



DASC 7606

Deep Learning

Tutorial 1

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This Tutorial includes:

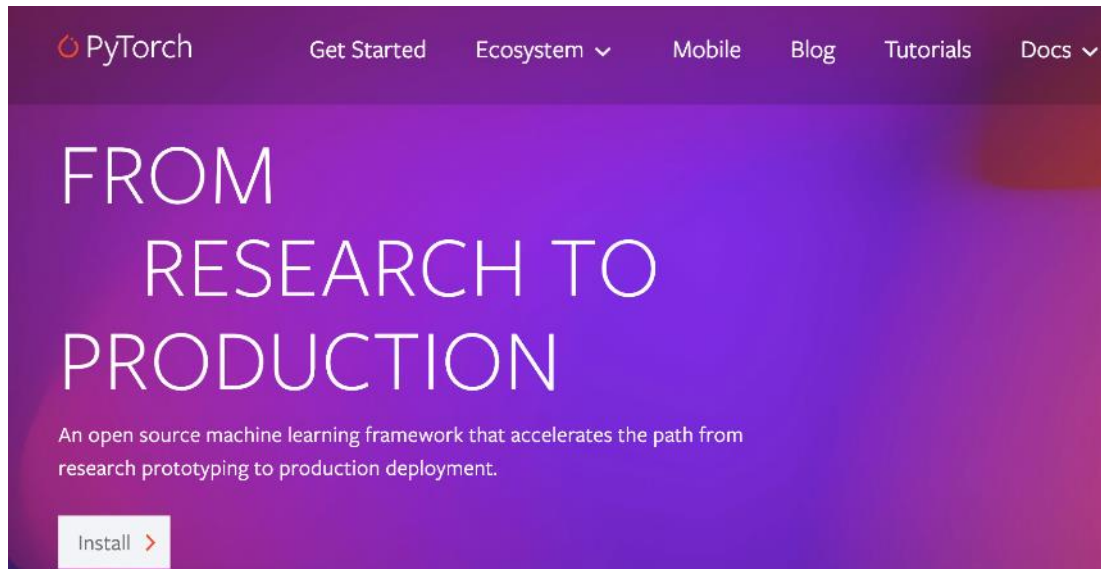
- Python and PyTorch resources for you to self-learn
- HKU GPU Farm
 - Apply for accounts
 - Accessing HKU GPU Farm using SSH and Basic Linux Commands
 - Connect to HKU GPU Farm Gateway Node and GPU Node
- Exercise using the GPU

Python

- Install Python from Anaconda:
 - <https://www.anaconda.com/products/distribution>
- Or install Python directly:
 - <https://www.python.org/downloads/>
- Python Tutorial:
 - <https://docs.python.org/3/tutorial/>
 - <https://www.w3schools.com/python/default.asp>

PyTorch – Python package for deep learning

<https://pytorch.org>



PyTorch is a Python package that provides two high-level features:

- Tensor computation (like NumPy) with strong GPU acceleration
- Deep neural networks built on a tape-based autograd system

You can reuse your favorite Python packages such as NumPy, SciPy, and Cython to extend PyTorch when needed.

PyTorch

- PyTorch quickstart tutorial:
 - https://pytorch.org/tutorials/beginner/basics/quickstart_tutorial.html
- PyTorch documentation:
 - <https://pytorch.org/docs/stable/index.html>

HKU GPU Farm

<https://www.cs.hku.hk/gpu-farm/home>



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[POLICIES AND GUIDELINES](#)

HKU CS GPU Farm

Department of Computer Science of HKU currently has two GPU farms.

Phase 1

The first GPU farm is a computer cluster with 84 NVIDIA GeForce GTX 1080Ti and 16 RTX 3090 GPU cards installed in 27 compute nodes. This computer cluster has 6 file servers providing 576 TB usable disk storage in total.

