

Explore AI/ML using the LinuxONE Machine Learning Lab

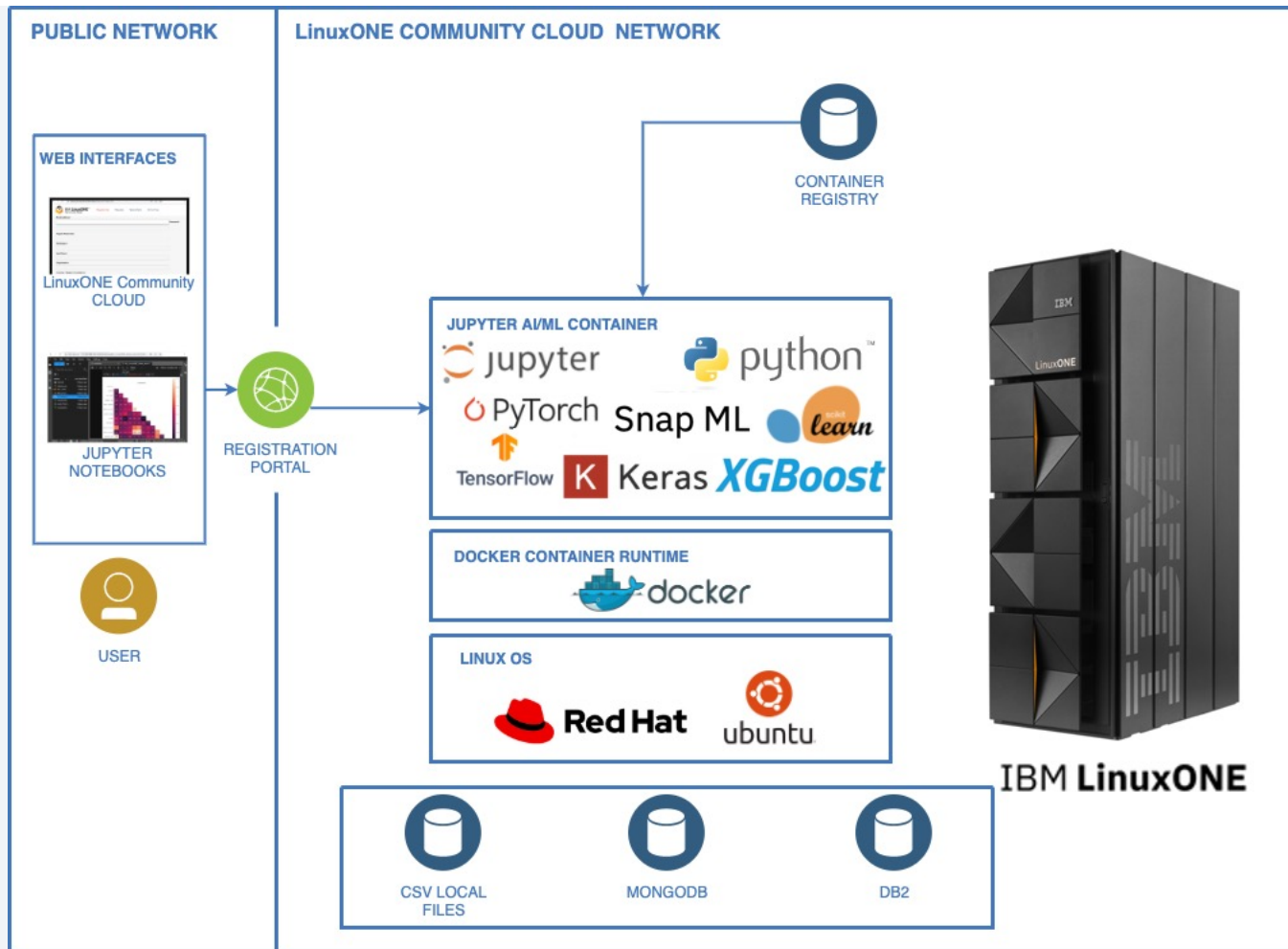
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AI/ML LAB Environment

-
For this Event!!!



