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CS571 - Cloud computing Infrastructure

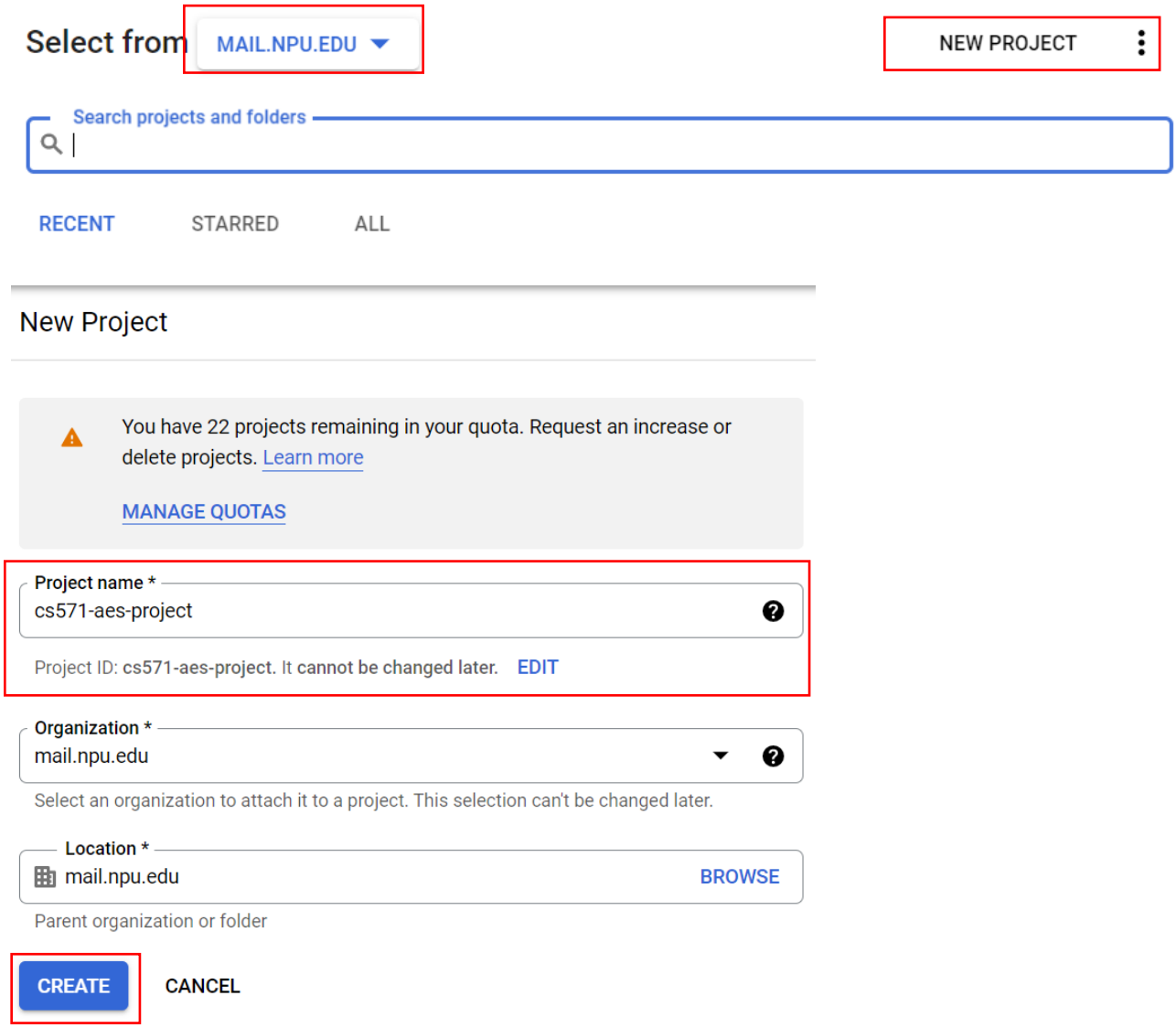
Week - 11 Automated Essay Scoring System (AES)

The project has conservative two stage approach, at stage one system used deep learning model read and store the essay for preprocessed text-summary and once the system is completed the system entered into stage two for comparing the instructor's summary with the students' one.

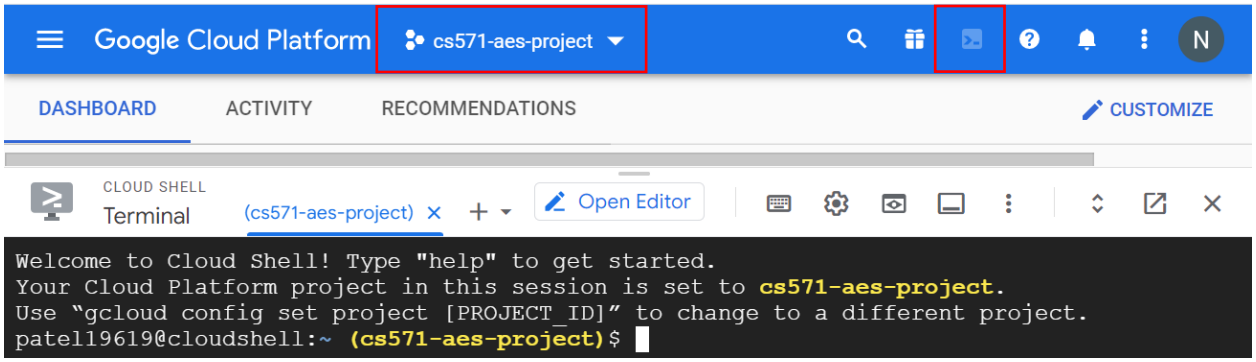
The Following are the procedures to hosting the system on the GCP GKE.

Step 1 Create a new project on GCP for this project work.

1. Create a new project on GCP.



2. Select the project that you created and open the GCP terminal windows.



We have created the specific space on GCP to organize the file for this AES project.

Step 2 To host the AES project on GKE cluster, the configuration steps are following:

1. Create and launch the new **aes-project** Kubernetes cluster on GKE with Python environment on GCP

   gcloud container clusters create aes-project --num-nodes=1 --machine-type=e2-micro --region=us-west1

```
patel19619@cloudshell:~ (cs571-aes-project)$ gcloud container clusters create aes-project --num-nodes=1 --
machine-type=e2-micro --region=us-west1
Default change: VPC-native is the default mode during cluster creation for versions greater than 1.21.0-gk
e.1500. To create advanced routes based clusters, please pass the `--no-enable-ip-alias` flag
Note: Your Pod address range (`--cluster-ipv4-cidr`) can accommodate at most 1008 node(s).
Creating cluster aes-project in us-west1... Cluster is being health-checked (master is healthy)..
.done.
Created [https://container.googleapis.com/v1/projects/cs571-aes-project/zones/us-west1/clusters/aes-projec
t].
To inspect the contents of your cluster, go to: https://console.cloud.google.com/kubernetes/workload_/gclo
ud/us-west1/aes-project?project=cs571-aes-project
kubeconfig entry generated for aes-project.
NAME: aes-project
LOCATION: us-west1
MASTER_VERSION: 1.21.6-gke.1503
MASTER_IP: 34.145.112.181
MACHINE_TYPE: e2-micro
NODE_VERSION: 1.21.6-gke.1503
NUM_NODES: 3
STATUS: RUNNING
```

