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"Київський політехнічний інститут імені Ігоря Сікорського"
Фізико-технічний інститут**

«Харні технології»

Лабораторна робота №2

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Київ – 2022

ЗАВДАННЯ

1. Отримати програматично дані щодо курсу гривні у JSON-форматі на інстанс (<https://bank.gov.ua/ua/open-data/api-dev>) (засобами Python за 2021 рік)
2. Написати скрипт, що створить відповідний csv-файл з даними, конвертуючи отриманий json-файл з пункту 1
3. Створені csv-файли мають програматично вивантажуватись на S3
4. Розробити скрипт для читання файлів з бакету та візуалізації курсу валют засобами Python (наприклад у jupyter notebook - <https://jupyter.org>, ядро якого працюватиме на інстансі, а сам він буде працювати у браузері на вашому комп'ютері)
5. Побудувати графік із курсом гривні щодо іноземних валют (Долар США та Євро) для 2021 року
6. Зберегти побудований графік на бакет та додати його до звіту
7. Результати усіх кроків оформити у вигляді детального протоколу зі скріншотами та командами в консолі які використовувалися
8. Навести перелік проблем, вирішення яких було складним в ході виконання роботи в розділі висновків до протоколу

Створимо бакет в тому ж регіоні, що і наш інстанс

aws

Services

Search for services, features, blogs, docs, and more

[Alt+S]

S3

EC2

Amazon S3 > Buckets > Create bucket

1

Create bucket

Info

Buckets are containers for data stored in S3. [Learn more](#)

General configuration

Bucket name

data.hurdzhyia

Bucket name must be unique and must not contain spaces or uppercase letters. [See rules for bucket naming](#)

AWS Region

US West (N. California) us-west-1

Copy settings from existing bucket - optional

Only the bucket settings in the following configuration are copied.

Choose bucket

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Services

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S3

EC2

Amazon S3 > Buckets > Create bucket

1

Object Ownership

Info

Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

☒ ACLs disabled (recommended)

All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.

☐ ACLs enabled

Objects in this bucket can be owned by other AWS accounts. Access to this bucket and its objects can be specified using ACLs.

Object Ownership

Bucket owner enforced

Block Public Access settings for this bucket

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. [Learn more](#)

☒ Block all public access

Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.

☒ Block public access to buckets and objects granted through new access control lists (ACLs)

Бакет успішно створився

aws

Services

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S3

EC2

Amazon S3 > Buckets

1

Successfully created bucket "data.hurdzhyia"

To upload files and folders, or to configure additional bucket settings choose [View details](#).

[View details](#)

[Learn more](#)

Account snapshot

Storage lens provides visibility into storage usage and activity trends. [Learn more](#)

[View Storage Lens dashboard](#)

Buckets (1)

Info

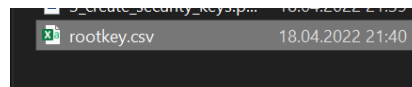
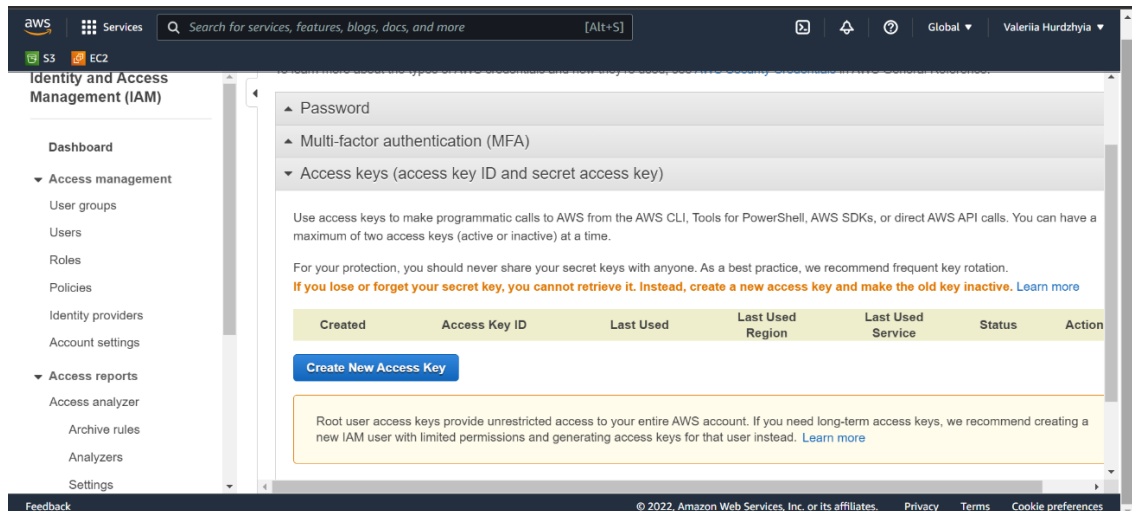
[Refresh](#) [Copy ARN](#) [Empty](#) [Delete](#) [Create bucket](#)

