

# CO416 – Machine Learning for Imaging

## Tutorial 5

### Setting up a GPU Virtual Machine on Azure

This tutorial is about setting up a GPU virtual machine on Microsoft Azure that you will need to for an 3D image segmentation task to be done as part of the second coursework.

**This tutorial should be done together with your coursework group members.**

#### Step 1: Log in to Azure

Check your emails for a message with subject “Action required: Accept your Azure lab assignment” and click on “**Accept lab assignment**”.



#### Accept your Azure lab assignment

You have a pending lab assignment. Please accept your assignment to get started with your course.

[Accept lab assignment >](#)

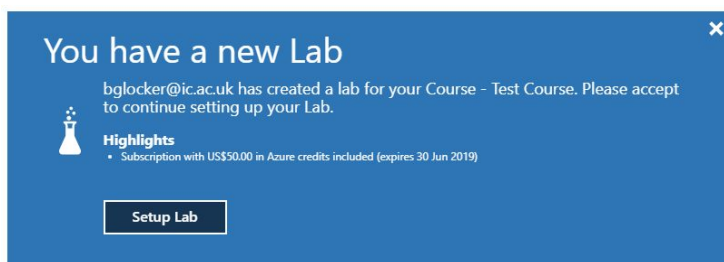
Alternatively, try opening the website:

[https://portal.azure.com/#blade/Microsoft\\_Azure\\_Education/EducationMenuBlade/quickstart](https://portal.azure.com/#blade/Microsoft_Azure_Education/EducationMenuBlade/quickstart)

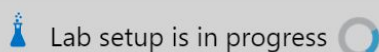
Log in to Azure using your college credentials. You will have to use your email address in the following format: **<login>@ic.ac.uk**

#### Step 2: Set up the lab

After you logged in, you should see the following message:



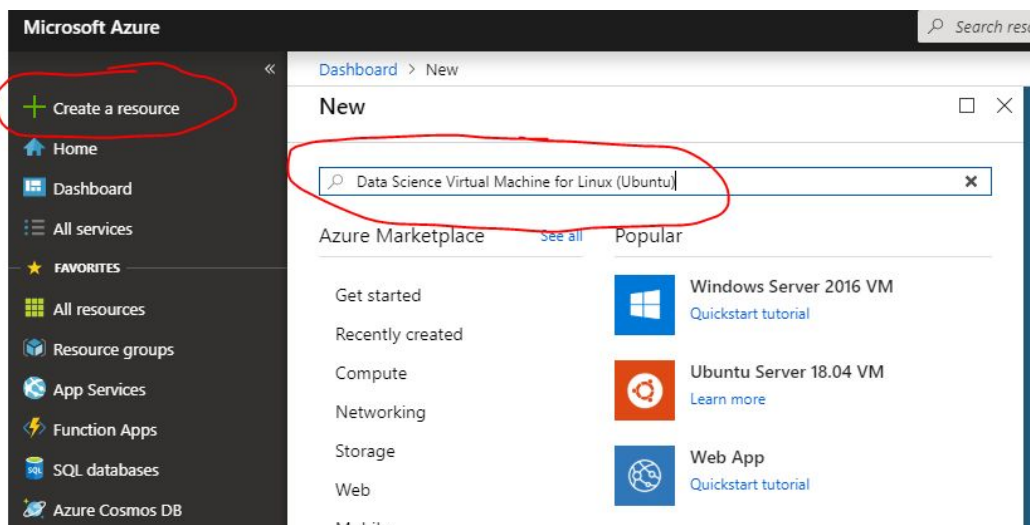
Click on “Setup Lab” and you should see the following message. Wait for it be finished.



