

HPCs at OU

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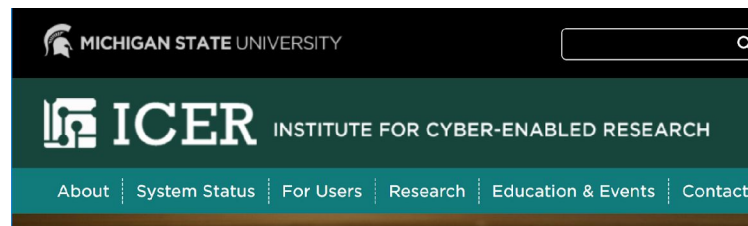
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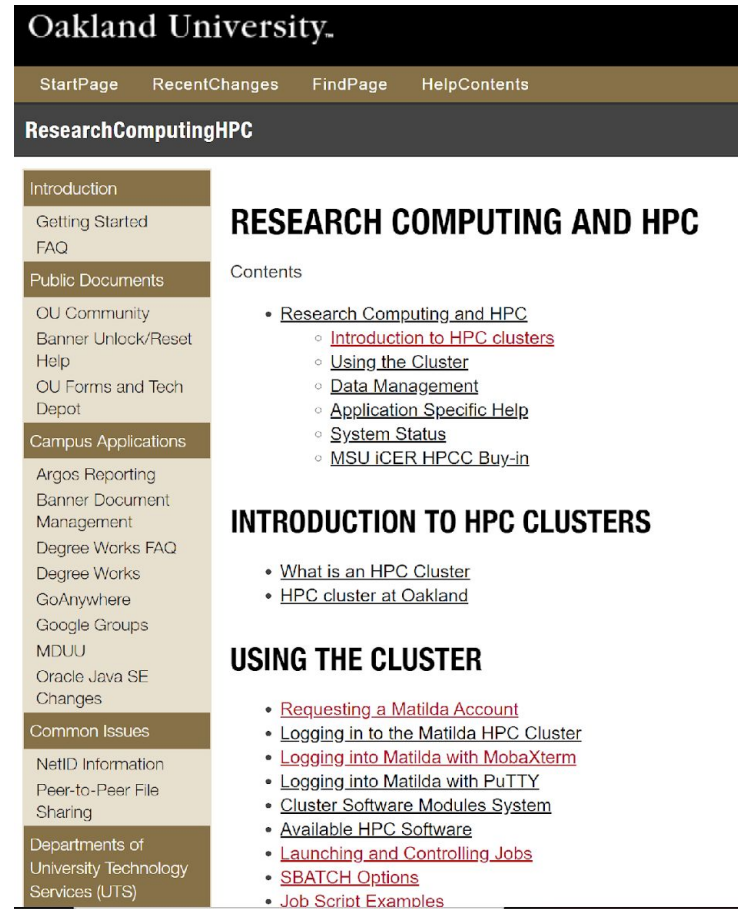
HPCMatilda

MSU ICER
icer.msu.edu



For general information:

https://kb.oakland.edu/uts/ResearchComputingHPC#Introduction_to_HPC_clusters



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ResearchComputingHPC

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RESEARCH COMPUTING AND HPC

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INTRODUCTION TO HPC CLUSTERS

- [What is an HPC Cluster](#)
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USING THE CLUSTER

- [Requesting a Matilda Account](#)
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To access the cluster from Windows:

[MobaXterm download \(home edition\)](#)

<https://mobaxterm.mobatek.net/download.html>

The screenshot shows the MobaXterm website's download page. The header includes the MobaXterm logo, navigation links (Home, Demo, Features, Download, Plugins, Help, Contact), social media icons, and buttons for 'Customer area' and 'Buy'. The main content area is divided into two columns: 'Home Edition' and 'Professional Edition'. The 'Home Edition' column is light blue and lists features for a free version, including support for X server, SSH, remote desktop, and various protocols. The 'Professional Edition' column is orange and lists features for a paid version, including customization options, unlimited sessions, and lifetime rights. Both columns have a 'Download now' button at the bottom.