Phase 2

The second GPU farm has similar configurations to the first one with 100 NVIDIA GeForce RTX 2080Ti GPU cards in 25 compute nodes. This computer cluster also has 6 file servers providing another 576 TB usable disk storage.

Both computer clusters are managed by the SLURM cluster management and job scheduling system. Compute- or data-intensive software, such as TensorFlow and PyTorch for deep learning, can be run on this platform.

- [Charges and Payment \(for non-CS department users\)](#)
- [Applying for an Account and Using the HKU CS GPU Farm](#)
- [GPU Farm Usage Policies and Guidelines](#)

If you have any feedback or query please [click here](#).

HKU GPU Farm

<https://www.cs.hku.hk/gpu-farm/quickstart>



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DEPARTMENT OF
COMPUTER SCIENCE

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POLICIES AND GUIDELINES

Using the HKU CS GPU Farm (Quick Start)

Applying for an Account

Users of the Faculty of Engineering, including members of the Department of Computer Science, are eligible to use GPU Farm Phase 2. Please visit https://intranet.cs.hku.hk/gpufarm_acct_cas/ for application. The username of the account will be the same as your HKU Portal ID. A new password will be set for the account.

Charges apply to users who are not members of the Department of Computer Science. See <https://www.cs.hku.hk/research/major-equipment-charges> for details.

An email will be sent to you after your account is created.

DASC 7606 Students:
Apply for phase 2 accounts

1 GPU, 4 CPU cores and 28 GB RAM will be allocated to you when you access the GPU Machine in Phase 2

Please visit https://intranet.cs.hku.hk/gpufarm_acct_cas/ for application. The username and password of the account will be the same as your CS account.

Due to the high utilization of GPU Farm Phase 1, new users are recommended to apply for a Phase 2 account first.

HKU GPU Farm – Apply for phrase 2 accounts

https://intranet.cs.hku.hk/gpufarm_acct_cas

- Contact support@cs.hku.hk if you have any issue regarding the application for the account of HKU GPU Farm

The screenshot shows the 'List GPU Farm Resources Application' interface. At the top, there is a 'GPU Farm Account' dropdown set to 'frediam'. Below it, the 'Account Username' is 'frediam' with radio buttons for 'exact', 'prefix', and 'partial match' (all unselected). There are buttons for 'Find', 'Print Application List', and 'Return to Main Menu'. A message 'Click a row to view options.' is displayed above a table. The table has 13 columns: Application Id, GPU Hours, Disk Space (GB), Endorser Name, Endorsement Status, Endorsed By, Endorsement Time, Approval Status, Approved By, Approval Time, Allocation Status, Allocated By, and Allocation Time. The table contains one entry with Application Id 21714, GPU Hours 100.0, Disk Space 100, Endorser Name GPU Farm Admin, and Endorsement Status Pending. Pagination shows '(Entries: 1 - 1 of 1)'.

Application Id	GPU Hours	Disk Space (GB)	Endorser Name	Endorsement Status	Endorsed By	Endorsement Time	Approval Status	Approved By	Approval Time	Allocation Status	Allocated By	Allocation Time
21714	100.0	100	GPU Farm Admin	Pending								

After applying for account, waiting for approval

The screenshot shows the same 'List GPU Farm Resources Application' interface. The 'Account Username' is now empty. The table entry for Application Id 21714 now shows an 'Endorsement Status' of 'Endorsed', 'Endorsed By' of 'Hung Hing Fai', 'Endorsement Time' of '2022-12-10 19:24:47', 'Approval Status' of 'Approved', 'Approved By' of 'Administrator', 'Approval Time' of '2022-12-10 19:24:47', 'Allocation Status' of 'Allocated', 'Allocated By' of 'WS Chan', and 'Allocation Time' of '2022-12-15 17:44:41'. The pagination still shows '(Entries: 1 - 1 of 1)'.