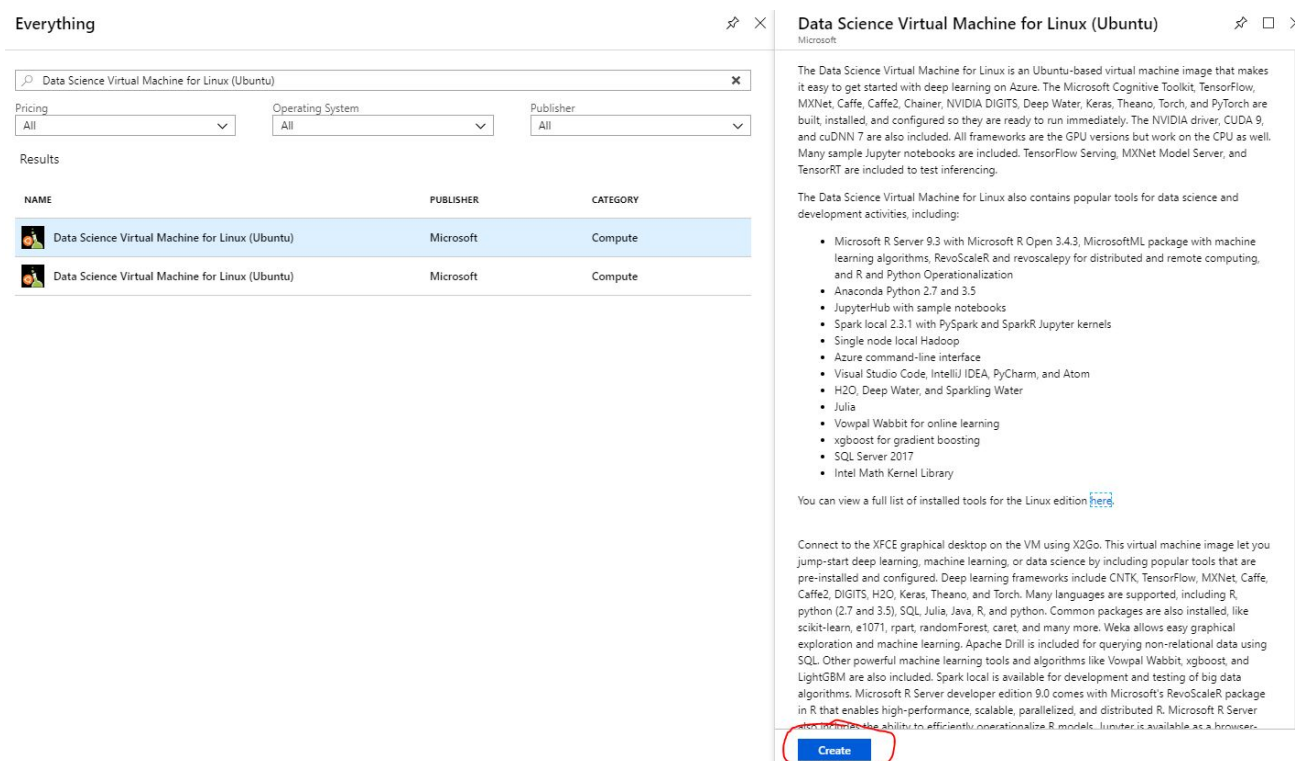
## Step 3: Creating a virtual machine

a) On the left-hand side in the menu, click on “Create a resource”:

b) In the search box, type “Data Science Virtual Machine for Linux (Ubuntu)”



c) Choose the VM and on the right-hand side click on “Create” at the bottom of the description.



d) You should now see the following:

Dashboard > New > Marketplace > AI + Machine Learning > Data Science Virtual Machine for Linux (Ubuntu) > Create a virtual machine

## Create a virtual machine

customization.  
Looking for classic VMs? [Create VM from Azure Marketplace](#)

### PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

\* Subscription ⓘ

\* Resource group ⓘ   
[Create new](#)

### INSTANCE DETAILS

\* Virtual machine name ⓘ  ✓

\* Region ⓘ

Availability options ⓘ

\* Image ⓘ   
[Browse all images and disks](#)