MobaXterm Home Demo Features **Download** Plugins Help Contact f t i

Customer area Buy

Home Edition

Free

- Full **X server** and **SSH** support
- Remote desktop (RDP, VNC, Xdmcp)
- Remote terminal (SSH, telnet, rlogin, Mosh)
- X11-Forwarding
- Automatic SFTP browser
- Master password protection
- Plugins support
- Portable and installer versions
- Full documentation
- Max. **12** sessions
- Max. **2** SSH tunnels
- Max. **4** macros
- Max. **360** seconds for Tftp, Nfs and Cron

Download now

Professional Edition

\$69 / 49€ per user*

* Excluding tax. Volume discounts [available](#)

- Every feature from Home Edition +**
- Customize your startup message and logo
- Modify your profile script
- Remove unwanted games, screensaver or tools
- Unlimited number of sessions
- Unlimited number of tunnels and macros
- Unlimited run time for network daemons
- Enhanced security settings
- 12-months updates included
- Deployment inside company
- Lifetime right to use

Subscribe online / Get a quote

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The screenshot shows the MobaXterm 'Session settings' dialog box. The 'SSH' icon in the top toolbar is circled in red. The 'Basic SSH settings' tab is active, showing the 'Remote host' as 'pc-login.oakland.edu', 'Specify username' checked with 'battistu' entered, and 'Port' as '22'. Below this, the 'Advanced SSH settings' tab is selected, displaying a large grey box with the text 'Remote host: hpc-login.oakland.edu' and 'Username: netid'. At the bottom are 'OK' and 'Cancel' buttons. A footer message reads: 'UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>'.

Session settings

SSH Telnet Rsh Xdmcp RDP VNC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL

MobaXterm

Terminal Sessions View X serv

Basic SSH settings

Remote host * pc-login.oakland.edu ☒ Specify username battistu Port 22

Advanced SSH settings Terminal settings Network settings Bookmark settings

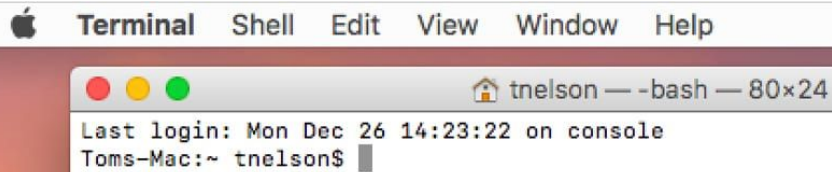
Remote host: hpc-login.oakland.edu

Username: netid

OK Cancel

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To access the cluster on Mac:



The screenshot shows a Mac Terminal window with the title bar 'Terminal' and menu items 'Shell', 'Edit', 'View', 'Window', and 'Help'. The window title is 'tnelson — -bash — 80x24'. The terminal output shows 'Last login: Mon Dec 26 14:23:22 on console' and the prompt 'Toms-Mac:~ tnelson\$'.

```
ssh username@hpc-login.oakland.edu
```


Successful connection!

1

1

GUI of your home space

2

Command line space

hpc-login.oakland.edu (battistu)

Terminal Sessions View X server Tools Games Settings Macros Help

Session Servers Tools Games Sessions View Split Multitex Tunneling Packages Settings Help

Quick connect...

/home/b/battistu/

Name Size (KB)

- ..
- ..cache
- ..conda
- ..config
- ..dgl
- ..keras
- ..lmod.d
- ..mozilla
- ..parallel
- ..ssh
- ..anaconda3
- Documents
- SEG
- test_SEG
- testroary2
- ..bash_history
- ..bash_logout
- ..bash_profile
- ..bashrc
- ..condarc
- ..emacs
- ..kshrc
- ..Xauthority
- plAAccounting_LCR2.pl
- readme.txt
- plroaryscript_MSU_Aero2.pl
- slurm-19116.out
- testMXhpc.txt
- testMXhpc_exactTimes.nwk
- testMXhpc_nexus.tre
- testMXhpc_relTimes.nwk
- testMXhpc_summary.txt
- usageAgreement.txt

Follow terminal folder

Remote monitoring

hpc-login-p01 0% 9.39 GB / 376.41 GB 0.03 Mb/s 0.02 Mb/s 198 days elder

MobaXterm 12.4

(SSH client, X-server and networking tools)

> SSH session to **battistu@hpc-login-p01.sys.oakland.edu**

- SSH compression : ✓
- SSH-browser : ✓
- X11-forwarding : ✓ (remote display is forwarded through SSH)
- DISPLAY : ✓ (automatically set on remote server)

> For more [info](#), ctrl+click on [help](#) or visit our [website](#)

Matilda HPC

This system is for authorized users only.
Your use of this system indicates your agreement to Oakland University's policies and consent to monitoring, recording, and auditing of usage. Unauthorized use of this system is prohibited and subject to discipline and prosecution.