2. Check the running node

   kubectl get nodes

```
patel19619@cloudshell:~ (cs571-aes-project)$ kubectl get nodes
NAME                                          STATUS   ROLES    AGE     VERSION
gke-aes-project-default-pool-d36f0289-3d3x    Ready    <none>   2m20s   v1.21.6-gke.1503
gke-aes-project-default-pool-de5e79c2-nbx5    Ready    <none>   2m20s   v1.21.6-gke.1503
gke-aes-project-default-pool-f6764252-2wz4    Ready    <none>   2m20s   v1.21.6-gke.1503
```

3. Make new final_project directory and go to newly created final_project directory.

   mkdir final_project

   cd final_project

```
(base) patel19619@cloudshell:~ (cs571-aes-project)$ cd final_project
```

4. Download the latest Anaconda Miniconda shell script

   wget https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.sh

```
(base) patel19619@cloudshell:~/final_project$ wget https://repo.anaconda.com/miniconda/Minico
nda3-latest-Linux-x86_64.sh
--2022-04-06 03:34:16--  https://repo.anaconda.com/miniconda/Miniconda3-latest-Linux-x86_64.s
h
Resolving repo.anaconda.com (repo.anaconda.com)... 104.16.131.3, 104.16.130.3, 2606:4700::681
0:8203, ...
Connecting to repo.anaconda.com (repo.anaconda.com)|104.16.131.3|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 75660608 (72M) [application/x-sh]
Saving to: 'Miniconda3-latest-Linux-x86_64.sh.1'

Miniconda3-latest-Linux 100%[============================>]  72.16M   165MB/s    in 0.4s

2022-04-06 03:34:16 (165 MB/s) - 'Miniconda3-latest-Linux-x86_64.sh.1' saved [75660608/756606
08]
```

5. Execute the miniconda installation script

   chmod +x Miniconda3-latest-Linux-x86_64.sh

```
(base) patel19619@cloudshell:~/final_project$ chmod +x Miniconda3-latest-Linux-x86_64.sh
```

```
(base) patel19619@cloudshell:~/final_project$ ls -l
total 73888
-rwxr-xr-x 1 patel19619 patel19619 75660608 Feb 15 19:07 Miniconda3-latest-Linux-x86_64.sh
```

6. Run miniconda installation script

   ./Miniconda3-latest-Linux-x86_64.sh

```
(base) patel19619@cloudshell:~/final_project$ ./Miniconda3-latest-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.

All rights reserved under the 3-clause BSD License:
```

Keep press Enter and yes then again press Enter

```
Please answer 'yes' or 'no':'
>>> yes

Miniconda3 will now be installed into this location:
/home/patel19619/miniconda3

  - Press ENTER to confirm the location
  - Press CTRL-C to abort the installation
  - Or specify a different location below

[/home/patel19619/miniconda3] >>>
PREFIX=/home/patel19619/miniconda3
Unpacking payload ...
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: /home/patel19619/miniconda3

  added / updated specs:
    - _libgcc_mutex==0.1=main
    - _openmp_mutex==4.5=1_gnu
    - brotlipy==0.7.0=py39h27cfd23_1003
    - ca-certificates==2021.10.26=h06a4308_2
    - certifi==2021.10.8=py39h06a4308_2
    - cffi==1.15.0=py39hd667e15_1
```

```
==> For changes to take effect, close and re-open your current shell. <==

If you'd prefer that conda's base environment not be activated on startup,
   set the auto_activate_base parameter to false:

conda config --set auto_activate_base false

Thank you for installing Miniconda3!
```

7. Open the Cloud shell Editor.
8. Create and activate a Python virtual environment for this project

conda create -n myenv python=3.6

```
(base) patel19619@cloudshell:~/final_project$ conda create -n myenv python=3.6
WARNING: A conda environment already exists at '/home/patel19619/miniconda3/envs/myenv'
Remove existing environment (y/[n])? y

Collecting package metadata (current_repodata.json): done
Solving environment: done


==> WARNING: A newer version of conda exists. <==
  current version: 4.11.0
  latest version: 4.12.0

Please update conda by running

    $ conda update -n base -c defaults conda
```

```
Downloading and Extracting Packages
pip-21.2.2           | 1.8 MB    | ############################################### | 100%
python-3.6.13        | 32.5 MB   | ############################################### | 100%
certifi-2020.6.20    | 155 KB    | ############################################### | 100%
sqlite-3.38.2        | 1.0 MB    | ############################################### | 100%
openssl-1.1.1n       | 2.5 MB    | ############################################### | 100%
ca-certificates-2022 | 117 KB    | ############################################### | 100%
setuptools-58.0.4    | 788 KB    | ############################################### | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
# To activate this environment, use
#
#     $ conda activate myenv
#
# To deactivate an active environment, use
#
#     $ conda deactivate
```

conda activate myenv

```
(base) patel19619@cloudshell:~/final_project$ conda activate myenv
(myenv) patel19619@cloudshell:~/final_project$
```

9. Clone the Quan's AES project from github.

git clone https://github.com/Quan25/flask-summary.git aes_project

```
(myenv) patel19619@cloudshell:~/final_project$ git clone https://github.com/Quan25/flask-summ
ary.git aes_project
Cloning into 'aes_project'...
remote: Enumerating objects: 191, done.
remote: Counting objects: 100% (191/191), done.
remote: Compressing objects: 100% (136/136), done.
remote: Total 191 (delta 91), reused 148 (delta 51), pack-reused 0
Receiving objects: 100% (191/191), 710.58 KiB | 5.38 MiB/s, done.
Resolving deltas: 100% (91/91), done.
```

10. Go to aes_project directory

cd aes_project

```
drwxr-xr-x 10 patel19619 patel19619     4096 Apr  6 03:39 aes_project
(myenv) patel19619@cloudshell:~/final_project$ cd aes_project
```