Application Id	GPU Hours	Disk Space (GB)	Endorser Name	Endorsement Status	Endorsed By	Endorsement Time	Approval Status	Approved By	Approval Time	Allocation Status	Allocated By	Allocation Time
21714	100.0	100	GPU Farm Admin	Endorsed	Hung Hing Fai	2022-12-10 19:24:47	Approved	Administrator	2022-12-10 19:24:47	Allocated	WS Chan	2022-12-15 17:44:41

Account allocated; you can now connect to HKU GPU Farm using SSH

Accessing GPU Farm using SSH

– Mac: Use Terminal `ssh -X <your_portal_id>@gpu2gate1.cs.hku.hk`

```
tutorial_support — fredlam@gpu2gate1: ~ — ssh -X fredlam@gpu2gate1.cs.hku.hk —...
[fredlam@Freds-MacBook-Air tutorial_support %]
[fredlam@Freds-MacBook-Air tutorial_support %]
[fredlam@Freds-MacBook-Air tutorial_support %]
[fredlam@Freds-MacBook-Air tutorial_support %]
[fredlam@Freds-MacBook-Air tutorial_support % ssh]
usage: ssh [-46AaCfGgKkMnqsTtVvXxYy] [-B bind_interface]
          [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]
          [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]
          [-i identity_file] [-J [user@]host[:port]] [-L address]
          [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]
          [-Q query_option] [-R address] [-S ctl_path] [-W host:port]
          [-w local_tun[:remote_tun]] destination [command]
[fredlam@Freds-MacBook-Air tutorial_support %]
[fredlam@Freds-MacBook-Air tutorial_support %]
[fredlam@Freds-MacBook-Air tutorial_support % ssh -X fredlam@gpu2gate1.cs.hku.hk]
fredlam@gpu2gate1.cs.hku.hk's password: [?]
```

To access the GPU farm, you need to be connected to the HKU network (e.g., when you are using the wired network in CS laboratories and offices, or connected to HKU Wifi or HKUVPN). Use SSH to connect to one of the *gateway nodes*:

Accessing GPU Farm using SSH

– Windows: Use putty <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

The installer packages above will provide versions of all of these (except PuTTYtel and pterm), but
(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

putty.exe (the SSH and Telnet client itself)

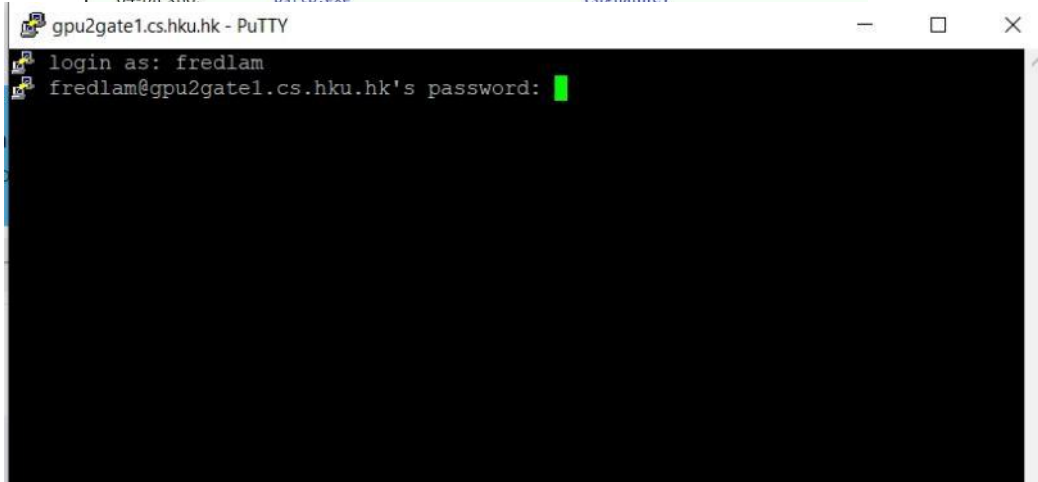
64-bit x86:	putty.exe	(signature)
64-bit Arm:	putty.exe	(signature)
32-bit x86:	putty.exe	(signature)

pscp.exe (an SCP client, i.e. command-line secure file copy)