The Matilda HPC utilizes the Slurm workload schedule,
see: <https://slurm.schedmd.com/quickstart.html>
To see a list of available modules/software use: `modules avail`
To load software to your path use: `module load <module_name>`

To avoid 'no space left on device' errors during runs please consider
reassigning your TMP space: <https://kb.oakland.edu/uts/HPCTmp>

Join us on Slack
Sign up here: https://join.slack.com/t/ouhpc/shared_invite/zt-vkpch2rn-xcjQhAI7olP-dvzxAjZONg

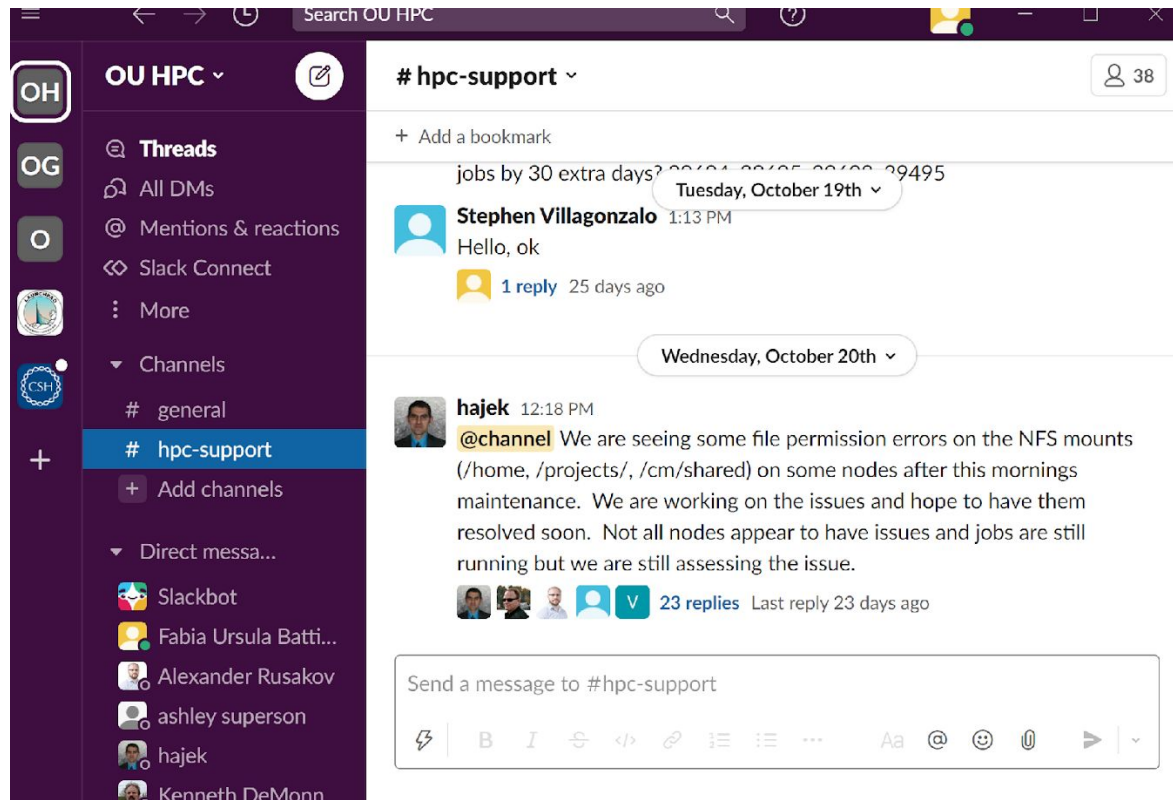
[battistu@hpc-login-p01 ~]\$

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Technical support:



What is available on Matilda:

Home directory: `home/firstletternetID/netID` (e.g., `home/b/battistu`)
20GB (this is where you land when you connect)

Project directory: `projects/blab` **1TB** (to access this you can do `cd /project/blab`): this is a shared space for everyone in a project. This has to be activated by the PI of the group

Files in these two locations will not be deleted unless you actively delete them

What is available on Matilda:

Then there is the scratch space:

Scratch project: `scratch/projects/blab` **10TB** (to access this you can do `cd /scratch/projects/blab`): this is a shared space for all of us

Scratch home: `scratch/users/netID` (e.g., `scratch/users/battistu`) **10 TB**

*Inactive files in scratch are **automatically deleted every 45 days** so make sure to regularly download the files*

To get a Matilda account:
forms.oakland.edu

If you had an account created just for this workshop, it will be deactivated Dec. 6. To request a long-term account follow the instructions

M

[MarketPlace Access Request](#)

[MarketPlace Account Unlock/Password Reset Request](#)

[MarketPlace Product Request](#)

[Matilda HPC Cluster Access Request](#)

[Miscellaneous Pay - Staff Employees Only](#)