Get a Linux VM in IBM LinuxONE Community Cloud

(Ref detail instructions in github)

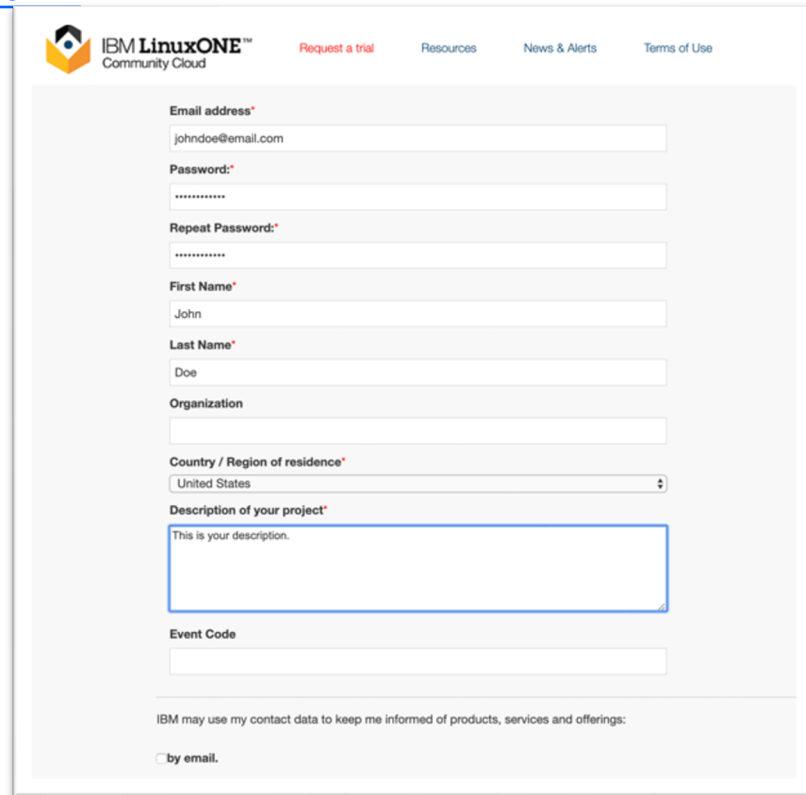
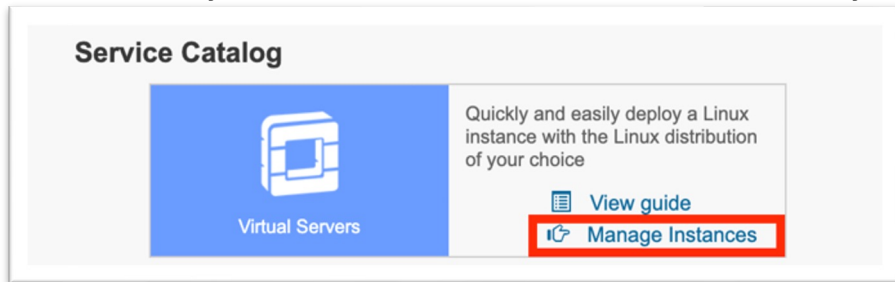
<https://github.com/linuxone-community-cloud/jupyter-lab-ml>

1. Register in LinuxONE Community Cloud

- Event code: **SSF23**

- Instructions: <https://ibm.biz/BdPcL8>

2. Create your Ubuntu 22.04 instance and ssh key

A screenshot of the IBM LinuxONE Community Cloud registration form. The form is titled "IBM LinuxONE Community Cloud" and includes links for "Request a trial", "Resources", "News & Alerts", and "Terms of Use". The form fields are: "Email address*" (with the value "johndoe@email.com"), "Password*" (with a masked input), "Repeat Password*" (with a masked input), "First Name*" (with the value "John"), "Last Name*" (with the value "Doe"), "Organization", "Country / Region of residence*" (with a dropdown menu showing "United States"), "Description of your project*" (with a text area containing "This is your description."), "Event Code", and a checkbox for "by email." at the bottom.

Bring up Jupyter Lab container

3. Open a secure shell (ssh) connection and install docker runtime

MacOS/Linux: `ssh -i <your_key>.pem linux1@148.100.xx.xx` **Windows:** PuTTY ssh session (ref <https://ibm.biz/BdPcL8>)

```
curl -sSL https://get.docker.com | sh
```

```
sudo usermod -aG docker $USER; newgrp docker
```

```
sudo systemctl start docker
```

4. Start Jupyter Lab container on the port 38888

```
docker login -u l1cc registry.linuxone.cloud.marist.edu
```

```
mkdir shared && chmod a+w shared
```