Check the cloned AES project repository

ls -l

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ ls -l
total 336
-rw-r--r-- 1 patel19619 patel19619    255 Apr  6 03:39 Instructor.json
-rw-r--r-- 1 patel19619 patel19619   2127 Apr  6 03:39 README.md
-rw-r--r-- 1 patel19619 patel19619    741 Apr  6 03:39 Student.json
drwxr-xr-x 2 patel19619 patel19619   4096 Apr  6 03:39 __pycache__
-rw-r--r-- 1 patel19619 patel19619   2566 Apr  6 03:39 app.py
-rw-r--r-- 1 patel19619 patel19619   5356 Apr  6 03:39 argsParser.py
-rw-r--r-- 1 patel19619 patel19619   3229 Apr  6 03:39 autoGrader.py
drwxr-xr-x 2 patel19619 patel19619   4096 Apr  6 03:39 css
-rw-r--r-- 1 patel19619 patel19619 184193 Apr  6 03:39 demo.png
-rw-r--r-- 1 patel19619 patel19619   1377 Apr  6 03:39 generateGrade.py
-rw-r--r-- 1 patel19619 patel19619   1036 Apr  6 03:39 generateSummary.py
-rw-r--r-- 1 patel19619 patel19619  68783 Apr  6 03:39 guides.pdf
-rw-r--r-- 1 patel19619 patel19619     31 Apr  6 03:39 requirements.txt
drwxr-xr-x 3 patel19619 patel19619   4096 Apr  6 03:39 static
drwxr-xr-x 2 patel19619 patel19619   4096 Apr  6 03:39 students
-rw-r--r-- 1 patel19619 patel19619     64 Apr  6 03:39 students.txt
drwxr-xr-x 3 patel19619 patel19619   4096 Apr  6 03:39 summarizer
-rw-r--r-- 1 patel19619 patel19619   1204 Apr  6 03:39 summarizerApp.py
drwxr-xr-x 2 patel19619 patel19619   4096 Apr  6 03:39 templates
-rw-r--r-- 1 patel19619 patel19619  13083 Apr  6 03:39 test.txt
```

11. Type the following command to download rough.zip to your directory

wget --load-cookies /tmp/cookies.txt

"https://docs.google.com/uc?export=download&confirm=$(wget --quiet --savecookies

/tmp/cookies.txt --keep-session-cookies --no-check-certificate

'https://drive.google.com/file/d/1RxfZOYyNvzvCf37_vABfJMkohAsEZKtH/' -O- | sed -

rn 's/.confirm=([0-9A-Za-z_]+)./\1\n/p')&id=1RxfZOYyNvzvCf37_vABfJMkohAsEZKtH"

-O rough.zip && rm -rf /tmp/cookies.txt

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ wget --load-cookies /tmp/cookies.txt "http
s://docs.google.com/uc?export=download&confirm=$(wget --quiet --savecookies /tmp/cookies.txt --keep-s
ession-cookies --no-check-certificate 'https://drive.google.com/file/d/1RxfZOYyNvzvCf37_vABfJMkohAsEZ
KtH/' -O- | sed -rn 's/.confirm=([0-9A-Za-z_]+)./\1\n/p')&id=1RxfZOYyNvzvCf37_vABfJMkohAsEZKtH" -O ro
ugh.zip && rm -rf /tmp/cookies.txt                          wget: unrecognized option '--savecookies
'
Usage: wget [OPTION]... [URL]...

Try `wget --help' for more options.
Cannot open cookies file '/tmp/cookies.txt': No such file or directory
--2022-04-06 03:45:16--  https://docs.google.com/uc?export=download&confirm=&id=1RxfZOYyNvzvCf37_vABf
JMkohAsEZKtH
Resolving docs.google.com (docs.google.com)... 142.250.107.102, 142.250.107.101, 142.250.107.139, ...
Connecting to docs.google.com (docs.google.com)|142.250.107.102|:443... connected.
HTTP request sent, awaiting response... 303 See Other
Location: https://doc-14-ao-docs.googleusercontent.com/docs/securesc/ha0ro937gcuc7l7deffksulhg5h7mbp1
/ma2oqv4mtd0efoop6lqsf10n24cpkpnm/1649216700000/09591049636102722091/*/1RxfZOYyNvzvCf37_vABfJMkohAsEZ
KtH?e=download [following]
Warning: wildcards not supported in HTTP.
--2022-04-06 03:45:22--  https://doc-14-ao-docs.googleusercontent.com/docs/securesc/ha0ro937gcuc7l7de
ffksulhg5h7mbp1/ma2oqv4mtd0efoop6lqsf10n24cpkpnm/1649216700000/09591049636102722091/*/1RxfZOYyNvzvCf3
7_vABfJMkohAsEZKtH?e=download
Resolving doc-14-ao-docs.googleusercontent.com (doc-14-ao-docs.googleusercontent.com)... 74.125.195.1
32, 2607:f8b0:400e:c09::84
Connecting to doc-14-ao-docs.googleusercontent.com (doc-14-ao-docs.googleusercontent.com)|74.125.195.
132|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3916745 (3.7M) [application/zip]
Saving to: 'rough.zip'

rough.zip              100%[=========================>]   3.73M  --.-KB/s    in 0.04s

2022-04-06 03:45:22 (96.8 MB/s) - 'rough.zip' saved [3916745/3916745]
```

Check the downloaded rough.zip file: **ls -l**

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ ls -l
total 4164
-rw-r--r-- 1 patel19619 patel19619     255 Apr  6 03:39 Instructor.json
-rw-r--r-- 1 patel19619 patel19619    2127 Apr  6 03:39 README.md
-rw-r--r-- 1 patel19619 patel19619     741 Apr  6 03:39 Student.json
drwxr-xr-x 2 patel19619 patel19619    4096 Apr  6 03:39 __pycache__
-rw-r--r-- 1 patel19619 patel19619    2566 Apr  6 03:39 app.py
-rw-r--r-- 1 patel19619 patel19619    5356 Apr  6 03:39 argsParser.py
-rw-r--r-- 1 patel19619 patel19619    3229 Apr  6 03:39 autoGrader.py
drwxr-xr-x 2 patel19619 patel19619    4096 Apr  6 03:39 css
-rw-r--r-- 1 patel19619 patel19619  184193 Apr  6 03:39 demo.png
-rw-r--r-- 1 patel19619 patel19619    1377 Apr  6 03:39 generateGrade.py
-rw-r--r-- 1 patel19619 patel19619    1036 Apr  6 03:39 generateSummary.py
-rw-r--r-- 1 patel19619 patel19619   68783 Apr  6 03:39 guides.pdf
-rw-r--r-- 1 patel19619 patel19619      31 Apr  6 03:39 requirements.txt
-rw-r--r-- 1 patel19619 patel19619 3916745 Apr  6 03:45 rough.zip
drwxr-xr-x 3 patel19619 patel19619    4096 Apr  6 03:39 static
drwxr-xr-x 2 patel19619 patel19619    4096 Apr  6 03:39 students
-rw-r--r-- 1 patel19619 patel19619      64 Apr  6 03:39 students.txt
drwxr-xr-x 3 patel19619 patel19619    4096 Apr  6 03:39 summarizer
-rw-r--r-- 1 patel19619 patel19619    1204 Apr  6 03:39 summarizerApp.py
drwxr-xr-x 2 patel19619 patel19619    4096 Apr  6 03:39 templates
-rw-r--r-- 1 patel19619 patel19619   13083 Apr  6 03:39 test.txt
```

12. Extract the rough.zip file

unzip rough.zip

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ unzip rough.zip
Archive:  rough.zip
   creating: RELEASE-1.5.5/
   creating: RELEASE-1.5.5/data/
   creating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/
  inflating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/adj.exc
  inflating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/verb.exc
  inflating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/adv.exc
  inflating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/WordNet-2.0.exc.db
  inflating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/buildExeptionDB.pl
  inflating: RELEASE-1.5.5/data/WordNet-2.0-Exceptions/noun.exc
  inflating: RELEASE-1.5.5/data/WordNet-2.0.exc.db
```

13. Go to **RELEASE-1.5.5** directory to download the required libraries for Rough-1.5.5 version

cd RELEASE-1.5.5

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ cd RELEASE-1.5.5
```

14. Install libxml-parser-perl, it is essential for installing ROUGE-1.5.5

sudo apt-get install libxml-parser-perl

```
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ sudo apt-get install libxml-parser-per
l
********************************************************************************
You are running apt-get inside of Cloud Shell. Note that your Cloud Shell
machine is ephemeral and no system-wide change will persist beyond session end.