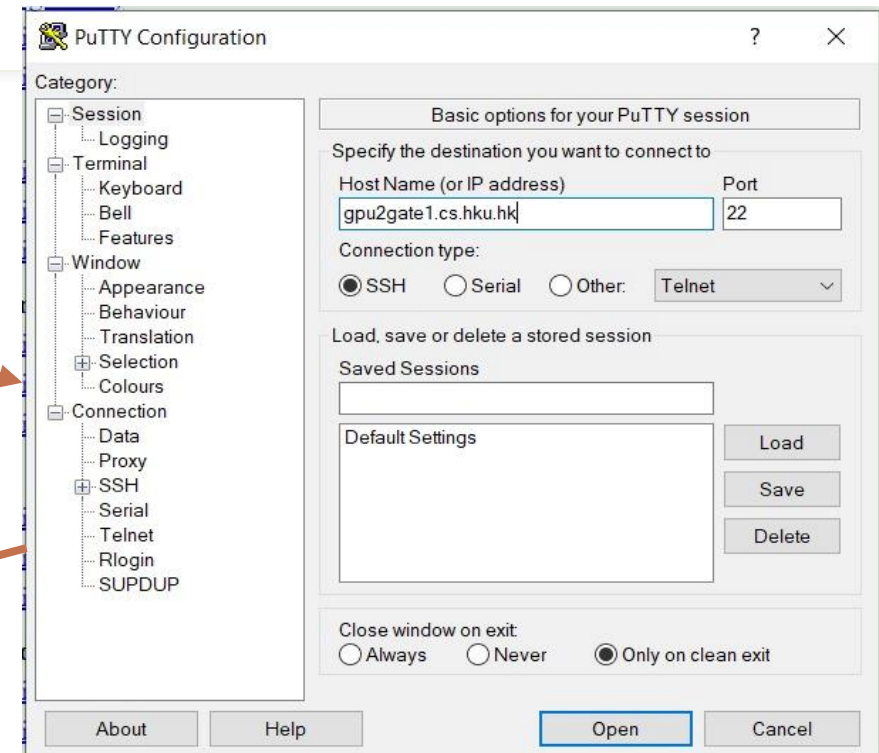
64-bit x86:	pscp.exe	(signature)
64-bit Arm:	pscp.exe	(signature)
32-bit x86:	pscp.exe	(signature)

psftp.exe (an SFTP client, i.e. general file transfer sessions much like FTP)

64-bit x86:	psftp.exe	(signature)
-------------	---------------------------	-----------------------------



```
gpu2gate1.cs.hku.hk - PuTTY
login as: fredlam
fredlam@gpu2gate1.cs.hku.hk's password: 
```



To access the GPU farm, you need to be connected to the HKU network (e.g., when you are using the wired network in CS laboratories and offices, or connected to HKU Wifi or HKUVPN). Use SSH to connect to one of the *gateway nodes*:

Useful Linux Commands

Linux Command	Purpose	
ls	display the contents of a directory	https://docs.rockylinux.org/books/admin_guide/03-commands/#ls-command
pwd	display the absolute path of the current directory	https://docs.rockylinux.org/books/admin_guide/03-commands/#pwd-command
cd	change the current directory	https://docs.rockylinux.org/books/admin_guide/03-commands/#cd-command
mkdir	create a directory or directory tree	https://docs.rockylinux.org/books/admin_guide/03-commands/#mkdir-command
mv	moves and renames a file	https://docs.rockylinux.org/books/admin_guide/03-commands/#mv-command
rm	delete a file or directory	https://docs.rockylinux.org/books/admin_guide/03-commands/#rm-command
cp	copy a file or directory	https://docs.rockylinux.org/books/admin_guide/03-commands/#cp-command
bash	execute commands read from the standard input or from a file	https://www.tutorialspoint.com/unix_commands/bash.htm
wget	download of files from the Web	https://www.tutorialspoint.com/unix_commands/wget.htm