Password: LinuxONE (0 is zero).

```
docker run -p 38888:8888 --name notebook -v /home/linux1/shared:/home/jovyan/shared \
```

```
-d registry.linuxone.cloud.marist.edu/jupyterlab-image-s390x:latest jupyter lab --ServerApp.token='Your_Token'
```

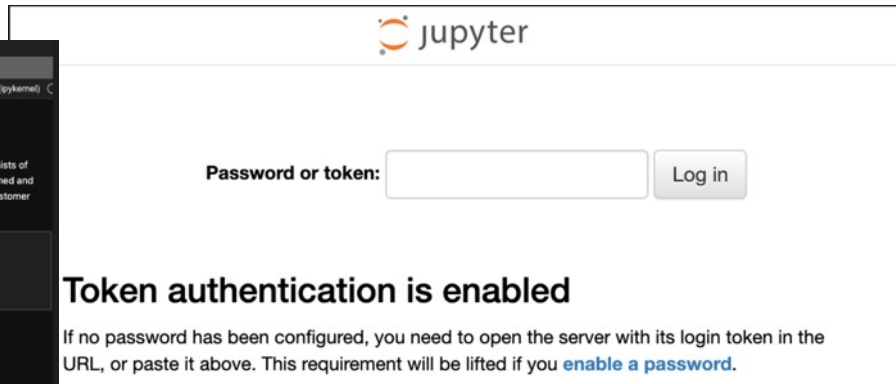
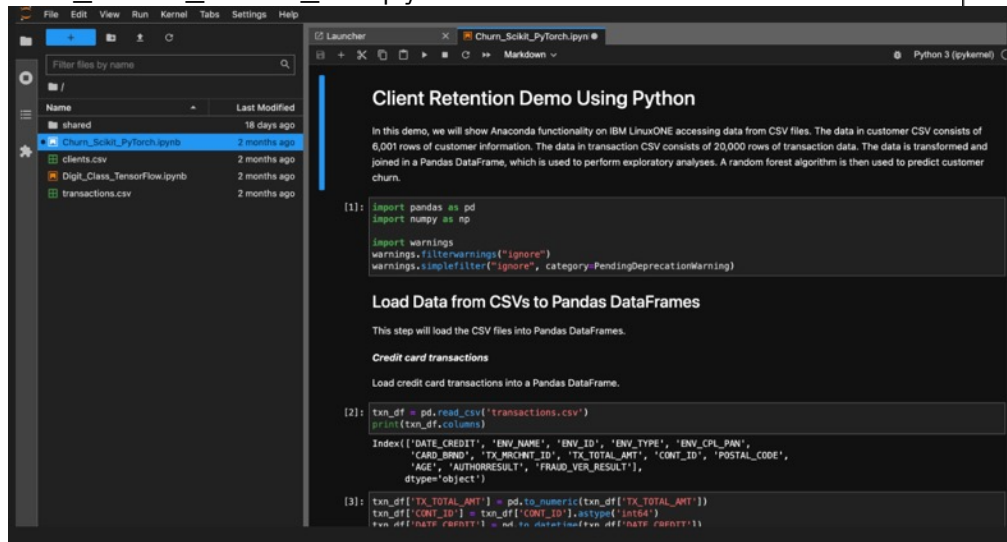
Open Jupyter Lab IDE and run a sample notebook

5. Open Jupyter Lab in the Browser using the public IP address of your instance

URL: <http://148.100.X.X:38888>

Password: [Your_Token](#)

