



IDiA Inter-University Institute for Data Intensive Astronomy

ilifu Online Training

Session 1: Introduction to ilifu

2 September 2025

Jeremy Smith, ilifu Operations Manager
University of Cape Town



Topics

- Introduction to the ilifu research facility
- Directory structure
- Software environment
 - Singularity containers
 - Modules
- JupyterHub
- Introduction to Slurm

Getting help

- Support contact

support@ilifu.ac.za

- User documentation

<http://docs.ilifu.ac.za>

- Ilifu System Status

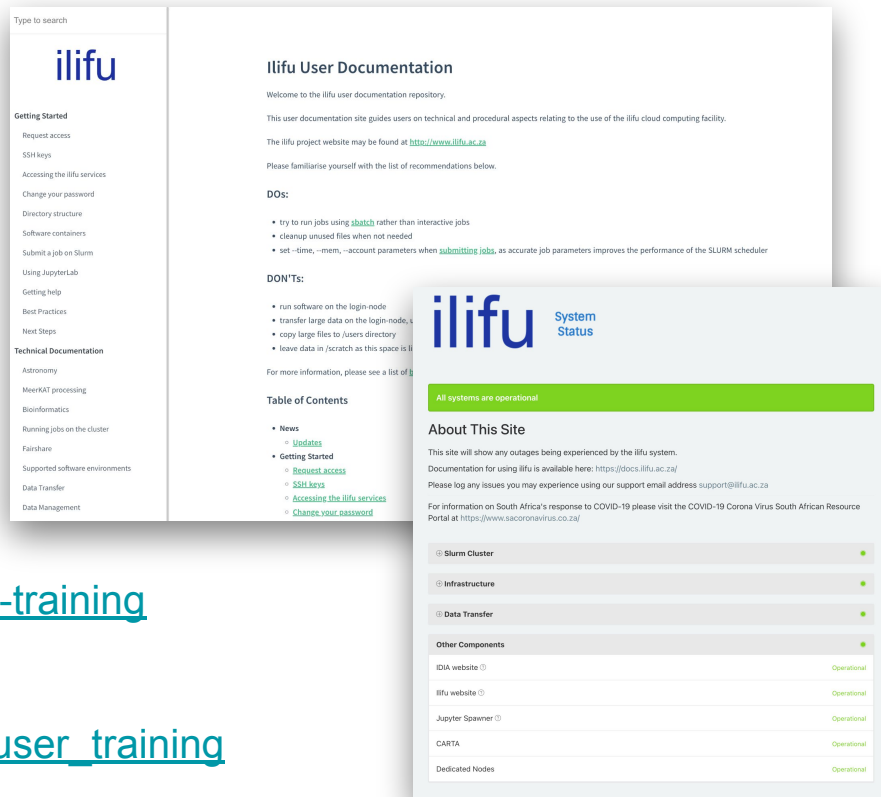
<https://status.ilifu.ac.za>

- Training videos

<https://www.ilifu.ac.za/latest-training>

- Tutorials

https://github.com/ilifu/ilifu_user_training



The image displays three overlapping screenshots of the ilifu website. The top-left screenshot shows the 'ilifu' homepage with a sidebar menu containing links like 'Getting Started', 'Request access', 'SSH keys', 'Accessing the ilifu services', 'Change your password', 'Directory structure', 'Software containers', 'Submit a job on Slurm', 'Using JupyterLab', 'Getting help', 'Best Practices', 'Next Steps', 'Technical Documentation', 'Astronomy', 'MixeKAT processing', 'Bioinformatics', 'Running jobs on the cluster', 'Fairshare', 'Supported software environments', 'Data Transfer', and 'Data Management'. The top-right screenshot shows the 'ilifu User Documentation' page, which includes a welcome message, a link to the project website, and a list of recommendations for users. The bottom-right screenshot shows the 'ilifu System Status' page, which features a green banner stating 'All systems are operational' and a table listing the status of various components.

ilifu User Documentation

Welcome to the ilifu user documentation repository.

This user documentation site guides users on technical and procedural aspects relating to the use of the ilifu cloud computing facility.

The ilifu project website may be found at <http://www.ilifu.ac.za>

Please familiarise yourself with the list of recommendations below.