To suppress this warning, create an empty ~/.cloudshell/no-apt-get-warning file.
The command will automatically proceed in 5 seconds or on any key.

Visit https://cloud.google.com/shell/help for more information.
********************************************************************************
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

sudo cpan install XML::Parser::PerlSAX

```
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ sudo cpan install XML::Parser::PerlSAX
Loading internal logger. Log::Log4perl recommended for better logging

CPAN.pm requires configuration, but most of it can be done automatically.
If you answer 'no' below, you will enter an interactive dialog for each
configuration option instead.

Would you like to configure as much as possible automatically? [yes] yes
Fetching with LWP:
http://www.cpan.org/authors/01mailrc.txt.gz
Reading '/root/.cpan/sources/authors/01mailrc.txt.gz'
.....................................................................DONE
Fetching with LWP:
http://www.cpan.org/modules/02packages.details.txt.gz
Reading '/root/.cpan/sources/modules/02packages.details.txt.gz'
  Database was generated on Wed, 06 Apr 2022 01:17:02 GMT
```

sudo cpan install XML::RegExp

```
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ sudo cpan install XML::RegExp
Loading internal logger. Log::Log4perl recommended for better logging
Reading '/root/.cpan/Metadata'
  Database was generated on Wed, 06 Apr 2022 01:17:02 GMT
Running install for module 'XML::RegExp'
Fetching with LWP:
http://www.cpan.org/authors/id/T/TJ/TJMATHER/XML-RegExp-0.04.tar.gz
Fetching with LWP:
http://www.cpan.org/authors/id/T/TJ/TJMATHER/CHECKSUMS
Checksum for /root/.cpan/sources/authors/id/T/TJ/TJMATHER/XML-RegExp-0.04.tar.gz ok
```

sudo cpan install XML::DOM

```
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ sudo cpan install XML::DOM
Loading internal logger. Log::Log4perl recommended for better logging
Reading '/root/.cpan/Metadata'
  Database was generated on Wed, 06 Apr 2022 01:17:02 GMT
Running install for module 'XML::DOM'
Fetching with LWP:
http://www.cpan.org/authors/id/T/TJ/TJMATHER/XML-DOM-1.46.tar.gz
Checksum for /root/.cpan/sources/authors/id/T/TJ/TJMATHER/XML-DOM-1.46.tar.gz ok
'YAML' not installed, will not store persistent state
Configuring T/TJ/TJMATHER/XML-DOM-1.46.tar.gz with Makefile.PL
Checking if your kit is complete...
Looks good
```

15. Make sure you can run this, which means the ROUGE is successfully installed

./runROUGE-test.pl

```
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ ./runROUGE-test.pl
../ROUGE-1.5.5.pl -e ../data -c 95 -2 -1 -U -r 1000 -n 4 -w 1.2 -a ROUGE-test.xml > ../sample-output/
ROUGE-test-c95-2-1-U-r1000-n4-w1.2-a.out
../ROUGE-1.5.5.pl -e ../data -c 95 -2 -1 -U -r 1000 -n 4 -w 1.2 -a -m ROUGE-test.xml > ../sample-outp
ut/ROUGE-test-c95-2-1-U-r1000-n4-w1.2-a-m.out
../ROUGE-1.5.5.pl -e ../data -c 95 -2 -1 -U -r 1000 -n 4 -w 1.2 -a -m -s ROUGE-test.xml > ../sample-o
utput/ROUGE-test-c95-2-1-U-r1000-n4-w1.2-a-m-s.out
../ROUGE-1.5.5.pl -e ../data -c 95 -2 -1 -U -r 1000 -n 4 -w 1.2 -l 10 -a ROUGE-test.xml > ../sample-o
utput/ROUGE-test-c95-2-1-U-r1000-n4-w1.2-l10-a.out
../ROUGE-1.5.5.pl -e ../data -c 95 -2 -1 -U -r 1000 -n 4 -w 1.2 -l 10 -a -m ROUGE-test.xml > ../sampl
e-output/ROUGE-test-c95-2-1-U-r1000-n4-w1.2-l10-a-m.out
../ROUGE-1.5.5.pl -e ../data -c 95 -2 -1 -U -r 1000 -n 4 -w 1.2 -l 10 -a -m -s ROUGE-test.xml > ../sa
mple-output/ROUGE-test-c95-2-1-U-r1000-n4-w1.2-l10-a-m-s.out
```

16. Now, to install pyrouge

git clone https://github.com/bheinzerling/pyrouge.git

cd pyrouge

```
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ git clone https://github.com/bheinzerl
ing/pyrouge.git
Cloning into 'pyrouge'...
remote: Enumerating objects: 551, done.
remote: Total 551 (delta 0), reused 0 (delta 0), pack-reused 551
Receiving objects: 100% (551/551), 123.17 KiB | 5.87 MiB/s, done.
Resolving deltas: 100% (198/198), done.
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ ls
README.txt        ROUGE-1.5.5.pl  docs     runROUGE-test.pl  sample-test
RELEASE-NOTE.txt  data            pyrouge  sample-output
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ cd pyrouge
(myenv) patel19619@cloudshell:~/.../RELEASE-1.5.5/pyrouge$
```

pip install -e .

```
(myenv) patel19619@cloudshell:~/.../RELEASE-1.5.5/pyrouge$ pip install -e .
Obtaining file:///home/patel19619/final_project/aes_project/RELEASE-1.5.5/pyrouge
Installing collected packages: pyrouge
  Running setup.py develop for pyrouge
Successfully installed pyrouge-0.1.3
```

17. Install pytorch 1.1.0 on pyrouge

conda install pytorch-cpu==1.1.0 torchvision-cpu==0.3.0 cpuonly -c pytorch

```
(myenv) patel19619@cloudshell:~/.../RELEASE-1.5.5/pyrouge$ conda install pytorch-cpu==1.1.0 torchvisi
on-cpu==0.3.0 cpuonly -c pytorch
Collecting package metadata (current_repodata.json): done
Solving environment: failed with initial frozen solve. Retrying with flexible solve.
Solving environment: failed with repodata from current_repodata.json, will retry with next repodata s
ource.
Collecting package metadata (repodata.json): done
Solving environment: done
```

```
pillow-8.3.1         | 637 KB    | ############################################################ | 100%
blas-1.0             | 6 KB      | ############################################################ | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
```

18. Go back to your **aes_project** directory and download pretrained-bert-model.

```
(myenv) patel19619@cloudshell:~/.../RELEASE-1.5.5/pyrouge$ cd ..
(myenv) patel19619@cloudshell:~/.../aes_project/RELEASE-1.5.5$ cd ..
```

wget https://s3.amazonaws.com/models.huggingface.co/bert/bert-large-uncased.tar.gz