Buckets are containers for data stored in S3. [Learn more](#)

[<](#) [1](#) [>](#) [Refresh](#)

Name	AWS Region	Access	Creation date
<input type="radio"/> data.hurdzhyia	US West (N. California) us-west-1	Bucket and objects not public	April 18, 2022, 21:29:47 (UTC+03:00)

Створимо Access key (access key ID and secret access key)



Створимо нового користувача

Add user

12345

Set user details

You can add multiple users at once with the same access type and permissions. [Learn more](#)

User name*

[Add another user](#)

Select AWS access type

Select how these users will primarily access AWS. If you choose only programmatic access, it does NOT prevent users from accessing the console using an assumed role. Access keys and autogenerated passwords are provided in the last step. [Learn more](#)

Select AWS credential type*

☒ Access key - Programmatic access
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, and other development tools.

☒ Password - AWS Management Console access
Enables a **password** that allows users to sign-in to the AWS Management Console.

Add user

12345

Review

Review your choices. After you create the user, you can view and download the autogenerated password and access key.

User details

User name	lera
AWS access type	Programmatic access and AWS Management Console access
Console password type	Custom
Require password reset	Yes
Permissions boundary	Permissions boundary is not set

Add user

12345

Success

You successfully created the users shown below. You can view and download user security credentials. You can also email users instructions for signing in to the AWS Management Console. This is the last time these credentials will be available to download. However, you can create new credentials at any time.

Users with AWS Management Console access can sign-in at: <https://721793568104.signin.aws.amazon.com/console>

Download .csv

	User	Access key ID	Secret access key	Email login instructions
▶	lera	AKIA2QDR7ZVUCPLEFVOP	Ui7JRg[REDACTED] [REDACTED] Hide	Send email

Close

Ввійшли в акаунт



Sign in as IAM user

Account ID (12 digits) or account alias

721793568104

IAM user name

lera

Password

.....

☐ Remember this account

Sign in

[Sign in using root user email](#)

[Forgot password?](#)

aws

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[Alt+S]

S3

EC2

IAM

N. Virginia

lera @ 7217-9356-8104

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Starting April 2022, the new AWS Console Home will replace your current experience. Switch now to customize your Console Home and view valuable insights. [Learn more](#) or let us know what you think.

Switch now

AWS Management Console

AWS services

▼ Recently visited services

EC2

S3

IAM

▶ All services

New AWS Console Home

See valuable insights for your account and services with the new customizable Console Home experience. [Learn more](#)

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Stay connected to your AWS resources on-the-go

Feedback

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Встановимо AWS CLI

```
[ec2-user@ip-172-31-11-110 ~]$ curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total     Spent    Left  Speed
100 44.7M  100 44.7M    0     0  124M      0 --:--:-- --:--:-- --:--:--  124M
```

```
[ec2-user@ip-172-31-11-110 ~]$ unzip awscliv2.zip
Archive:  awscliv2.zip
  creating: aws/
  creating: aws/dist/
 inflating: aws/install
 inflating: aws/THIRD_PARTY_LICENSES
 inflating: aws/README.md
  creating: aws/dist/_struct/
  creating: aws/dist/awscli/
  creating: aws/dist/cryptography/
  creating: aws/dist/cryptography-3.3.2-py3.9.egg-info/
  creating: aws/dist/docutils/
```

```
[ec2-user@ip-172-31-11-110 ~]$ sudo ./aws/install
You can now run: /usr/local/bin/aws --version
[ec2-user@ip-172-31-11-110 ~]$ /usr/local/bin/aws --version
aws-cli/2.5.6 Python/3.9.11 Linux/5.10.102-99.473.amzn2.x86_64 exe/x86_64.amzn.2 prompt/off
```