DOs:

- try to run jobs using [slurbs](#) rather than interactive jobs
- cleanup unused files when not needed
- set -time, -mem, -account parameters when [submitting jobs](#), as accurate job parameters improves the performance of the SLURM scheduler

DON'Ts:

- run software on the login node
- transfer large data on the login node, i
- copy large files to /users directory
- leave data in /scratch as this space is li

For more information, please see a list of g

Table of Contents

- News
 - [Updates](#)
- Getting Started
 - [Request access](#)
 - [SSH keys](#)
 - [Accessing the ilifu services](#)
 - [Change your password](#)

ilifu System Status

All systems are operational

About This Site

This site will show any outages being experienced by the ilifu system.

Documentation for using ilifu is available here: <https://docs.ilifu.ac.za/>

Please log any issues you may experience using our support email address support@ilifu.ac.za

For information on South Africa's response to COVID-19 please visit the COVID-19 Corona Virus South African Resource Portal at <https://www.sacoronavirus.co.za/>

Component	Status
Slurm Cluster	Operational
Infrastructure	Operational
Data Transfer	Operational
Other Components	
IDIA website	Operational
ilifu website	Operational
Jupyter Spawner	Operational
CARTA	Operational
Dedicated Nodes	Operational

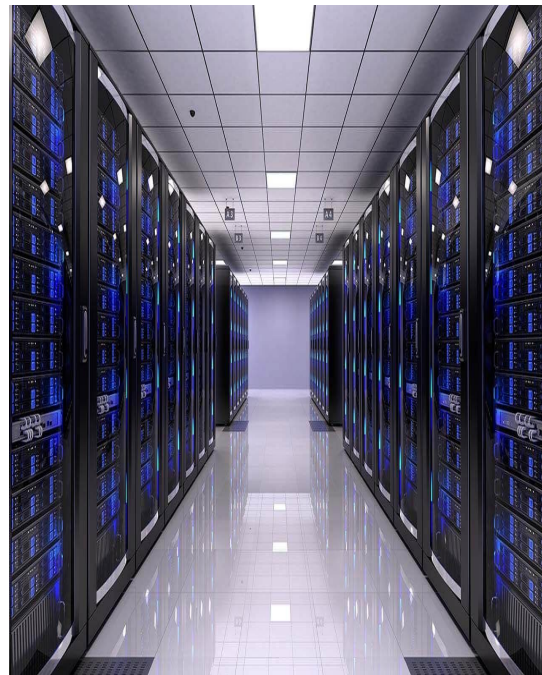
High Performance Computing

Combining power of compute clusters

- collection of servers (computers)
- connected by fast local network
- to solve complex problems

Some terminology

- computer system/server also referred to as a node
- group of nodes is a cluster



ilifu Research Facility

Cloud-based infrastructure for data-intensive research

Network of remote servers, accessed over the internet, to store, manage, and process data

- Open source cloud software to deploy infrastructure as a service (IaaS)
- Support variety of different scientific projects and requirements
- Flexible compute environment
 - Cluster environment with workload management, additional services
- Data management: storage, transfer

ilifu Research Facility - interfaces

Command line interface

ssh - shell terminal

```

For any queries or if you need help please contact the support team
at support@ilifu.ac.za

Please login to https://reports.ilifu.ac.za/ and make sure your
account is up to date as well as to view usage summaries.

Valid Slurm Accounts for user jeremy on ilifu-slurm2021:
b03-idia-ag (default)
b34-admins-ag (default)
Change your default account with:
sacctmgr modify user name=jeremy set DefaultAccount=<account>
Running job count: 0
Pending job count: 0

Run the "shelp" command to display this message.

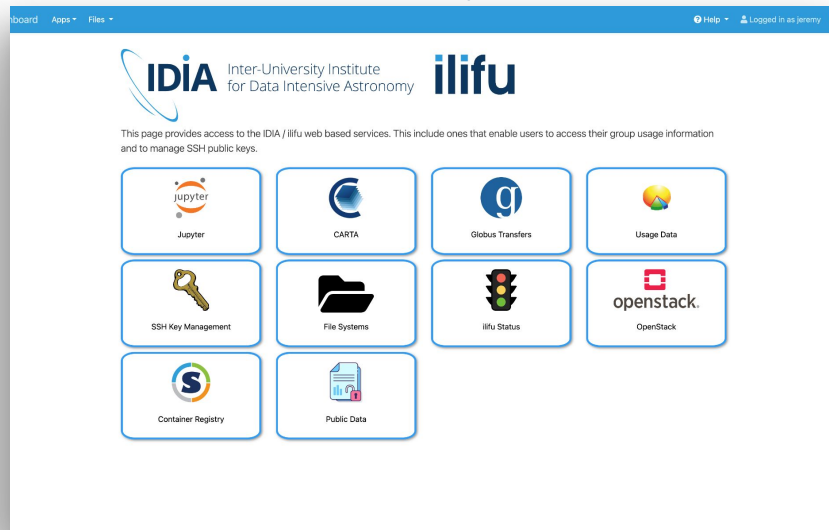
jeremy@slurm-login:~$ sinfo
PARTITION AVAIL TIMELIMIT NODES STATE MODEL/LIST
Main*      up 14-00:00:0 1 drain* compute-002
Main*      up 14-00:00:0 11 mix compute-[201-203,205-206,208-209,231,24
Main*      up 14-00:00:0 36 alloc compute-[011,017,204,207,210-226,228-23
Main*      up 14-00:00:0 37 idle compute-[003-010,012-016,018-021,101-10
Jupyter    up infinite 5 mix jupyter-[003-004,006-008]
Jupyter    up infinite 4 alloc jupyter-[001-002,005,009]
Jupyter    up infinite 1 idle jupyter-010
JupyterGPU up 14-00:00:0 2 alloc gpu-[003-004]
HighMem    up 14-00:00:0 1 mix highmem-003
HighMem    up 14-00:00:0 2 alloc highmem-[001-002]
GPU        up 14-00:00:0 4 alloc gpu-[001-004]
GPU        up 14-00:00:0 3 idle gpu-[005-007]
GPUUV100   up 14-00:00:0 1 idle gpu-005
Devel      up 5-00:00:0 1 alloc compute-001
jeremy@slurm-login:~$ sbatch test.job.sh
  