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ wget https://s3.amazonaws.com/models.huggi
ngface.co/bert/bert-large-uncased.tar.gz
--2022-04-06 04:37:04--  https://s3.amazonaws.com/models.huggingface.co/bert/bert-large-uncased.tar.g
z
Resolving s3.amazonaws.com (s3.amazonaws.com)... 54.231.137.192
Connecting to s3.amazonaws.com (s3.amazonaws.com)|54.231.137.192|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1248501532 (1.2G) [application/x-tar]
Saving to: 'bert-large-uncased.tar.gz'

bert-large-uncased.tar.gz 100%[===================================>]   1.16G  41.4MB/s    in 28s

2022-04-06 04:37:33 (42.0 MB/s) - 'bert-large-uncased.tar.gz' saved [1248501532/1248501532]
```

19. Go to summarizer directory and open BertParent.py

cd summarizer

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ cd summarizer
(myenv) patel19619@cloudshell:~/.../aes_project/summarizer$ ls
BertParent.py   __pycache__   lecture_summarizer.py
```

20. Change the path in BertParent.py in summarizer folder.

    self.model=BertModel.from_pretrained('your_project_Directory/bert-large-uncased.tar.gz')

```
def __init__(self, model_type: str, size: str):
    #self.model = self.model_handler[model_type].from_pretrained(self.
    size_handler[size][model_type])
    self.model = BertModel.from_pretrained('/home/patel19619/final_project/
    aes_project/bert-large-uncased.tar.gz')
    self.tokenizer = self.token_handler[model_type].from_pretrained(self.
    size_handler[size][model_type])
    self.vector_size = self.vector_handler[size][model_type]
    self.model_type = model_type
    self.model.eval()
```

21. Go to **aes_project** directory and install all the following Python frameworks and dependencies packages.

    pip3 install flask

    pip3 install pandas

    pip3 install sklearn

    pip3 install nltk

    pip3 install gensim==3.8.3

    pip3 install pytorch-pretrained-bert

    pip3 install matplotlib==3.0.0

22. Download punkt package with nltk

    python3

    import nltk

    nltk.download('punkt')

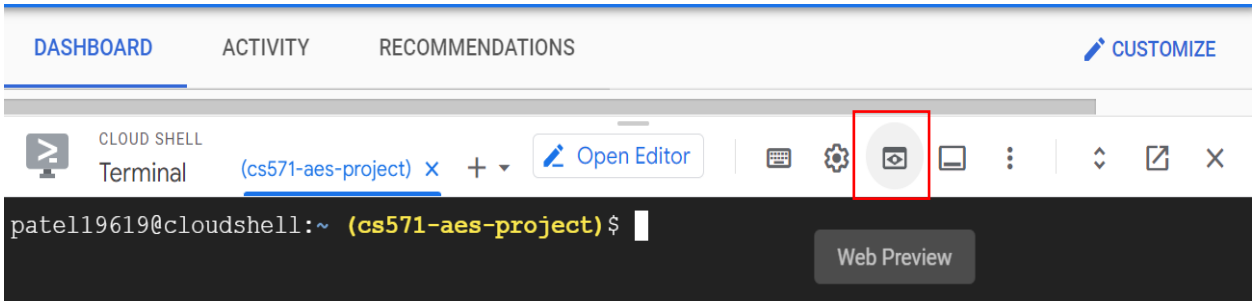
```
(myenv) patel19619@cloudshell:~/final_project$ python3
Python 3.6.13 |Anaconda, Inc.| (default, Jun  4 2021, 14:25:59)
[GCC 7.5.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import nltk
>>> nltk.download('punkt')
[nltk_data] Downloading package punkt to /home/patel19619/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
True
>>> exit()
```

23. Now it's time to run AES system

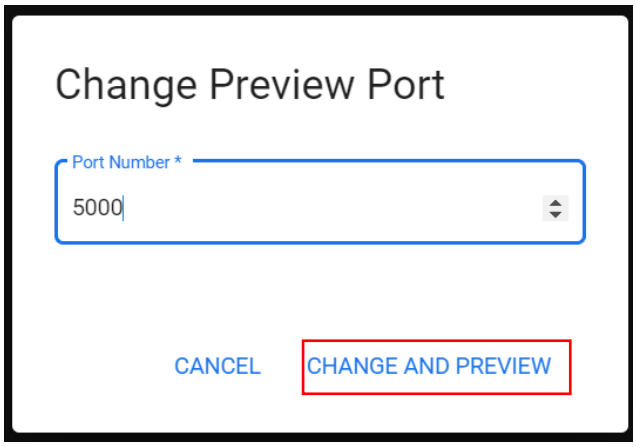
    python3 app.py

```
(myenv) patel19619@cloudshell:~/final_project/aes_project$ python3 app.py
 * Serving Flask app 'app' (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: on
WARNING:werkzeug: * Running on all addresses.
   WARNING: This is a development server. Do not use it in a production deployment.
INFO:werkzeug: * Running on http://172.17.0.4:5000/ (Press CTRL+C to quit)
INFO:werkzeug: * Restarting with stat
WARNING:werkzeug: * Debugger is active!
INFO:werkzeug: * Debugger PIN: 230-025-357
```

24. Use Web Preview and change the port option



25. Enter port number 5000 and click change and preview



Please paste the contents that you want to summarize:

Potential Summary:

Add To Instructor
Add To Student

20%

submit

Grade Students

Reset

26. Let's check the how system make summary from the text.

Please paste the contents that you want to summarize:

The hacking group known as APT29, or "Cozy Bear," is largely believed to operate as part of Russia's security services, and the three countries allege that it is carrying out a persistent and ongoing cyber campaign to steal intellectual property about a possible coronavirus vaccine.

Potential Summary:

Russia is facing renewed scrutiny for its cyber espionage efforts after the U. S.
, Great Britain and Canada alleged Thursday that a Kremlin-linked hacking group is attempting to steal research related to coronavirus vaccine developments and testing.