[Modify an Approved Undergraduate Program](#)

[MSDNAA Student Account Request \(No Login\)](#)

[My PUB Alumni Profile and Impact Statement](#)

N

[NetID Guest Account Request](#)

[NetID Shared Account Request](#)

O

[Oakland University On-Campus Accident Form \(No Login\)](#)

To access Matilda from outside of campus: *forms.oakland.edu*

Request a VPN account, set up DUO authentication with your phone (or another device)



[Software & Hosted Solution Purchasing Checklist \(No Login\)](#)

[Special Account Request](#) (pdf)

[Special Credit Offering Request](#)

[Student Employee/Intern Confidentiality Agreement](#)

T

[Technology Control Plan Template](#)

[Touchnet Unlock Account / Password Reset](#)

[Travel Authorization Request \(UTS\)](#)

[Tuition Assistance Application](#)

[Tuition Assistance Application for Faculty](#)

V

[Vendor/Consultant Account Access Request](#)

[Virtual Labs Change Request](#)

[VPN Access Request](#)

Y

[Youth protection Approval Request](#)

Z

[Zoom HIPAA Request](#)

To execute an analysis:

Use SLURM to schedule your job in the cluster. This will make the job go in a queue and allow to request resources (# nodes, # of CPUs, types of nodes, etc)

For testing purpose, you can skip the cue and run the job on the login node (only for testing purposes!)

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Let's run "Hello world"

> Hello, world!_

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

To write the script on windows:

1. Open Notepad++ (do not use Word) on your computer (not the cluster)
2. Type: `print(“Hello world”)`
3. Save
4. Upload (or drag and drop) the file into your home directory in the cluster

To write the script in Linux:

1. In your home directory type: `nano` (this is a text editor in linux)
2. Type: `print(“Hello world”)`
3. `Ctrl+x`, give a file name

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster (python is automatically loaded when you log in but for practice let's go through the process)

In the cluster type:

module spider python

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hpc-login.oakland.edu (battistu)

Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split Multixec Tunneling Packages Settings Help

X server Exit

Quick connect...

/home/b/battistu/

Name	Size (KB)	L
..	2	2
.cache	2	2
.conda	2	2
.config	2	2
.dgl	2	2
.keras	2	2
.lmod.d	2	2
.mozilla	2	2
.parallel	2	2
.ssh	2	2
anaconda3	2	2
Documents	2	2
SEG	2	2
test_SEG	2	2
testroary2	2	2
.bash_history	39	2
.bash_logout	1	2
.bash_profile	1	2
.bashrc	1	2
.condarc	1	2
.emacs	1	2
.kshrc	1	2
.Xauthority	1	2
plAAccounting_LCR2.pl	8	2
helloworld.py	1	2
readme.txt	1	2
roaryscript_MSU_Aero2.pl	4	2
slurm-19116.out	2	2
testMXhpc.txt	3	2
testMXhpc_exactTimes.nwk	1	2
testMXhpc_nexus.tre	2	2
testMXhpc_relTimes.nwk	1	2
testMXhpc_summary.txt	4	2
usageAgreement.txt	6	2

☐ Follow terminal folder

Remote monitoring

```
[battistu@hpc-login-p01 ~]$ module spider python
```

Python:

Versions:

```
Python/2.7.18
Python/3.6.8-emcee
Python/3.7.3
Python/3.8.7
Python/3.9.0
```

For detailed information about a specific "Python" package (including how to load the modules) use the module's full name. Note that names that have a trailing (E) are extensions provided by other modules.
For example:

```
$ module spider Python/3.9.0
```

```
ml-pythondeps-py37-cuda10.2-gcc: ml-pythondeps-py37-cuda10.2-gcc/4.0.8
```

You will need to load all module(s) on any one of the lines below before the "ml-pythondeps-py37-cuda10.2-gcc/4.0.8" module is available to load.

shared

Help:

Adds Python libraries for Machine Learning to your environment variables,

```
python3: python3
```

Description:

Python is a programming language that lets you work more quickly and integrate your systems more effectively. - Homepage: <https://www.python.org/>

hpc-login-p01 0% 9.43 GB / 376.41 GB 0.20 Mb/s 0.15 Mb/s 198 days elder elder mahmood mahmood rusakov mahmood sugumara mahmood mahmood battistu rusakov sher

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

```
[battistu@hpc-login-p01 ~]$ module spider Python/3.9.0
```

```
Python: Python/3.9.0
```

```
You will need to load all module(s) on any one of the lines below before the "Python/3.9.0" module is available to load.  
shared
```

```
Help:  
  Adds Python3.9.0 to path,
```

```
[battistu@hpc-login-p01 ~]$
```