6. Run Demo notebooks e.g. Churn_Scikit_PyTorch.ipynb, Digit_Class_TensorFlow.ipynb and Fraud_LSTM_Keras_TF.ipynb



List of Pre-installed Packages

```
absl-py==1.4.0
aiohttp==3.8.5
aiohttp-cors==0.7.0
aiosignal==1.3.1
alembic==1.12.0
altair==4.2.0
anyio==4.0.0
apistar==0.5.41
argon2-cffi==23.1.0
argon2-cffi-bindings==21.2.0
arrow==1.2.3
asttokens==2.4.0
astunparse==1.6.3
async-lru==2.0.4
async-timeout==4.0.3
attrs==23.1.0
Babel==2.12.1
backcall==0.2.0
beautifulsoup4==4.10.0
BentoML==0.13.0
bleach==6.0.0
blinker==1.6.2
bokeh==2.4.2
boto3==1.28.59
botocore==1.31.59
Bottleneck==1.3.4
cachetools==5.3.0
Cerberus==1.3.5
certifi==2022.12.7
cffi==1.16.0
charset==4.0.0
charset-normalizer==3.0.1
click==8.1.7
cloudpickle==2.0.0
comm==0.1.4
configparser==6.0.0
contextlib2==21.6.0
contourpy==1.1.1
cycler==0.12.0

Cython==3.0.2
dask==2022.2.1
dbus-python==1.2.18
debugpy==1.8.0
decorator==5.1.1
deepmerge==1.1.0
defusedxml==0.7.1
dependency-injector==4.41.0
dill==0.3.4
distro==1.8.0
docker==5.0.3
entrypoints==0.4
exceptiongroup==1.1.3
executing==1.2.0
expecttest==0.1.6
fastjsonschema==2.18.0
fire==0.5.0
Flask==3.0.0
flatbuffers==1.12
fonttools==4.43.0
fqdn==1.5.1
frozenset==1.4.0
fsspec==2023.9.2
future==0.18.3
gast==0.4.0
google-auth==2.16.0
google-auth-oauthlib==0.4.6
google-pasta==0.2.0
grpcio==1.51.1
gunicorn==21.2.0
h5py==3.8.0
html5lib==1.1
humanfriendly==10.0
hypothesis==6.87.1
idna==3.4
imageio==2.31.5
ipykernel==6.25.2
ipyml==0.8.8
ipython==8.16.0

ipython-genutils==0.2.0
ipywidgets==7.6.5
isoduration==20.11.0
itsdangerous==2.1.2
jedi==0.19.0
Jinja2==3.1.2
jmespath==1.0.1
joblib==1.3.2
json5==0.9.14
jsonpointer==2.4
jsonschema==4.19.1
jsonschema-
specifications==2023.7.1
jupyter-events==0.7.0
jupyter-lsp==2.2.0
jupyter_client==8.3.1
jupyter_core==5.3.2
jupyter_server==2.7.3
jupyter_server_terminals==0.4.
4
jupyterlab==4.0.6
jupyterlab-pygments==0.2.2
jupyterlab-widgets==3.0.9
jupyterlab_server==2.25.0
keras==2.9.0
Keras-Preprocessing==1.1.2
keras2onnx==1.7.0
kiwisolver==1.4.5
libclang @
file:///tensorflow_wheel/libcl
ang-15.0.6.1-py2.py3-none-
any.whl
llvmlite==0.40.1
locket==1.0.0
lxml==4.8.0
Mako==1.2.4
Markdown==3.4.1
MarkupSafe==2.1.2
matplotlib==3.7.3

matplotlib-inline==0.1.6
mistune==3.0.1
mpmath==1.3.0
multidict==6.0.4
nbclient==0.8.0
nbconvert==7.8.0
nbformat==5.9.2
nest-asyncio==1.5.8
networkx==3.1
nose==1.3.7
notebook==7.0.4
notebook_shim==0.2.3
numba==0.57.1
numexpr==2.8.1
numpy==1.24.4
oauthlib==3.2.2
onnx==1.14.1
onnxconverter-common==1.14.0
opt-einsum==3.3.0
overrides==7.4.0
packaging==23.0
pandas==1.4.3
pandocfilters==1.5.0
parso==0.8.3
partd==1.4.1
patsy==0.5.2
pexpect==4.8.0
pickleshare==0.7.5
Pillow==10.0.1
platformdirs==3.10.0
portpicker==1.5.2
prometheus-client==0.17.1
prompt-toolkit==3.0.39
protobuf==3.20.2
psutil==5.9.4
ptyprocess==0.7.0
pure-eval==0.2.2
pyasn1==0.4.8
pyasn1-modules==0.2.8

pyparser==2.21
pydot==1.4.2
Pygments==2.11.2
PyGObject==3.42.1
pyparsing==3.1.1
python-dateutil==2.8.2
python-json-logger==2.0.7
pytz==2023.3.post1
PyWavelets==1.4.1
PyYAML==5.4.1
pyzmq==25.1.1
referencing==0.30.2
requests==2.31.0
requests-oauthlib==1.3.1
rfc3339-validator==0.1.4
rfc3986-validator==0.1.1
rpds-py==0.10.3
rsa==4.9
ruamel.yaml==0.17.34
ruamel.yaml.clib==0.2.8
s3transfer==0.7.0
schema==0.7.5
scikit-build==0.17.6
scikit-image==0.19.2
scikit-learn==1.2.2
scipy==1.8.0
scour==0.38.2
seaborn==0.11.2
Send2Trash==1.8.2
six==1.16.0
skl2onnx==1.15.0
sklearn-pandas==2.2.0
snapml==1.14.1
sniffio==1.3.0
sortedcontainers==2.4.0
soupsieve==2.3.1
SQLAlchemy==1.3.24
SQLAlchemy-Utils==0.36.5
stack-data==0.6.2

statsmodels==0.13.5
sympy==1.9
tabulate==0.9.0
tensorboard==2.9.1
tensorboard-data-server==0.6.1
tensorboard-plugin-wit==1.8.1
Tensorflow 2.9.3
tensorflow-estimator==2.9.0
tensorflow_io_gcs_filesystem-
0.23.1
termcolor==2.2.0
terminado==0.17.1
tf2onnx==1.15.1
tfserve==0.3
threadpoolctl==3.2.0
tifffile==2023.9.26
tinycss2==1.2.1
tomli==2.0.1
toolz==0.12.0
torch==1.13.0
tornado==6.3.3
traitlets==5.10.1
types-dataclasses==0.6.6
typing_extensions==4.4.0
tzdata==2023.3
uri-template==1.3.0
urllib3==1.25.11
wcwidth==0.2.7
webcolors==1.13
webencodings==0.5.1
websocket-client==1.6.3
Werkzeug==3.0.0
whitenoise==6.5.0
widgetsnbextension==3.5.2
wrapt==1.14.1
xgboost==1.6.1
xlrd==2.0.1
yarl==1.9.2
```