Налаштуємо клієнт

```
[ec2-user@ip-172-31-11-110 ~]$ aws configure
AWS Access Key ID [None]: AKIA2QDR7ZVUCPLEFVOP
AWS Secret Access Key [None]: Ut7JRg-
Default region name [None]: us-west-2
Default output format [None]: json
```

Для налаштування Python API встановимо Miniconda

```
(kali@kali)-[~/Desktop]
$ scp -i "laba.pem" Miniconda3-py39_4.11.0-Linux-x86_64.sh ec2-user@ec2-50-18-41-223.us-west-1.compute.amazonaws.com:.
Miniconda3-py39_4.11.0-Linux-x86_64.sh      100% 72MB 5.8MB/s 00:12
```

```
[ec2-user@ip-172-31-11-110 ~]$ ./Miniconda3-py39_4.11.0-Linux-x86_64.sh

Welcome to Miniconda3 py39_4.11.0

In order to continue the installation process, please review the license
agreement.
Please, press ENTER to continue
>>>
=====
End User License Agreement - Miniconda
=====

Copyright 2015-2021, Anaconda, Inc.
```

Та власне сам Python SDK для AWS

```
(base) [ec2-user@ip-172-31-11-110 ~]$ conda install boto3
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: /home/ec2-user/miniconda3

added / updated specs:
- boto3
```

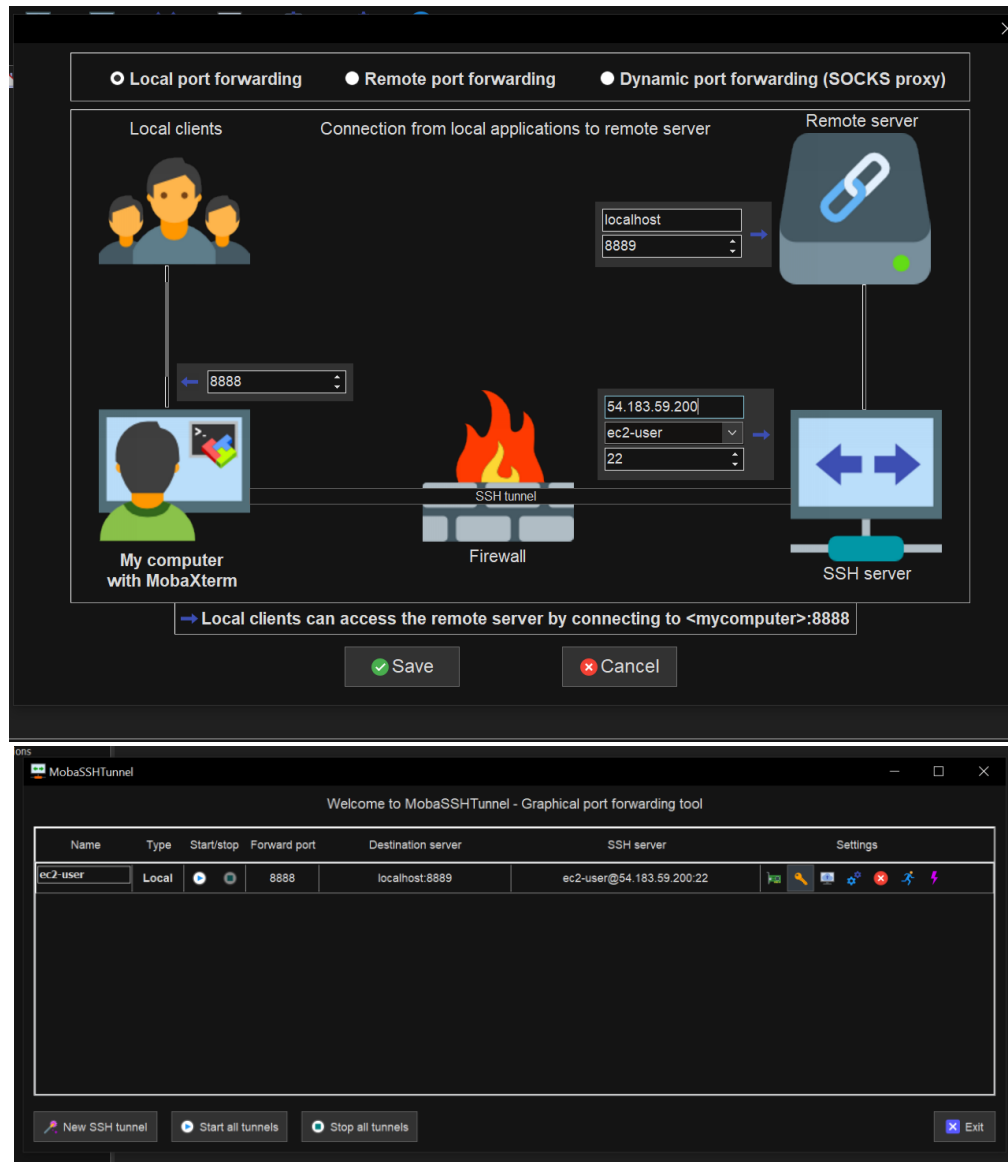
Розгорнемо Jupyter Notebook на інстансі

```
[ec2-user@ip-172-31-11-110 ~]$ sudo pip3 install jupyter notebook
WARNING: Running pip install with root privileges is generally not a good idea. Try `pip
3 install --user` instead.
Collecting jupyter
  Downloading jupyter-1.0.0-py2.py3-none-any.whl (2.7 kB)
Collecting notebook
  Downloading notebook-6.4.11-py3-none-any.whl (9.9 MB)
    | 9.9 MB 22.2 MB/s
Collecting jupyter-console
```