Add To Instructor
Add To Student

Total Time cost:25.02s

20%

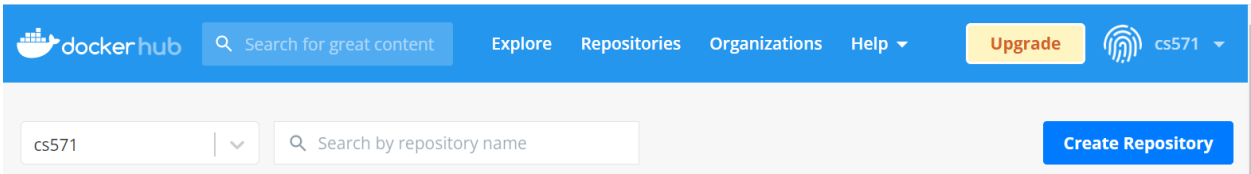
submit

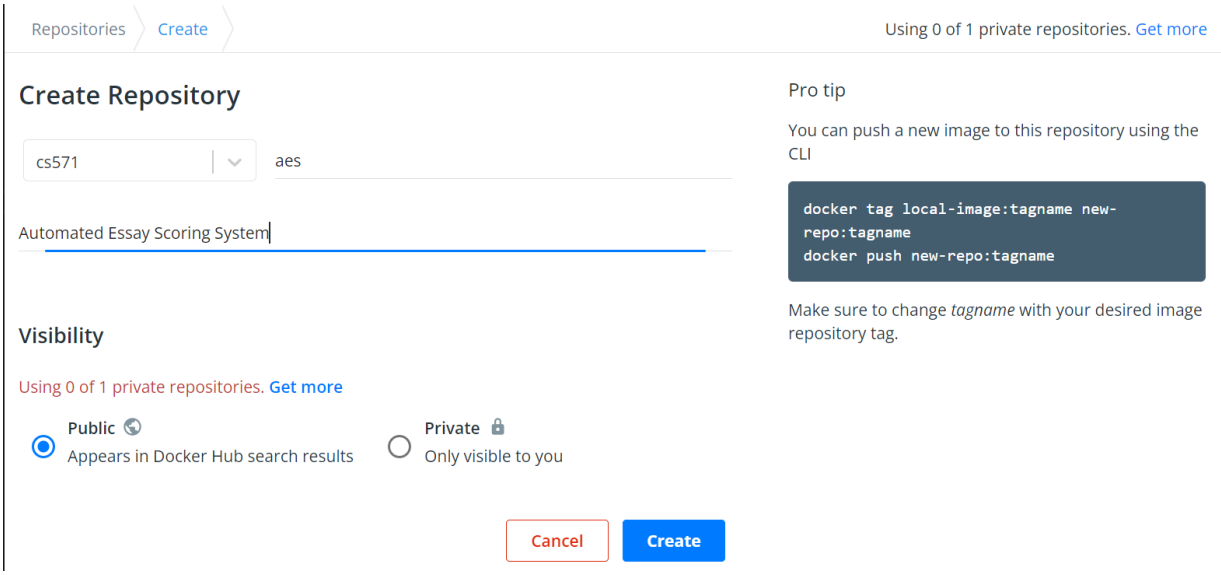
Grade Students

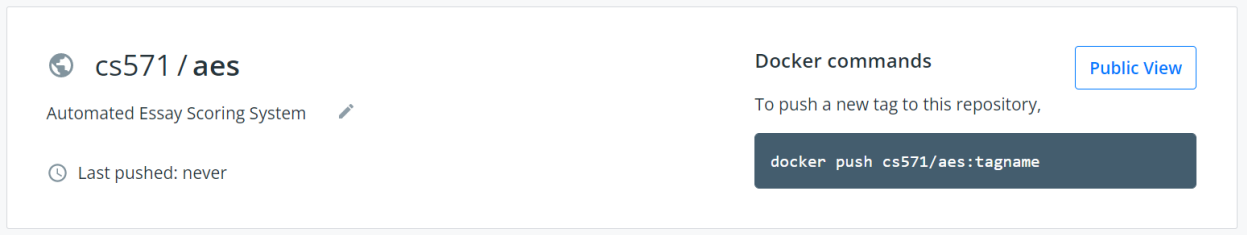
Reset

Step 3 Configuration of hosting the system on the GCP for external user.

1. Create the docker hub **aes** repository for this automated essay scoring system here







2. Build the aes system docker image

```
FROM python:alpine3.7
COPY ./app
WORKDIR /app
RUN pip install --upgrade pip
RUN pip install -r requirements.txt
ENV PORT 5000
EXPOSE 5000
ENTRYPOINT ["python3"]
CMD ["app.py"]
```

pip freeze > requirements.txt

```
nv) patel19619@cloudshell:~/final_project/aes_project$ pip freeze > requirements.txt
(myenv) patel19619@cloudshell:~/final_project/aes_project$
```

docker build -t yourdockerhubID/aes .

```
patel19619@instance-1:~$ sudo docker build -t cs571/aes .
Sending build context to Docker daemon  2.932GB
Step 1/33 : FROM ubuntu:20.04
 ---> 825d55fb6340
Step 2/33 : ENV TZ=America/Los_Angeles
 ---> Using cache
 ---> 82dcb7b71838
Step 3/33 : RUN ln -snf /usr/share/zoneinfo/$TZ /etc/localtime && echo $TZ > /etc/timezone
 ---> Using cache
 ---> 0f6154791a0b
Step 4/33 : RUN mkdir -p /home/project/
 ---> Using cache
 ---> 0bd0b11801bf
Step 5/33 : COPY rough.zip /home/project/
 ---> 0aaff57fd5b9
Step 6/33 : COPY punktDownload.py /home/project/
 ---> 85e1be8ba01d
Step 7/33 : COPY bert-large-uncased.tar.gz /home/project/
```

```
Step 30/33 : RUN python3 punktDownload.py
 ---> Running in d649c59b6d58
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
Removing intermediate container d649c59b6d58
 ---> b7f8942428f6
Step 31/33 : WORKDIR /home/project/flask-summary
 ---> Running in 3d127c1e63d5
Removing intermediate container 3d127c1e63d5
 ---> d48f6be9cb0a
Step 32/33 : EXPOSE 5000
 ---> Running in 7c6c0ec89c16
Removing intermediate container 7c6c0ec89c16
 ---> a1f22f7d91aa
Step 33/33 : CMD ["python3", "app.py"]
 ---> Running in f24ed82a7d78
Removing intermediate container f24ed82a7d78
 ---> 7adad75d1b35
Successfully built 7adad75d1b35
Successfully tagged cs571/aes:latest
```

3. Push the builded aes system docker image to docker hub **aes** repository

   docker push yourdockerhubID/aes

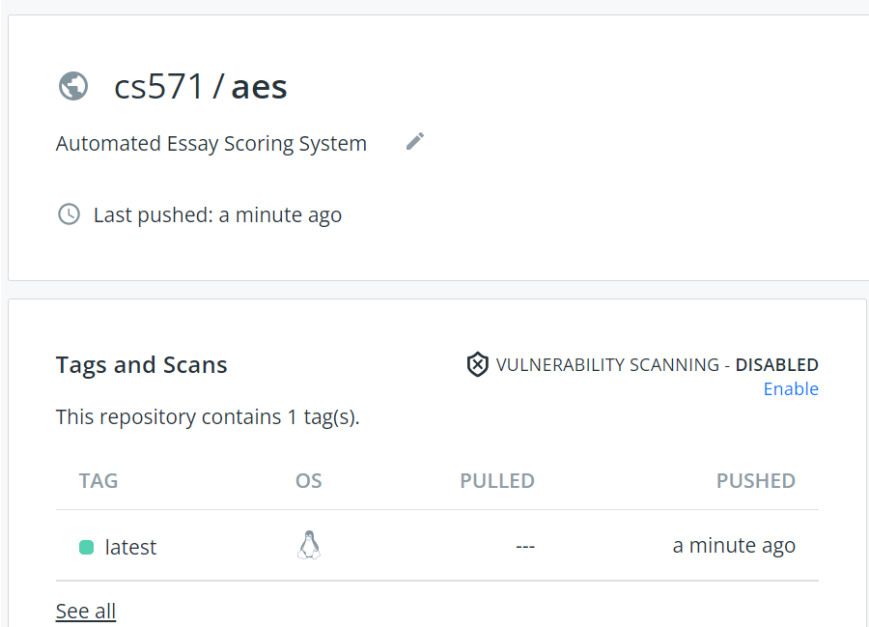
```
patel19619@instance-1:~$ sudo docker push cs571/aes
Using default tag: latest
The push refers to repository [docker.io/cs571/aes]
b9a826495b7a: Pushed
0eb34136581e: Pushed
31bfb422563b: Pushed
4ebe93ba1a51: Pushed
d166cb38dd81: Pushed
8b872efde500: Pushed
88e1e9cc69bf: Pushed
472c04d1a258: Pushed
ce88e912cc9e: Pushed
f8f0ab872868: Pushed
57dd56744e5b: Pushed
f068cad287c6: Pushed
0a6ed04003d8: Pushed
9678aee8fba9: Pushed
623bc70ef911: Pushed
58fcfe8a028c: Pushed
ce88be7cd8d3: Pushed
adb206d21c8d: Pushed
ad7cb1a33a61: Pushed
11396e5f7be2: Pushed
14dde2b12b7b: Pushed
71f495535a40: Pushed
c451d3787385: Pushed
c5ec52c98b31: Mounted from library/ubuntu
latest: digest: sha256:b4a55e774d5bd545c5a1f1ed1a56053945eb9a082e2b96f2c64ec4594fb70a8e size: 5
377
```

