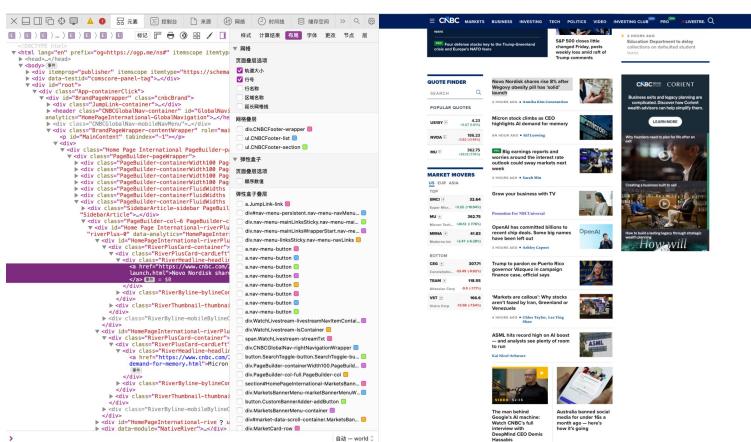
```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ stall python3-requests python3-bs4
[sudo: authenticate] Password:
python3-requests is already the newest version (2.32.3+dfsg-5ubuntu1).
python3-requests set to manually installed.
The following packages were automatically installed and are no longer
needed:
  linux-headers-6.17.0-5          linux-tools-6.17.0-5
  linux-headers-6.17.0-5-generic  linux-tools-6.17.0-5-generic
  linux-modules-6.17.0-5-generic
Use 'sudo apt autoremove' to remove them.

Installing:
  python3-bs4

Installing dependencies:
  python3-cssselect  python3-lxml      python3-webencodings
  python3-html5lib   python3-soupsieve

Suggested packages:
  python3-genshi  python-lxml-doc
```

(2) A web scraping script was written to collect HTML data from the CNBC World News webpage.



(3) Two directories named raw_data and processed_data were created inside the data folder to store raw and processed data separately

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ cd ..
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID$ cd data
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/data$ mkdir raw_data
processed_data
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/data$ ls
processed_data  raw_data
```

(4) A Python script named web_scraper.py was written using Requests and BeautifulSoup to send an HTTP request to the target URL and retrieve the HTML content of the webpage. The collected HTML content was saved into a file named web_data.html inside the data/raw_data directory for further processing.

The screenshot shows two terminal windows. The left window contains the Python script `web_scraper.py` which sends an HTTP request to `https://www.cnbc.com/world/?region=world`, opens the response, writes it to `../data/raw_data/web_data.html`, and prints "HTML saved". It then prettifies the HTML using BeautifulSoup and saves it again, printing "HTML saved and prettified". The right window shows the contents of `web_data.html` as copied from the terminal, including meta tags for the website and its content.

```
GNU nano 8.4  web_scraper.py
import requests
from bs4 import BeautifulSoup
url="https://www.cnbc.com/world/?region=world"
headers={
    "User-Agent": "Mozilla/5.0"
}
html=requests.get(url,headers=headers)
with open( '../data/raw_data/web_data.html', "w", encoding="utf-8") as f:
    f.write(html.text)
print("HTML saved")

#make it look pretty
beautifulsoup=BeautifulSoup(html.text,"html.parser")
with open("../data/raw_data/web_data.html", "w", encoding="utf-8") as f:
    f.write(beautifulsoup.prettify())
print("HTML saved and prettified")
```

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ python3 web_scraper.py
HTML saved
HTML saved and prettified
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/Yourname_YourUSCID/scripts$ head ../data/raw_data/web_data.html
<!DOCTYPE html>
<html itemscope="" itemtype="https://schema.org/WebPage" lang="en" prefix="og: https://ogp.me/ns#">
<head>
    <meta content="website" property="og:type"/>
    <meta content="International: Top News And Analysis" property="og:title"/>
    <meta content="CNBC International is the world leader for news on business, technology, China, trade, oil prices, the Middle East and markets." property="og:description"/>
    <meta content="https://www.cnbc.com/world/" property="og:url"/>
    <meta content="CNBC" property="og:site_name"/>
    <meta content="max-image-preview:large" name="robots"/>
    <meta content="telephone=no" name="format-detection"/>
```

● Data Filtering Task

A Python script named data_filter.py was written to read the saved HTML file and extract relevant information using BeautifulSoup. Market data and latest news data were parsed from the webpage and stored into two CSV files named market_data.csv and news_data.csv inside the data/processed_data directory. The script was executed successfully and printed messages to the terminal during processing. This screenshot shows the successful execution of the data filtering script.

The screenshot shows three terminal windows. The first window shows the execution of `data_filter.py` with messages: "Filtering field", "Store the market data", and "CSV created". The second window shows the contents of `market_data.csv` and `news_data.csv`. The third window shows the contents of `market_data.csv` and `news_data.csv` in full, listing various news items and their details.

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/TianyiGe_5804514679/scripts$ python3 data_filter.py
Filtering field
Store the market data
CSV created
```

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/TianyiGe_5804514679/data$ ls processed_data
market_data.csv  news_data.csv
```

```
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/TianyiGe_5804514679/scripts$ head ../data/processed_data/market_data.csv
symbol,stockposition,pct
tianyi-ge@tianyi-ge-VMware20-1:~/Desktop/TianyiGe_5804514679/scripts$ head ../data/processed_data/news_data.csv
timestamp,title,link
2 Hours Ago,Week in review: Stocks battled a flood of news and we booked some profits,https://www.cnbc.com/2026/01/17/week-in-review-stocks-battled-a-flood-of-news-and-we-booked-some-profits.html
3 Hours Ago,Trump threatens to sue JPMorgan Chase for 'debanking' him,https://www.cnbc.com/2026/01/17/trump-jpmorgan-chase-debanking.html
5 Hours Ago,Trump: NATO members to face tariffs up to 25% until a Greenland deal is struck,https://www.cnbc.com/2026/01/17/trump-greenland-tariffs-nato.html
6 Hours Ago,"Led by Texas, states race to prove they can put bitcoin on public balance sheet",https://www.cnbc.com/2026/01/17/texas-us-states-budgets-bitcoin-crypto-strategic-reserve.html
7 Hours Ago,Unshaken: Why Brazilian stocks have looked past the Venezuela attack,https://www.cnbc.com/2026/01/17/unshaken-why-brazilian-stocks-have-looked-past-the-venezuela-attack.html
7 Hours Ago,Bestselling author: How to create better habits without relying on discipline,https://www.cnbc.com/2026/01/17/james-clear-how-to-create-better-habits-without-relying-on-discipline.html
8 Hours Ago,"Warren Buffett: To maximize your potential, ask yourself this question",https://www.cnbc.com/2026/01/17/warren-buffett-to-maximize-your-potential-ask-yourself-this-question.html
8 Hours Ago,"Buy these five stocks ahead of earnings, Bank of America says",https://www.cnbc.com/2026/01/17/stocks-to-buy-ahead-of-earnings-bank-of-america-says.html
8 Hours Ago,This week's most overbought names include Darden Restaurants and Target,https://www.cnbc.com/2026/01/17/this-weeks-most-overbought-names-include-darden-restaurants-and-target.html
```

!!!! The CNBC webpage contains certain elements, such as the market banner at the top of the page, that are dynamically rendered using JavaScript. Since this script uses the Requests library, which only retrieves the initial HTML response from the server and does not execute JavaScript, these dynamically generated elements are not present in the saved HTML file. The script therefore collects and saves the raw HTML content returned by the server.