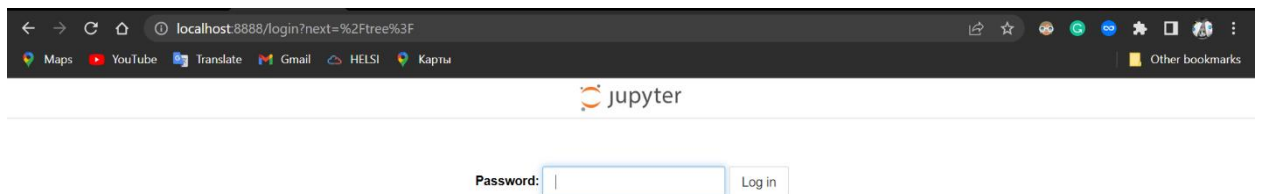
```
[ec2-user@ip-172-31-11-110 ~]$ jupyter notebook --no-browser --port 8889
[I 15:05:39.712 NotebookApp] Writing notebook server cookie secret to /home/ec2-user/.lo
cal/share/jupyter/runtime/notebook_cookie_secret
[I 15:05:39.970 NotebookApp] Serving notebooks from local directory: /home/ec2-user
[I 15:05:39.970 NotebookApp] Jupyter Notebook 6.4.11 is running at:
[I 15:05:39.970 NotebookApp] http://localhost:8889/?token=462ad667e86acc5cc455512120257b
8d16f569f5f721ed8e
[I 15:05:39.970 NotebookApp] or http://127.0.0.1:8889/?token=462ad667e86acc5cc455512120
257b8d16f569f5f721ed8e
[I 15:05:39.970 NotebookApp] Use Control-C to stop this server and shut down all kernels
(twice to skip confirmation).
[C 15:05:39.974 NotebookApp]

To access the notebook, open this file in a browser:
  file:///home/ec2-user/.local/share/jupyter/runtime/nbserver-4716-open.html
Or copy and paste one of these URLs:
  http://localhost:8889/?token=462ad667e86acc5cc455512120257b8d16f569f5f721ed8e
  or http://127.0.0.1:8889/?token=462ad667e86acc5cc455512120257b8d16f569f5f721ed8e
```

Створюємо SSH-тунель через MobaXterm



Вводимо в браузері <http://localhost:8888/> та отримаємо запрошення для вводу токена авторизації



Наш хмарний ноутбук готовий для роботи

localhost:8888/tree?