\* Size ⓘ **Standard DS3 v2**  
4 vcpus, 14 GB memory  
[Change size](#)

### ADMINISTRATOR ACCOUNT

Authentication type ⓘ ☒ Password ☐ SSH public key

\* Username ⓘ

\* Password ⓘ

\* Confirm password ⓘ

Login with Azure Active Directory (Preview) ⓘ ☐ On ☒ Off

[Review + create](#) [Previous](#) [Next : Disks >](#)

1. Select your subscription “MLI CW2 Lab GROUP <X>” where <X> is your group number
2. Create a new resource group. You can name it “MLI”
3. Choose a name for your VM, for example, “mli-group-<X>” where <X> is your group number
4. Make sure “Region” is set to “Western Europe”
5. Choose a username, for example, group<x> and a password that you share in your group
6. **IMPORTANT:** Click now on “Change size” under “Size” and you see the following:

## Select a VM size

Browse available virtual machine sizes and their features

[Clear all filters](#)

Size : Small (0-4)
Generation : Current
Family : General purpose

Showing 12 of 215 VM sizes. | Subscription: Test Lab GROUP1 | Region: West Europe

7. Click on “Clear all filters” and type “NC6” into the search box, and you should see:

[Restore default filters](#)

[Add filter](#)

Showing 3 of 215 VM sizes. | Subscription: Test Lab GROUP1 | Region: West Europe | Current size: Standard\_DS3\_v2

VM SIZE	OFFERING	FAMILY	VCPUS	RAM (GB)	DATA DISKS	MAX IOPS	TEMPORARY STORA...	PREMIUM DISK SUP...	COST/MONTH (ESTL...
NC6	Standard	GPU	6	56	24	20000	380 GB	No	£646.56
NC6s_v2	Standard	GPU	6	112	12	20000		Yes	£1,487.20
NC6s_v3	Standard	GPU	6	112	12	20000		Yes	£2,205.84

8. Choose “NC6” which is a VM with one Tesla K80 GPU. Click on “Select” at the bottom.

9. Back in the previous window, select “Review + create”.

**Size**

**Standard NC6**  
6 vcpus, 56 GB memory  
[Change size](#)

**ADMINISTRATOR ACCOUNT**

Authentication type ☒ Password ☐ SSH public key

\* Username

\* Password

\* Confirm password

Login with Azure Active Directory (Preview) ☐ On ☒ Off

[Review + create](#)
[Previous](#)
[Next : Disks >](#)

10. After the validation passes, you should see this. Note the price per hour.

## Create a virtual machine

✓ Validation passed

Basics | Disks | Networking | Management | Guest config | Tags | **Review + create**

**PRODUCT DETAILS**

Data Science Virtual Machine for Linux (Ubuntu)  
by Microsoft  
[Terms of use](#) | [Privacy policy](#)

Standard NC6  
by Microsoft  
[Terms of use](#) | [Privacy policy](#)

Pricing not available for this offering

Subscription credits apply  
**0.8690 GBP/hr**  
[Pricing for other VM sizes](#)

11. Click on “Create” at the bottom and your VM will be set up. This may take a few minutes.

## Step 4: Configuring your VM for remote access

When you see this, click on “Go to resource”.

✓ Your deployment is complete

[Go to resource](#)



Deployment name: CreateVm-microsoft-dsvm.linux-data-science-vm-ubu-20190208145030  
Subscription: [Test Lab GROUP1](#)  
Resource group: [MLI](#)

DEPLOYMENT DETAILS [\(Download\)](#)

Start time: 08/02/2019, 15:10:23  
Duration: 3 minutes 8 seconds  
Correlation ID: 5d80b11b-072c-4351-bfcf-19334ed82bc0