FAQs

1. I registered in LinuxONE Community Cloud (L1CC) and have not received my registration email?

A: Did you use the event code assigned for this specific event when registering for your Virtual Machine?

A: Also, check your spam/junk folder for the activation email.

2. I registered for a Virtual Machine on L1CC but cannot access it ?

A: You need to activate your account by clicking the link on the activation email to be able to access your virtual machine

3. My server is not responding / I am not able to ping my server?

A: If a server does not respond to ping or ssh the server needs to be stopped and restarted in L1CC dashboard.

FAQs (cont.)

4. How to ssh to my Virtual Machine?

- A: Follow the steps provided in the Github link shared – the documentation has detailed steps on how to get connected with Putty and ssh terminal.

5. Docker gives permission error. How to resolve it?

A: After a fresh installation of docker, it configures permissions and environment. For some settings to take an effect, you need to reload the shell (exec bash) or reestablish the ssh session.

6. Jupyter Lab gives permission error for the "shared" folder

A: The folder is mounted from the host. Need to make sure that the user with uid 1000 has write access to it. E.g. Run this command on the Linux instance

```
sudo chown -R 1000:1000 /home/linux1/jupyter
```

FAQs (cont.)

7. Cannot get my jupyter lab container working. How to re-deploy it?

```
docker logs notebook  
docker rm -f notebook  
docker run ....
```

8. How can I get a list of files uploaded to IBM LinuxONE environment?

In Jupiter notebook, type:

```
import glob  
print(glob.glob("*.csv"))
```

9. How can I install a missing package from pypi?

```
import sys  
!{sys.executable} -m pip install tensorflow_datasets
```

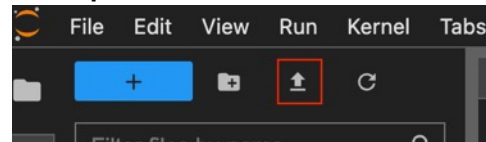
FAQs (cont.)

10. How can I upload my data and notebook to IBM LinuxONE environment

- A: Upload files in the Jupyter Lab Web interface. Drag&Drop is also possible.

CSV files are supported.

Max file size is 200MB.



11. Where can I see the list of available packages?

<https://github.com/linuxone-community-cloud/jupyter-lab-ml/blob/main/packages.txt>

- Or in Jupiter notebook, type:

```
import pkg_resources

for i in pkg_resources.working_set:
    print(i)
```

FAQs (cont.)

12. I ran out of disk space on my Linux Virtual Server. How can I free it up ?

- A: You can clean up unused docker images to free up space:

```
docker images -a  
docker rmi $(docker images -qa)
```

13. I have created the Ubuntu instance, but facing issue in opening ssh and installing docker runtime.

- A: Make sure to follow the required steps. Re-login to ssh.

```
ssh -i <your_key>.pem linux1@148.100.xx.xx  
  
curl -fsSL https://get.docker.com -o get-docker.sh && sudo sh get-docker.sh  
  
sudo usermod -aG docker $USER; newgrp docker  
  
sudo systemctl start docker  
  
exec bash    # or exit and reconnect via ssh
```

FAQs (cont.)