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

```
battistu@hpc-login-p01 ~]$ module list
Currently Loaded Modules:
 1) shared      2) DefaultModules  3) dot          4) slurm/slurm/19.05.8  5) default-environment  6) gcc/9.2.0
battistu@hpc-login-p01 ~]$
```

“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

```
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$ module load Python/3.9.0  
battistu@hpc-login-p01 ~]$ module list  
  
Currently Loaded Modules:  
 1) shared    2) DefaultModules    3) dot    4) slurm/slurm/19.05.8    5) default-environment    6) gcc/9.2.0    7) Python/3.9.0  
  
battistu@hpc-login-p01 ~]$
```


“Hello world” is a script written in Python.

To run you will need:

1. The script
2. Python loaded on the cluster

Case sensitive
Do not use spaces
Meaningful names



To run your script type:

Python3 helloworld.py

```
[battistu@hpc-login-p01 ~]$ python3 helloworld.py
Hello world
[battistu@hpc-login-p01 ~]$
```

“Hello world” is a script written in Python.

To submit your job you will need:

1. The script
2. The SLURM file
3. Python loaded on the cluster

```
#!/bin/bash --login
```

```
##### SBATCH Lines for Resource Request #####
```

```
SBATCH --time=00:01:00      # walltime
```

```
#SBATCH --nodes=1           # number of nodes
```

```
#SBATCH --ntasks=1          # number of tasks
```

```
#SBATCH --cpus-per-task=40   # number of CPUs (or cores) per task
```

```
#SBATCH --mem-per-cpu=2G     # memory required per allocated CPU
```

```
#SBATCH --job-name HelloWorld # job name for easier identification
```


Command Lines to Run

```
module load Python/3.9.0
```

```
cd /home/b/battistu      ### directory where your code is located
```

```
python3 helloworld.py > output.txt      ### call your executable
```

```
scontrol show job $SLURM_JOB_ID      ### write job info to output file
```

```
1 □#!/bin/bash --login
2
3 ##### SBATCH Lines for Resource Request #####
4
5 #SBATCH --time=00:01:00           # limit of wall clock time - how long the job will run in hrs:min:sec (same
   as -t). Max 168:00:00 (7 days)
6 #SBATCH --nodes=1                # number of different nodes - could be an exact number or a range of nodes
   (same as -N)
7 #SBATCH --ntasks=1               # number of tasks - how many tasks (nodes) that you require (same as -n)
8 #SBATCH --cpus-per-task=40        # number of CPUs (or cores) per task (same as -c). Max for most nodes: 40
9 #SBATCH --mem-per-cpu=2G          # memory required per allocated CPU (or core) - amount of memory (in bytes)
10 #SBATCH --job-name HelloWorld    # you can give your job a name for easier identification (same as -J)
11
12 ##### Command Lines to Run #####
13 module load Python/3.9.0
14
15 cd /home/b/battistu              ### change to the directory where your code is located
16
17 python3 helloworld.py > outut.txt    ### call your executable
18
19 scontrol show job $SLURM_JOB_ID      ### write job information to output file
20
```


Upload the SLURM file into your home directory
Run the job:

sbatch MatildaSLURM_example.sb

```
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$ sbatch MatildaSLURM_example.sb  
batch: error: Batch script contains DOS line breaks (\r\n)  
batch: error: instead of expected UNIX line breaks (\n).  
battistu@hpc-login-p01 ~]$
```



module spider dos2unix
module load shared
module load dos2unix/7.4.2
dos2unix MatildaSLURM_example.sb



Repeat sbatch command


```
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$  
battistu@hpc-login-p01 ~]$ sbatch MatildaSLURM_example.sb  
submitted batch job 31287  
battistu@hpc-login-p01 ~]$ squeue -u battistu  
      JOBID PARTITION      NAME      USER ST       TIME  NODES NODELIST(REASON)  
battistu@hpc-login-p01 ~]$
```

pl AAccounting_LCR2.pl
helloworld.py
MatildaSLURM_example.sb
MatildaSLURM_example2l.sb
MatildaSLURM_examplemod.sb
output.txt
readme.txt
pl roaryscript_MSU_Aero2.pl
slurm-19116.out
slurm-31284.out
slurm-31285.out
slurm-31286.out
slurm-31287.out

squeue -u netid to check job status
scancel 31827 to cancel a job

Output is created as expected

Slurm-31287.out: check how the job ran; this
is where you will find error messages



You just completed your first HPC analysis