RESOURCE	TYPE	STATUS	OPERATION DETAILS
✓ <a href="#">mli-group-42</a>	Microsoft.Compute/virtualMachines	OK	<a href="#">Operation details</a>
✓ <a href="#">mli-group-4245</a>	Microsoft.Network/networkInterfaces	Created	<a href="#">Operation details</a>
✓ <a href="#">MLI-vnet</a>	Microsoft.Network/virtualNetworks	OK	<a href="#">Operation details</a>
✓ <a href="#">mli-group-42-nsg</a>	Microsoft.Network/networkSecurityGro...	OK	<a href="#">Operation details</a>
✓ <a href="#">mli-group-42-ip</a>	Microsoft.Network/publicIpAddresses	OK	<a href="#">Operation details</a>
✓ <a href="#">mlidiag399</a>	Microsoft.Storage/storageAccounts	OK	<a href="#">Operation details</a>

You should then see this:

Dashboard > CreateVm-microsoft-dsvm.linux-data-science-vm-ubu-20190208145030 - Overview > mli-group-42

**mli-group-42**  
Virtual machine

Search (Ctrl+V)

Connect Start Restart **Stop** Capture Delete Refresh

Resource group (change) : [MLI](#)

Status : Running

Location : West Europe

Subscription (change) : [Test Lab GROUP1](#)

Subscription ID : 4de3fe18-01e1-4634-975a-c9dec0a32fd

Tags (change) : [Click here to add tags](#)

Computer name : mli-group-42

Operating system : Linux

Size : Standard NC6 (6 vcpus, 56 GB memory)

Public IP address : [13.95.152.207](#)

Virtual network/subnet : [MLI-vnet/default](#)

DNS name : [Configure](#)

Show data for last: 1 hour 6 hours 12 hours 1 day 7 days 30 days

**CPU (average)**

Percentage CPU (Avg)  
mli-group-42  
0.83 %

**Network (total)**

Network In Billable...  
mli-group-42  
1.51 kB

Network Out Billable...  
mli-group-42  
878 B



**Disk bytes (total)**

Disk Read Bytes (Sum)  
mli-group-42  
300.83 MB

Disk Write Bytes (Sum)  
mli-group-42  
5.98 GB

**IMPORTANT:** You can “Stop” your VM anytime when it’s not used. A stopped VM will not induce any costs. Only a running VM will be charged to your credits.

Now, set up a DNS name so your VM is conveniently accessible from remote, e.g., via SSH. Click on “Configure” next the DNS name. You should see this:

 Save
  Discard

---

Assignment

☒ Dynamic
 ☐ Static

IP address ⓘ

13.95.152.207

Idle timeout (minutes) ⓘ

DNS name label (optional) ⓘ

In this example we chose the name “mli-group-42”. Click on “Save” at the top. This VM would now be accessible via the name “mli-group-42.westeurope.cloudapp.azure.com”.

Try to SSH into your VM with your chosen VM username and password from the terminal via:

```
$ ssh <username>@<dns_name>.westeurope.cloudapp.azure.com
```

```
ssh group44@mli-group-44.westeurope.cloudapp.azure.com
```

## Step 5: Installing Python environment on your VM

After successfully SSHing into your VM, you should see something like this:

```
*****
* Welcome to the Linux Data Science Virtual Machine on Azure!
*
* For more information on available tools and features,
* visit http://aka.ms/dsvm/discover.
*****

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

mli@mli-group-42:~$
```

Type “nvidia-smi”, to see if your GPU is up and running. You should see something like this:

```
mli@mli-group-42:~$ nvidia-smi
Fri Feb  8 15:33:01 2019

+-----+
| NVIDIA-SMI 396.44                  Driver Version: 396.44 |
+-----+-----+
| GPU   Name           Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf    Pwr:Usage/Cap|      Memory-Usage | GPU-Util  Compute M. |
+-----+-----+
|  0    Tesla K80       On          | 00005B25:00:00.0 Off |                    0 |
| N/A   43C    P0      55W / 149W |  0MiB / 11441MiB |      1%    Default  |
+-----+-----+

+-----+
| Processes:                         GPU Memory |
|   GPU       PID    Type    Process name      Usage  |
+-----+-----+
| No running processes found |
+-----+

mli@mli-group-42:~$
```