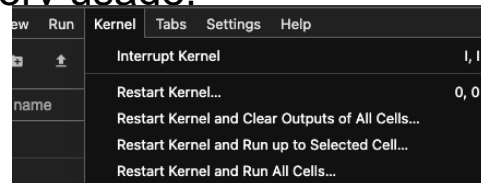
14. I receive memory error, when we try to do some big computation.

- A: Use the following commands in ssh shell to free up the memory usage:

```
docker stats
```

=> Restart Jupyter Kernel

```
sudo free && sync && echo 3 > /proc/sys/vm/drop_caches && free
```



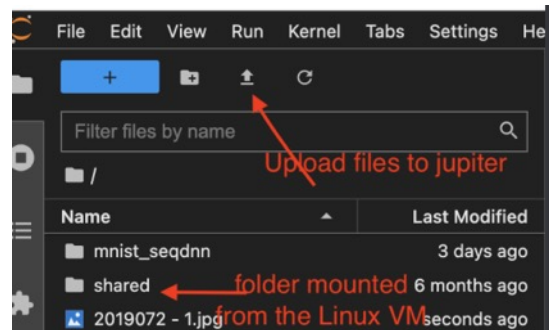
15. How do I transfer multiple files and folders to Jupyter lab?

- A: To copy files from your laptop to the home of linuxone instance, use scp - secure shell copy. E.g. *.csv files

```
scp -i sshkey.pem ./*.csv linux1@148.100.X.X:~/shared/
```

the files/folders in ~/shared/ (which is also /home/linux1/shared)

will appear in the jupyter lab interface under "shared" folder.

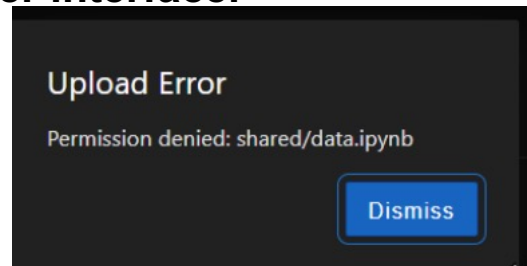


FAQs (cont.)

16. Error uploading/creating files in shared folder of Jupyter interface.

Need to modify folder permissions in ssh terminal:

```
sudo chown linux1:linux1 /home/linux1/shared  
sudo chmod a+w /home/linux1/shared
```



17. Are there any examples of AI/ML application on IBM Z ?

You can explore use cases and technical resources on IBM website

<https://www.ibm.com/support/z-content-solutions/journey-to-ai-on-z/>

Suggestions on where to source data

[kaggle.com](https://www.kaggle.com) - public datasets for machine learning

data.gov - government organizations provide all of its data to public

US Bureau of labor statistics.

- Unemployment rates
- Compensation
- Price index

Federal Reserve

- Household debt
- Consumer finances
- Lending rates

Public datasets in the cloud

Universities

- UCI
- UC Davis

Covid:

- CDC data (includes vaccine info) -
<https://covid.cdc.gov/covid-data-tracker/>
- Vaccination in other countries -
<https://ourworldindata.org/covid-vaccinations>
- ESRI data on hospital resources

Medical:

Center for medicaid and medicare -
<https://www.cms.gov/OpenPayments/Explore-the-Data/Dataset-Downloads>

Mental Health:

https://www.cdc.gov/mentalhealth/data_publications/index.htm

Criteria for the ML on IBM LinuxONE Challenge

Value to Community

Practicality

Creativity

Novelty



Leveraging IBM z/LinuxONE for

Machine Learning

Analytics

Data

Running /validating on IBM z/LinuxONE

Parts

Entire model

etc

Thank you !

Important Links:

Registration in LinuxONE Community Cloud

- Event code (put in project description): **SSF23**
- Instructions: <https://ibm.biz/BdPcL8>

Accessing VM with Jupyter Lab ML

<https://github.com/linuxone-community-cloud/jupyter-lab-ml>

- Docker repo credentials: u: l1cc p: **LinuxONE** (0 is zero).
- Jupyter Lab token: **Your_Token**