MapsYouTubeTranslateGmailHELISKартыOther bookmarks

jupyter

QuitLogout

FilesRunningClusters

Select items to perform actions on them.

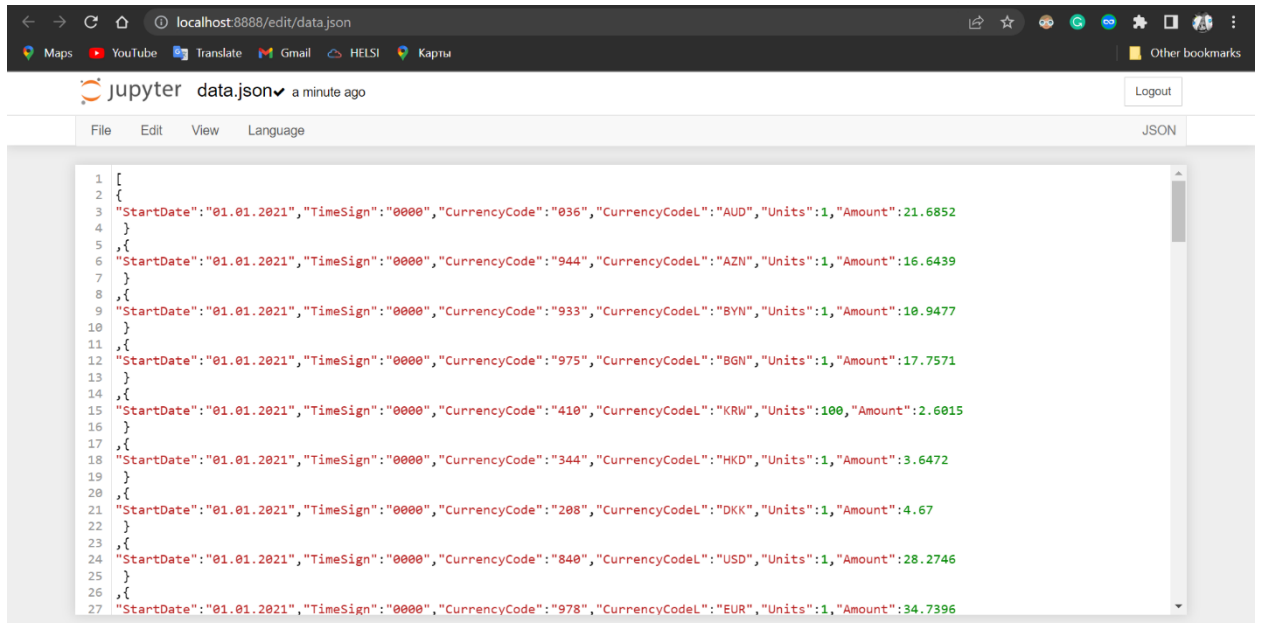
UploadNew

<input type="checkbox"/>	0		/	Name	Last Modified	File size
<input type="checkbox"/>			aws		6 days ago	
<input type="checkbox"/>			miniconda3		20 hours ago	
<input type="checkbox"/>			awscliv2.zip		2 days ago	46.9 MB
<input type="checkbox"/>			file.txt		a month ago	13 B
<input type="checkbox"/>			file1.txt		a month ago	0 B
<input type="checkbox"/>			Miniconda3-py39_4.11.0-Linux-x86_64.sh		20 hours ago	75.7 MB

Скрипт, що отримує програматично дані щодо курсу гривні у JSON-форматі на інстанс за 2021 рік

```
In [1]: import urllib
url = 'https://bank.gov.ua/NBU_Exchange/exchange?date=01012021&json'
urllib.request.urlretrieve(url, 'data.json')
```

```
Out[1]: ('data.json', <http.client.HTTPMessage at 0x7fddb85c8110>)
```