Next, we create a Python 3 virtual environment named “mli” using conda and then install all required Python packages. This will take a few minutes. Call the following commands one after each other on the VM’s terminal. Whenever prompted to proceed, answer “y” for yes.

```
$ conda create -n mli python=3.6
$ conda activate mli
$ conda install pytorch torchvision cudatoolkit=9.0 -c pytorch
$ pip install matplotlib jupyter pandas seaborn scikit-learn SimpleITK
```

## Step 6: Clone the coursework Git repository

On you VM’s terminal, run the following command

```
$ git clone https://gitlab.doc.ic.ac.uk/bglocker/mli-coursework-2
```

Change to the coursework folder:

```
$ cd mli-coursework2
```

You can download the coursework data to your VM by running the following command:

```
$ wget https://www.doc.ic.ac.uk/~bglocker/teaching/mli/mli-cw2-data.zip
```

Unzip the archive by running:

```
$ unzip mli-cw2-data.zip
```

Now, start a Jupyter notebook server on your VM:

```
$ jupyter notebook --no-browser --port=8888
```

You should see something like:

```
[I 18:01:12.553 NotebookApp] The Jupyter Notebook is running at:
[I 18:01:12.553 NotebookApp] http://localhost:8888/?token=8014e074a5399f49c7b3189c8e100d856be486bb769f9c68
[I 18:01:12.553 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 18:01:12.557 NotebookApp]

To access the notebook, open this file in a browser:
    file:///run/user/1003/jupyter/nbserver-3426-open.html
Or copy and paste one of these URLs:
    http://localhost:8888/?token=8014e074a5399f49c7b3189c8e100d856be486bb769f9c68
```

Mark and copy the highlighted URL including the full token.

On your local machine’s terminal (e.g., on a lab machine) run (in one line):

```
$ ssh -N -f -L localhost:8888:localhost:8888
    <username>@<dns_name>.westeurope.cloudapp.azure.com
```

Now, open a web browser and paste the URL including the token into the address bar. The Jupyter notebook application should appear.

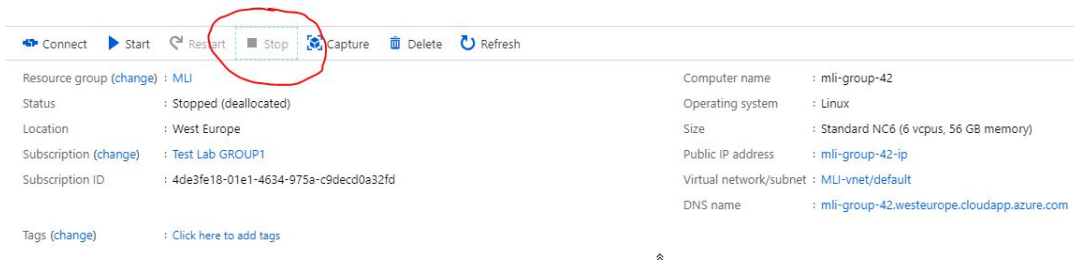
You can now work on your coursework notebooks remotely using your VM for computations. You may want to start with the notebook **MLI-MIC-Summary.ipynb**.

```
ssh -N -f -L localhost:8888:localhost:8888 group44@mli-group-44.westeurope.cloudapp.azure.com
```

## Notes

Remember, you have a **limited budget**. The given Azure credits should be sufficient to have your VM running almost 24/7 for the entire duration of the coursework. However, try to be as cost efficient as possible. You can stop your VM to save costs when it's not in use. Restarting the VM only takes a minute or so. You are free to use any leftover credits for your own projects.

**We may assign bonus points based on your credits left after the coursework.**



Also remember, everytime you reconnect to your VM you need to activate the Python environment:  
`$ conda activate mli`

**Have fun!**