Ubuntu Linux commands tutorial:

<https://ubuntu.com/tutorials/command-line-for-beginners#1-overview>

Accessing HKU GPU Farm

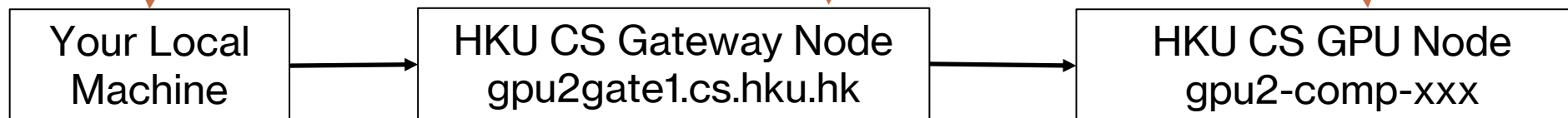
```
fredlam@Fred's-MacBook-Air tutorial_support %  
fredlam@Fred's-MacBook-Air tutorial_support % ssh -X fredlam@gpu2gate1.cs.hku.hk  
fredlam@gpu2gate1.cs.hku.hk's password:  
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0-175-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com
```

```
(base) fredlam@gpu2gate1:~$  
(base) fredlam@gpu2gate1:~$ gpu-interactive  
(Text mode only session.)  
(base) fredlam@gpu2-comp-102:~$  
(base) fredlam@gpu2-comp-102:~$ nvidia-smi  
Sat Jan 28 16:52:21 2023
```

NVIDIA-SMI 460.91.03				Driver Version: 460.91.03		CUDA Version: 11.2	
GPU	Name	Persistence-M	Bus-Id	Disp.A	Volatile Uncorr. ECC		
Fan	Temp	Perf	Pwr:Usage/Cap	Memory-Usage	GPU-Util	Compute M.	MIG M.
=====							
0	GeForce RTX 208...	On	00000000:05:00.0	Off		N/A	
18%	40C	P8	40W / 250W	1MiB / 11019MiB	0%	Default	N/A
=====							

+-----+-----+-----+-----+-----+-----+-----+-----+							
Processes:							
GPU	GI	CI	PID	Type	Process name	GPU Memory	
	ID	ID				Usage	
===== ===== ===== ===== ===== ===== ===== =====							
No running processes found							
+-----+-----+-----+-----+-----+-----+-----+-----+							
(base) fredlam@gpu2-comp-102:~\$							

```
(base) fredlam@gpu2-comp-102:~$
```



- All your processes running on the GPU node will be terminated when you exit from gpu-interactive command.
- You might be allocated another GPU node when you type 'gpu-interactive' again, but your files in the disk storage would remain the same.

```
(base) fredlam@gpu2-comp-102:~$  
(base) fredlam@gpu2-comp-102:~$ hostname -I  
10.64.32.112  
(base) fredlam@gpu2-comp-102:~$ exit  
exit  
(base) fredlam@gpu2gate1:~$  
(base) fredlam@gpu2gate1:~$  
(base) fredlam@gpu2gate1:~$ hostname -I  
10.64.32.126  
(base) fredlam@gpu2gate1:~$ gpu-interactive  
(Text mode only session.)  
(base) fredlam@gpu2-comp-100:~$  
(base) fredlam@gpu2-comp-100:~$  
(base) fredlam@gpu2-comp-100:~$ hostname -I  
10.64.32.110  
(base) fredlam@gpu2-comp-100:~$
```