4. Run the docker image

```
patel19619@instance-1:~$ docker run -p 5000:5000 -t cs571/aes
 * Serving Flask app 'app' (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: on
INFO:werkzeug: * Running on all addresses (0.0.0.0)
   WARNING: This is a development server. Do not use it in a production deployment.
 * Running on http://127.0.0.1:5000
 * Running on http://172.17.0.2:5000 (Press CTRL+C to quit)
INFO:werkzeug: * Restarting with stat
WARNING:werkzeug: * Debugger is active!
INFO:werkzeug: * Debugger PIN: 514-278-626
```

5. Check the uploaded **aes system** docker image on docker hub

   Go to docker hub -> select aes repository



To host the aes system to gcp for external users with domain name access

6. Start minikube

   minikube start

```
patel19619@cloudshell:~/aes-project$ minikube start
😄  minikube v1.25.2 on Debian 11.2 (amd64)
    ▪ MINIKUBE_FORCE_SYSTEMD=true
    ▪ MINIKUBE_HOME=/google/minikube
    ▪ MINIKUBE_WANTUPDATENOTIFICATION=false
✨  Automatically selected the docker driver. Other choices: ssh, none
👍  Starting control plane node minikube in cluster minikube
🚜  Pulling base image ...
💾  Downloading Kubernetes v1.23.3 preload ...
    > preloaded-images-k8s-v17-v1...: 505.68 MiB / 505.68 MiB  100.00% 108.39 M
🔥  Creating docker container (CPUs=2, Memory=4000MB) ...
🐳  Preparing Kubernetes v1.23.3 on Docker 20.10.12 ...
    ▪ kubelet.cgroups-per-qos=false
    ▪ kubelet.enforce-node-allocatable=""
    ▪ kubelet.housekeeping-interval=5m
    ▪ Generating certificates and keys ...
    ▪ Booting up control plane ...
    ▪ Configuring RBAC rules ...
🔎  Verifying Kubernetes components...
    ▪ Using image gcr.io/k8s-minikube/storage-provisioner:v5
🌟  Enabled addons: storage-provisioner, default-storageclass
🏄  Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
```

7. Enable Ingress service on minikube

   minikube addons enable ingress

8. Check the ingress is available on minikube

   minikube addons list

```
|-----------------------------|----------|--------------|--------------------------------|
| ambassador                  | minikube | disabled     | third-party (ambassador)       |
| auto-pause                  | minikube | disabled     | google                         |
| csi-hostpath-driver         | minikube | disabled     | kubernetes                     |
| dashboard                   | minikube | disabled     | kubernetes                     |
| default-storageclass        | minikube | enabled ✅   | kubernetes                     |
| efk                         | minikube | disabled     | third-party (elastic)          |
| freshpod                    | minikube | disabled     | google                         |
| gcp-auth                    | minikube | disabled     | google                         |
| gvisor                      | minikube | disabled     | google                         |
| helm-tiller                 | minikube | disabled     | third-party (helm)             |
| ingress                     | minikube | enabled ✅   | unknown (third-party)          |
| ingress-dns                 | minikube | disabled     | google                         |
| istio                       | minikube | disabled     | third-party (istio)            |
| istio-provisioner           | minikube | disabled     | third-party (istio)            |
| kong                        | minikube | disabled     | third-party (Kong HQ)          |
| kubevirt                    | minikube | disabled     | third-party (kubevirt)         |
| logviewer                   | minikube | disabled     | unknown (third-party)          |
| metallb                     | minikube | disabled     | third-party (metallb)          |
| metrics-server              | minikube | disabled     | kubernetes                     |
| nvidia-driver-installer     | minikube | disabled     | google                         |
| nvidia-gpu-device-plugin    | minikube | disabled     | third-party (nvidia)           |
| olm                         | minikube | disabled     | third-party (operator          |
|                             |          |              | framework)                     |
| pod-security-policy         | minikube | disabled     | unknown (third-party)          |
| portainer                   | minikube | disabled     | portainer.io                   |
| registry                    | minikube | disabled     | google                         |
| registry-aliases            | minikube | disabled     | unknown (third-party)          |
| registry-creds              | minikube | disabled     | third-party (upmc enterprises) |
| storage-provisioner         | minikube | enabled ✅   | google                         |
| storage-provisioner-gluster | minikube | disabled     | unknown (third-party)          |
| volumesnapshots             | minikube | disabled     | kubernetes                     |
|-----------------------------|----------|--------------|--------------------------------|
```

9. Create aes-project-deployment.yaml for deployment

   vim aes-project-deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: aes-deployment
spec:
  selector:
    matchLabels:
      app: aes-deployment
  replicas: 1
  template:
    metadata:
      labels:
        app: aes-deployment
    spec:
      containers:
      - name: aes-deployment
        image: cs571/aes
        ports:
        - containerPort: 5000
```

10. Create aes-project-deployment -deployment with using aes-project-deployment.yaml

    kubectl apply -f aes-deployment.yaml

```
patel19619@cloudshell:~/aes-project$ kubectl create -f aes-deployment.yaml
deployment.apps/aes-deployment created
```

11. Check the newly created aes-project-deployment

    kubectl get deployments

```
patel19619@cloudshell:~/aes-project$ kubectl get deployments
NAME             READY   UP-TO-DATE   AVAILABLE   AGE
aes-deployment   1/1     1            1           9m39s
```

12. Create a service to access the system from outside the cluster

    vim aes-project-service.yaml

```yaml
apiVersion: v1
kind: Service
metadata:
  name: aes-service
spec:
  selector:
    app: aes-deployment
  ports:
  - protocol: TCP
    port: 5000
    targetPort: 5000
```

13. Create the aes-project-service with using the **aes-project-service.yaml**

    kubectl apply -f aes-service.yaml

```
patel19619@cloudshell:~/aes-project$ kubectl create -f aes-service.yaml
service/aes-service created
```

14. Check the newly created **aes-project-service is running?**

    kubectl get svc