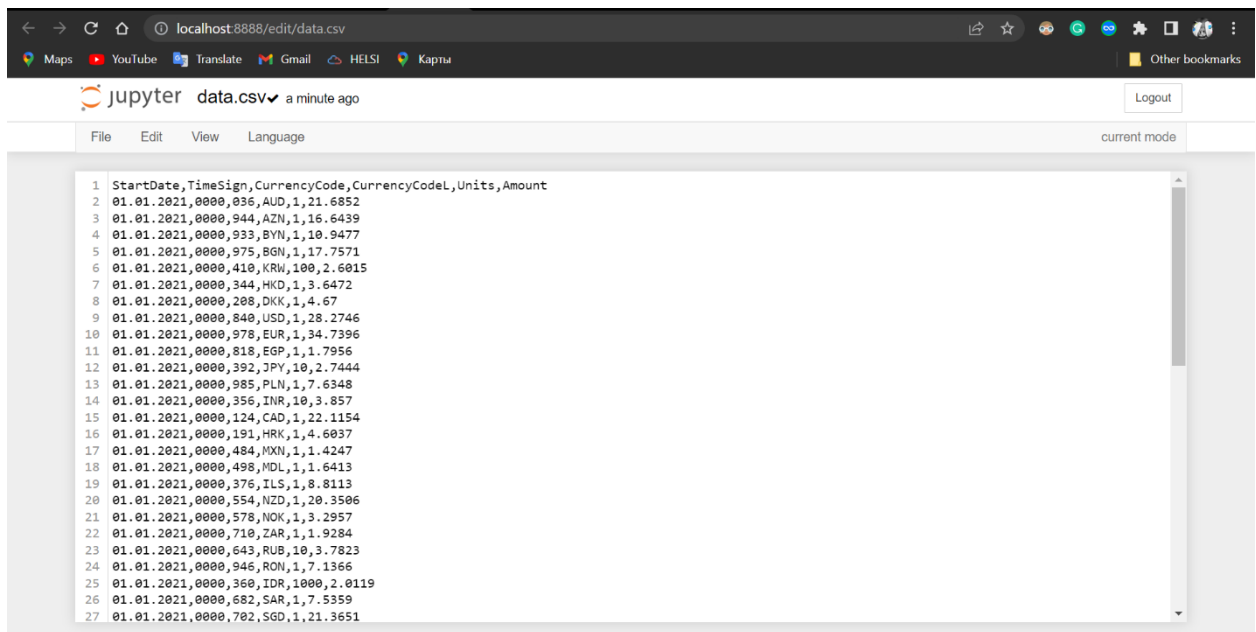


The screenshot shows a Jupyter Notebook interface with a browser window at the top displaying 'localhost:8888/edit/data.json'. Below the browser, the Jupyter interface shows a file named 'data.json' with a 'JSON' tab selected. The content of the file is a JSON array of 10 objects, each representing a currency exchange rate for a specific date and time. The data is as follows:

Index	StartDate	TimeSign	CurrencyCode	CurrencyCodeL	Units	Amount
1	"01.01.2021"	"0000"	"036"	"AUD"	1	21.6852
2	"01.01.2021"	"0000"	"944"	"AZN"	1	16.6439
3	"01.01.2021"	"0000"	"933"	"BYN"	1	10.9477
4	"01.01.2021"	"0000"	"975"	"BGN"	1	17.7571
5	"01.01.2021"	"0000"	"410"	"KRW"	100	2.6015
6	"01.01.2021"	"0000"	"344"	"HKD"	1	3.6472
7	"01.01.2021"	"0000"	"208"	"DKK"	1	4.67
8	"01.01.2021"	"0000"	"840"	"USD"	1	28.2746
9	"01.01.2021"	"0000"	"978"	"EUR"	1	34.7396
10	"01.01.2021"	"0000"	"978"	"EUR"	1	34.7396

Скрипт, що створює відповідний csv-файл з даними, конвертуючи отриманий json-файл

```
In [5]: import pandas as pd
import json
f = open('data.json', 'r')
json_str = f.read()
pd.DataFrame(json.loads(json_str)).to_csv("data.csv", index=False)
```