Accessing GPU Farm

SSH Connect to HKU GPU Farm Gateway node

- Connect to Gateway nodes for GPU Farm Phase 2:
 - `ssh -X <your_portal_id>@gpu2gate1.cs.hku.hk`
 - If my account is fredlam, then my command is:
 - `ssh -X fredlam@gpu2gate1.cs.hku.hk`
 - Then enter your password

```
tutorial_support — fredlam@gpu2gate1: ~ — ssh -X fredlam@gpu2gate1.cs.hku.hk — 150x53
fredlam@Freds-MacBook-Air tutorial_support %
fredlam@Freds-MacBook-Air tutorial_support %
fredlam@Freds-MacBook-Air tutorial_support % ssh -X fredlam@gpu2gate1.cs.hku.hk
fredlam@gpu2gate1.cs.hku.hk's password:
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0-175-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Sat Jan 28 13:10:28 HKT 2023

System load:  0.13           Processes:      268
Usage of /:   40.6% of 19.21GB Users logged in: 2
Memory usage: 3%            IP address for enp1s0: 10.64.32.126
Swap usage:   0%

=> /mnt is using 86.9% of 294.29GB

 * Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
   just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

85 updates can be applied immediately.
61 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

New release '20.04.5 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

*** System restart required ***
***** gpu2gate1 and gpu2gate2 do not have any GPU *****

Login a GPU node using gpu-interactive, or srun, before doing your work.
Do not run CPU or memory intensive jobs on gpu2gate1 and gpu2gate2. Such jobs
will be killed without prior notice.

*****
You can use 'passwd' to change the password of your Phase 2 GPU account.

Last login: Sat Jan 28 13:09:42 2023 from 10.64.197.197
GPU Quota(Used) in Minutes: 6000(226)
*****
Please run jupyter after logging a GPU node with gpu-interactive or srun
All jupyter instances running on gpu2gate1 will be terminated without prior notice
(base) fredlam@gpu2gate1:~$
(base) fredlam@gpu2gate1:~$
```


Accessing GPU Farm

SSH Connect to Gateway node -> then connect to GPU node

Ref: <https://www.cs.hku.hk/gpu-farm/quickstart#:~:text=Using%20GPUs%20in%20Interactive%20Mode>

Using GPUs in Interactive Mode

After logging on a gateway node, you can now login to a server node with actual GPUs attached. To have an interactive session, use the `gpu-interactive` command to run a bash shell on a GPU node. An available GPU compute node will be selected and allocated to you, and you will be logged on the node automatically. The GPU compute nodes are named `gpu-comp-x` for Phase 1 and `gpu2-comp-x` for Phase 2. Note the change of host name in the command prompt when you actually log on to a GPU node, e.g.,

```
tmchan@gpugate1:~$ gpu-interactive
tmchan@gpu-comp-1:~$
```

You can verify that a GPU is allocated to you with the `nvidia-smi` command, e.g.:

```
tmchan@gpu-comp-1:~$ nvidia-smi

Sat Feb 16 17:22:06 2019

+-----+
| NVIDIA-SMI 410.79      Driver Version: 410.79      CUDA Version: 10.0      |
+-----+-----+
| GPU   Name                Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf    Pwr:Usage/Cap|      Memory-Usage | GPU-Util  Compute M. |
+-----+-----+
|    0  GeForce GTX 108...    Off      | 00000000:06:00:0 Off  |           N/A       |
| 28%   38C    P0      56W / 250W |  0MiB / 11178MiB |      0%    Default  |
+-----+-----+

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

With the `gpu-interactive` command, 1 GPU, 4 CPU cores and 28 GB RAM are allocate to you.

You can now install and run software like using a normal Linux server.

Accessing the HKU GPU Farm

SSH Connect to Gateway node -> then connect to GPU node

With the `gpu-interactive` command, 1 GPU, 4 CPU cores and 28 GB RAM are allocated to you.

You can now install and run software like using a normal Linux server.

Note that you do not have sudo privileges. Do not use commands such as '`sudo pip`' or '`sudo apt-get`' to install software.

The time limits (quotas) for GPU and CPU time start counting once you have logged on to a GPU compute node, until you logout the GPU compute node:

```
tmchan@gpu-comp-1:~$ exit
tmchan@gpugate1:~$
```

All your processes running on the GPU node will be terminated when you exit from `gpu-interactive` command.

Accessing Your Session with Another Terminal

After you are allocated a GPU compute node with `gpu-interactive`, you may access the same node with another SSH session. What you need is the actual IP address of the GPU compute node you are in. Run '`hostname -I`' on the GPU compute node to find out its IP address. The output will be an IP address 10.XXX.XXX.XXX, e.g.,

```
tmchan@gpugate1:~$ hostname -I 10.21.5.225
```

Then using another terminal on your local desktop/notebook, SSH to this IP address:

```
ssh -X <your_cs_username>@10.XXX.XXX.XXX
```

These additional SSH sessions will terminate when you exit the `gpu-interactive` command.

Note: Do not use more than one `gpu-interactive` (or `srunk`) at the same time if you just want to access your current GPU session from a second terminal, since those commands will start a new independent session and allocate an additional GPU to you, i.e., your GPU time quota will be doubly deducted. Also, you cannot access the GPUs of your previous sessions.

HKU GPU Farm – Use Filzilla to Transfer files to GPU Node

<https://filezilla-project.org/download.php>



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Changelog
Issue tracker

Other projects

libfilezilla
Octochess

Promotion:



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Download FileZilla Client for macOS

The latest stable version of FileZilla Client is 3.63.1

Please select the file appropriate for your platform below.



Download
FileZilla Client



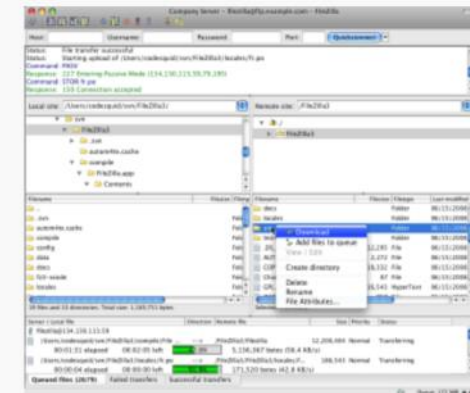
Requires macOS 10.13.2 or newer

More download options

Other platforms:    

Not what you are looking for?

[Show additional download options](#)



HKU GPU Farm – Use Filzilla to Transfer files to GPU Node

sftp://fredlam@10.64.32.110 - FileZilla

Host: 10.64.32.110 Username: fredlam Password: Port: 22 Quickconnect

Status: Listing directory /userhome/cs/fredlam
Status: Directory listing of "/userhome/cs/fredlam" successful
Status: Retrieving directory listing of "/userhome/cs/fredlam/assg_1"...
Status: Listing directory /userhome/cs/fredlam/assg_1
Status: Directory listing of "/userhome/cs/fredlam/assg_1" successful
Status: Retrieving directory listing of "/userhome/cs/fredlam"...
Status: Directory listing of "/userhome/cs/fredlam" successful

Local site: /Users/fredlam/Documents/projects/202301_HKU_TA/tutorial_support/ Remote site: /userhome/cs/fredlam/assg_1

202301_HKU_TA
Assg1
Assg2
Lecture_notes
previous_year

Filename	Filesize	Filetype	Last modified
..			
python_basic		Directory	01/28/23 15:50:41
.DS_Store	6148	File	01/28/23 15:49:42
DASC7606_Tutorial_1...	5040994	Microsoft Power..	01/28/23 13:12:09
python_basic.zip	467536	zip-file	01/28/23 15:51:56
pytorch_quickstart_t..	11823	Jupyter	01/28/23 17:47:48
~\$DASC7606_Tutoria..	165	Microsoft Power..	01/28/23 11:56:02

Selected 1 file. Total size: 11823 bytes

Remote site: /userhome/cs/fredlam/assg_1

Filename	Filesize	Filetype	Last modified	Permissions	Owner/Group
..					
Empty directory listing					

Empty directory.

Server/Local file Direction Remote file Size Priority Status

Queued files Failed transfers Successful transfers (6)



The End