```
patel19619@cloudshell:~/aes-project$ kubectl get svc
NAME          TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
aes-service   ClusterIP   10.111.168.108   <none>        5000/TCP   9m57s
kubernetes    ClusterIP   10.96.0.1        <none>        443/TCP    50m
```

15. Create a aes-ingress.yaml file for this project ingress service

vim aes-ingress.yaml

```yaml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: aes-ingress
  annotations:
    nginx.ingress.kubernetes.io/rewrite-target: /$2
spec:
  rules:
    - host: cs571.aesproject.com
      http:
        paths:
          - path: /
            pathType: Prefix
            backend:
              service:
                name: aes-service
                port:
                  number: 5000
```

16. Create the aes-ingress service with using aes-ingress.yaml file

kubectl apply -f aes-ingress.yaml

```
patel19619@cloudshell:~/aes-project$ kubectl create -f aes-ingress.yaml
ingress.networking.k8s.io/aes-ingress created
```

17. Check the created ingress is working

kubectl get ingress

```
patel19619@cloudshell:~/aes-project$ kubectl get ingress
NAME          CLASS   HOSTS              ADDRESS        PORTS   AGE
aes-ingress   nginx   aesproject.com   192.168.49.2   80      118s
```

18. Add ADDRESS to /etc/hosts

vi /etc/hosts

Add the address you got from above step to the end of the file

Your-ADDRESS cs571.aesproject.com

```
# Kubernetes-managed hosts file.
127.0.0.1       localhost
::1     localhost ip6-localhost ip6-loopback
fe00::0 ip6-localnet
fe00::0 ip6-mcastprefix
fe00::1 ip6-allnodes
fe00::2 ip6-allrouters
172.17.0.4      cs-810844977107-default
192.168.49.2  cs571.aesproject.com
```

Your /etc/hosts file should look something like this after adding the line, but your address maybe different.

19. Take a look the full cluster configuration is running

kubectl get all

```
patel19619@cloudshell:~/aes-project$ kubectl get all
NAME                                  READY   STATUS    RESTARTS   AGE
pod/aes-deployment-575cffc449-5hmbm   1/1     Running   0          5m47s

NAME                  TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
service/aes-service   ClusterIP   10.111.168.108   <none>        5000/TCP   5m29s
service/kubernetes    ClusterIP   10.96.0.1        <none>        443/TCP    46m

NAME                             READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/aes-deployment   1/1     1            1           5m47s

NAME                                        DESIRED   CURRENT   READY   AGE
replicaset.apps/aes-deployment-575cffc449   1         1         1       5m47s
```

20. Test the application with domain name

curl cs571.aesproject.com

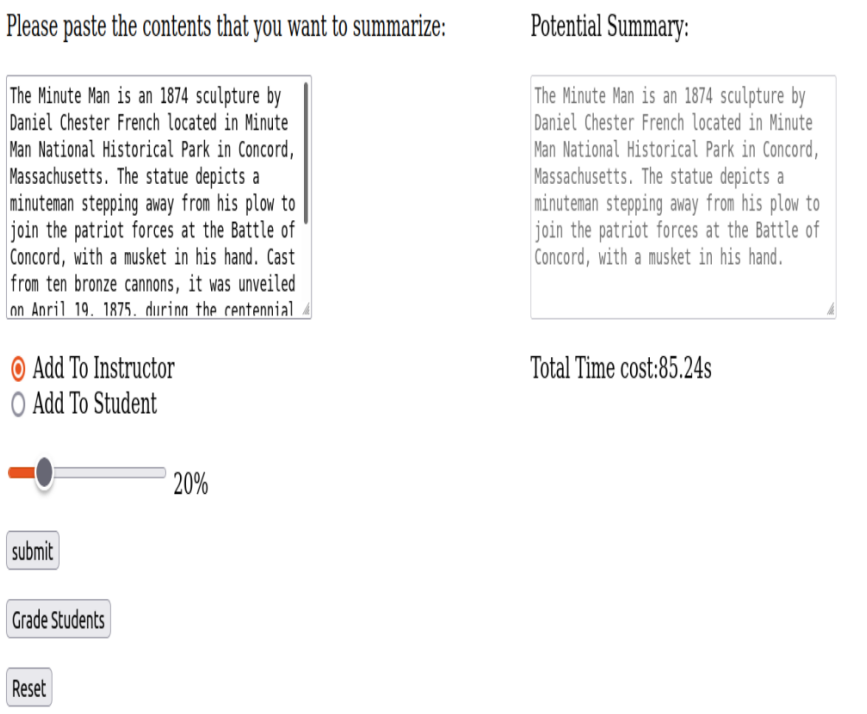
```
patel19619@cloudshell:~/aes-project$ curl cs571.aesproject.com
<html>
  <title>Flask Summary</title>
    <link rel="stylesheet" href="/static/css/main.css">
    <script>
    function reset() {
      confirm("Are you sure you want to reset the stored students' essays?");
    }
    function updateTextInput(val) {
          document.getElementById('textInput').value=val+'%';
    }
    </script>
    <body>
       <div id="left">
        <form action = "/result" method = "POST">
          <p>Please paste the contents that you want to summarize: </p>
           <textarea name="text" rows="8" cols="40" ></textarea>
           <p><input type="radio" id="instructor" name="add" value="Add To Instructor" checked />
           <label for="instructor">Add To Instructor</label><br>
           <input type="radio" id="student" name="add" value="Add To Student"  />
           <label for="student">Add To Student</label><br></p>

           <input type="range" name="ratio" min="1" max="100" value="20"onchange="updateTextInput(this.value);"
```

You will get the same as above html code output because the it is the user interface of aes-system.

21. To get the proper output, go to the browser and type the following:

    cs571.aesproject.com



To get the student score click on the **Grade Students buttons** and you will get the following result:

Instructor Essay Summary

- Instructor:

  Essay Summary: The Minute Man is an 1874 sculpture by Daniel Chester French located in Minute Man National Historical Park in Concord, Massachusetts. The statue depicts a minuteman stepping away from his plow to join the patriot forces at the Battle of Concord, with a musket in his hand.

Student Grade Rank (From High to Low)

Student Score Percentile

Name	Student 2	Student 5	Student 1	Student 3	Student 4
student percentile	1.0	0.8	0.6	0.4	0.2

- Student Name: Student 2

  Essay Summary: the first us deaths related to coronavirus might have occurred weeks earlier than previously thought

- Student Name: Student 5

  Essay Summary: The Minute Man is an 1874 sculpture by Daniel Chester French located in Minute Man National Historical Park in Concord, Massachusetts. The statue depicts a minuteman stepping away from his plow to join the patriot forces at the Battle of Concord, with a musket in his hand.

- Student Name: Student 1

  Essay Summary: the contagious respiratory illness continues to spread worldwide. health and government officials have asked every one of us to help slow the spread in our communities

- Student Name: Student 3

  Essay Summary: the cdc recommend that all people wear cloth face masks in public places where it is difficult to maintain a 6-foot (2-meter) distance from others. this will help slow the spread of the virus from asymptomatic people and people who do not know that they have contracted it.

- Student Name: Student 4

  Essay Summary: the entire speech requires about 10 minutes to read. there are two sections i wish to draw to your attention. the first principle is that you must not fool yourself