Створені csv-файли програматично вивантажуємо на S3

```
In [23]: import logging
import boto3
from botocore.exceptions import ClientError
import os
import glob
def upload_file(file_name, bucket, object_name=None):
    # If S3 object_name was not specified, use file_name
    if object_name is None:
        object_name = os.path.basename(file_name)
    # Upload the file
    s3_client = boto3.client('s3')
    try:
        response = s3_client.upload_file(file_name, bucket, object_name)
    except ClientError as e:
        logging.error(e)
        return False
    return True

os.chdir("./")
for file in glob.glob("*.csv"):
    print(file)
    upload_file(file, 'data.hurdzhyia')
```

data.csv

```
In [24]: !aws s3 ls data.hurdzhyia/
```

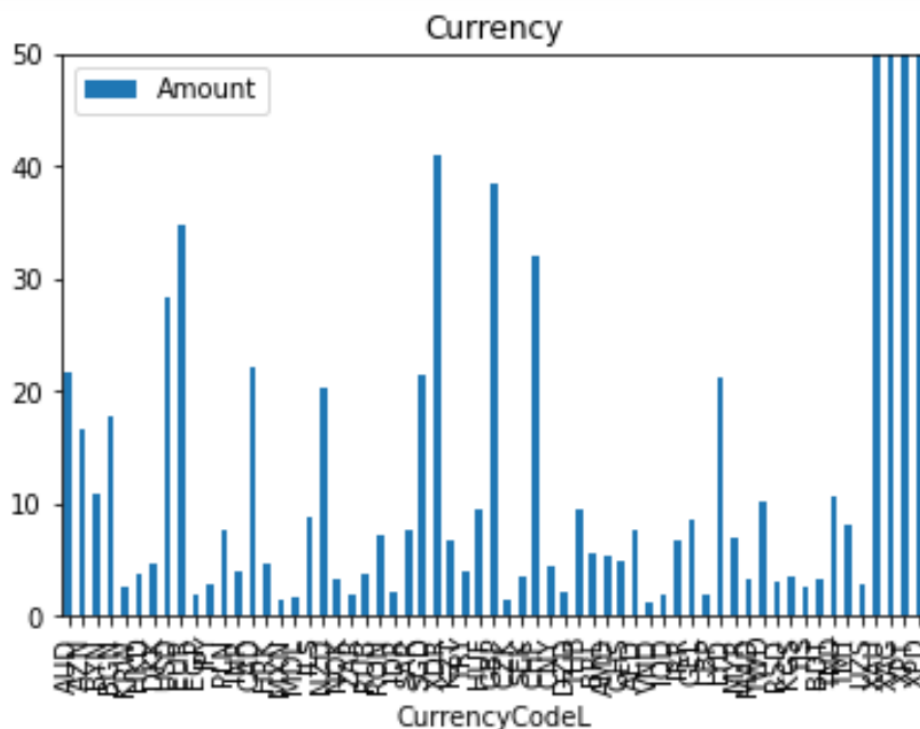
```
2022-04-21 19:37:52          2117 data.csv
```

Скрипт для читання файлів з бакету та візуалізації курсу валют засобами Python

```
In [164]: import boto3
import matplotlib.pyplot as plt
import pandas as pd
import io
s3 = boto3.resource('s3')
bucket = s3.Bucket('data.hurdzhyia')
obj = s3.ObjectSummary(bucket_name='data.hurdzhyia', key='data.csv')
file_content = obj.get()['Body'].read()
data_frame = pd.read_csv(io.BytesIO(file_content))
print(data_frame)

df = pd.DataFrame(data_frame, columns=['CurrencyCodeL', 'Amount'])
df.plot(x = 'CurrencyCodeL', y = 'Amount', kind = 'bar')
plt.title("Currency")
plt.ylim(0, 50)
plt.show()
```

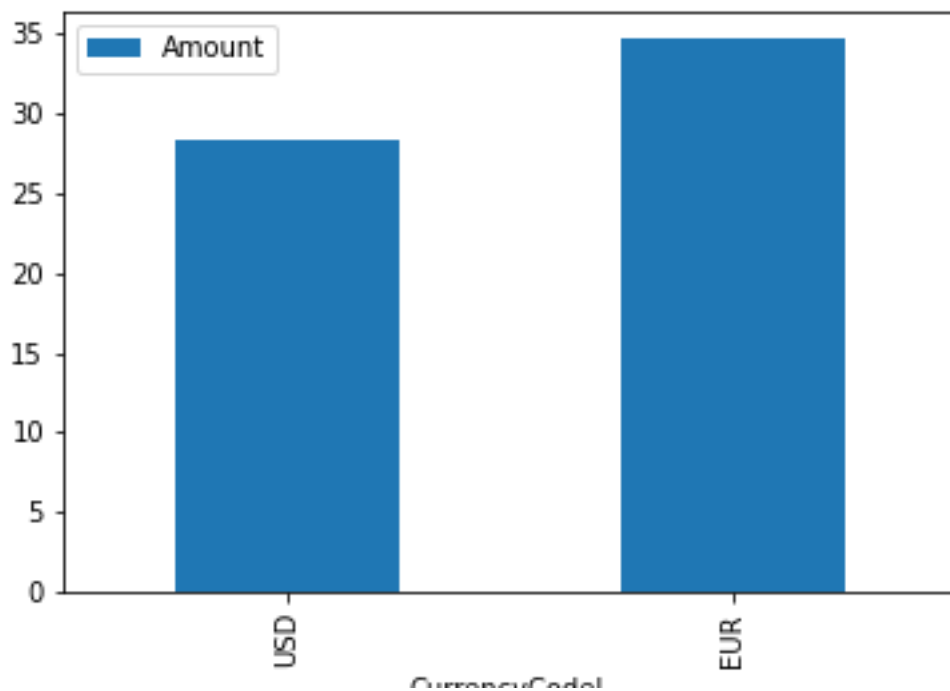
	StartDate	TimeSign	CurrencyCode	CurrencyCodeL	Units	Amount
0	01.01.2021	0	36	AUD	1	21.6852
1	01.01.2021	0	944	AZN	1	16.6439
2	01.01.2021	0	933	BYN	1	10.9477
3	01.01.2021	0	975	BGN	1	17.7571
4	01.01.2021	0	410	KRW	100	2.6015
..
56	01.01.2021	0	860	UZS	1000	2.6988
57	01.01.2021	0	959	XAU	1	53200.9200
58	01.01.2021	0	961	XAG	1	744.1900
59	01.01.2021	0	962	XPT	1	30203.4900
60	01.01.2021	0	964	XPB	1	66289.5200



Побудували графік із курсом гривні щодо іноземних валют (Долар США та Євро) для 2021 року

```
In [167]: import boto3
import matplotlib.pyplot as plt
import pandas as pd
import io
s3 = boto3.resource('s3')
bucket = s3.Bucket('data.hurdzhyia')
obj = s3.ObjectSummary(bucket_name='data.hurdzhyia', key='data.csv')
file_content = obj.get()['Body'].read()
data_frame = pd.read_csv(io.BytesIO(file_content))

df = pd.DataFrame(data_frame, columns=['CurrencyCodeL', 'Amount'], index=[7,8])
df.plot(x = 'CurrencyCodeL', y = 'Amount', kind = 'bar')
plt.savefig("currency.png")
plt.show()
```



Зберегли побудований графік на бакет

```
!aws s3 cp currency.png s3://data.hurdzhyia/
```

```
upload: ./currency.png to s3://data.hurdzhyia/currency.png
```

data.hurdzhyia

Info

Objects

Properties

Permissions

Metrics

Management

Access Points

Objects (2)

Objects are the fundamental entities stored in Amazon S3. You can use [Amazon S3 inventory](#) to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#)

Copy S3 URI

Copy URL

Download

Open

Delete

Actions



Create folder

Upload

Find objects by prefix

Show versions

< 1 >

	Name	Type	Last modified	Size	Storage class
<input type="checkbox"/>	 currency.png	png	April 22, 2022, 18:36:35 (UTC+03:00)	4.0 KB	Standard
<input type="checkbox"/>	 data.csv	csv	April 21, 2022, 22:37:52 (UTC+03:00)	2.1 KB	Standard

Проблеми, які виникли в ході виконання роботи

Не вдалося створити SSH-тунель через консоль, тому використала програму MobaXterm.

Коли встановлювала boto3 через conda, при написанні скрипта вибивалася помилка *moduleNotFoundError: no module named 'boto3'*, проте коли встановила ще раз через pip3, помилка зникла.

Висновок: В ході виконання роботи я навчилася користуватися бакетами в AWS, також дізналася про корисний інструмент jupyter, де відразу можна побачити результат виконання коду та його окремих частин.