```

ssh <username>@slurm.ilifu.ac.za

ssh <username>@transfer.ilifu.ac.za

Web applications

IDIA Science Gateway - App Dashboard

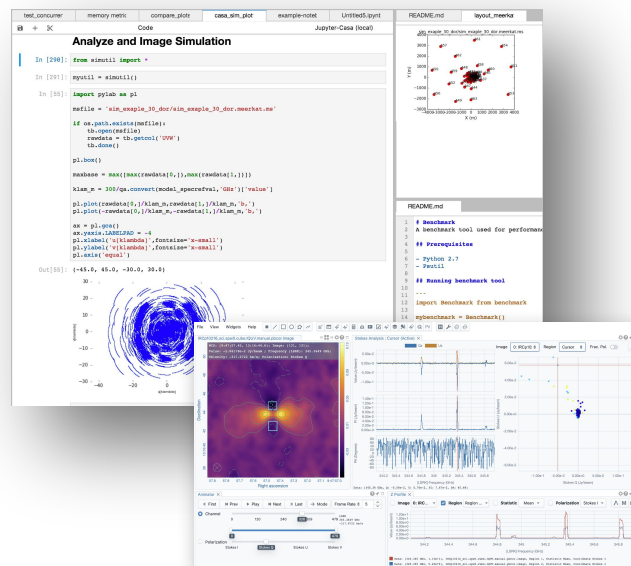
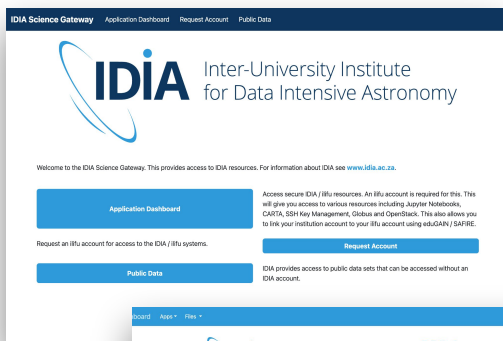


<https://gateway.idia.ac.za>



ilifu Research Facility - Web Applications

Application dashboard - accessed via <https://gateway.idia.ac.za>



Web application examples
<https://jupyter.ilifu.ac.za>
<https://carta.idia.ac.za>

ilifu

Compute environment - ssh

Your SSH key

- Used in the SSH (Secure Shell) protocol
- Authentication method for gaining access to encrypted connecting between systems
- Use connection to manage system remotely
- We need your SSH public key so our system knows to let you in
- Default:
 - `~/.ssh/id_rsa` `~/.ssh/id_rsa.pub`
 - `~/.ssh/id_ed25519` `~/.ssh/id_ed25519.pub`

Compute environment - ssh

Generating SSH key

- If you don't already have one
- New computer/formatted existing computer

GitHub docs on key generation:

[https://docs.github.com/en/github/authenticating-to-github/
connecting-to-github-with-ssh/generating-a-new-ssh-key-and-
adding-it-to-the-ssh-agent](https://docs.github.com/en/github/authenticating-to-github/connecting-to-github-with-ssh/generating-a-new-ssh-key-and-adding-it-to-the-ssh-agent)

Manage your SSH keys associated with your ilifu account

https://usage.ilifu.ac.za/ssh_keys

Compute environment - ssh

```
user-local:~$ ssh <username>@slurm.ilifu.ac.za
```

```
...
```

```
<username>@slurm-login:~$
```

```
<username>@slurm-login:~$ pwd
```

```
/users/<username>
```

```
<username>@slurm-login:~$ ls
```

```
README.md  workspace
```

```
<username>@slurm-login:~$ ls /idia/projects/
```

G4Jy	gamma-ray-binaries	meerlicht	shapley-uhf
M64-NGC151	goodsn	meerlirgs	share
adfs	grandspiral	meerrings	simba
antlia	hack4dev	merghers	supermightee

```
...
```

Directory Structure

Common areas:

- /users
 - limited storage shared among all users, for scripts and small files – don't place data here, capping /users storage capacity can prevent access to the cluster for all users. **Limited to 200GB**
- /scratch3/users
 - directory space for processing data, temporary storage only, i.e. use this space during processing, and then clear all files immediately after processing. Remove unnecessary data and move data that you want to keep to project folder.
 - **90-day scratch storage auto-deletion policy**

Remaining storage separated by group: IDIA, CBio, ilifu

Directory Structure

IDIA structure:

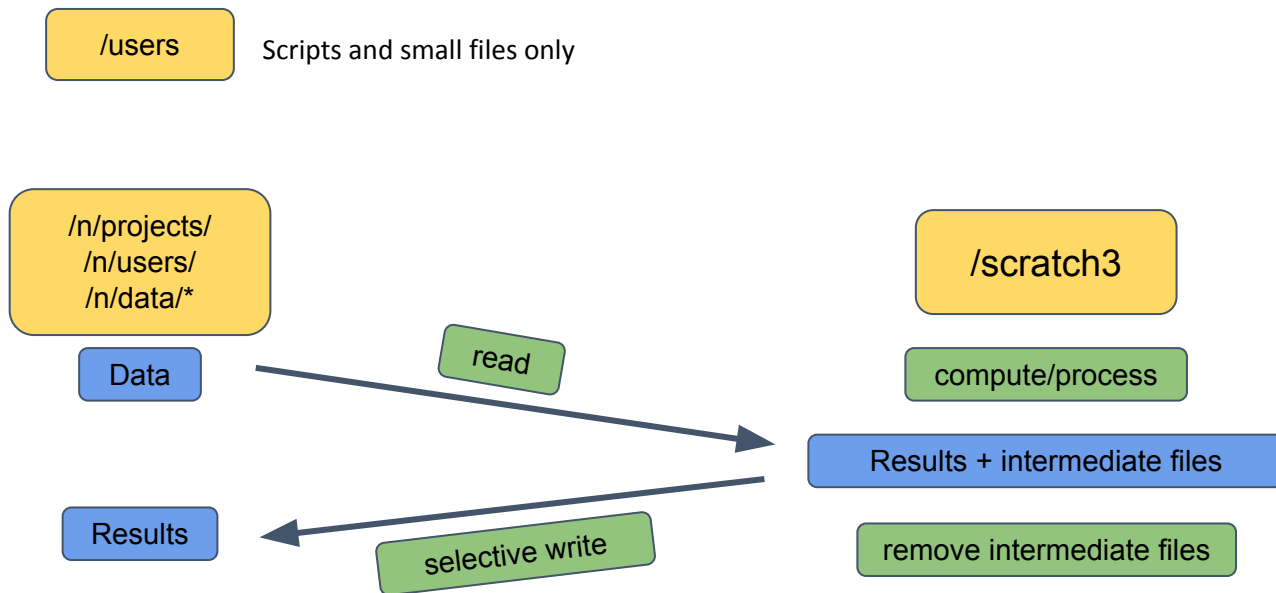
- /idia/users
 - user's private work directory, may store data products that are not ready to move to shared project space. **Limited to 10TB**
- /idia/projects
 - project specific directories. These directories are for sharing data and resources within project groups. Raw data associated with a project will also be available from the project folder. Raw data should always be read-only.
- /idia/software
 - software containers and the IDIA Pipelines software is stored here

Directory Structure

Similar structure for /cbio and /ilifu groups:

- /cbio/users (**Limited to 10TB**)
- /cbio/projects
- /cbio/soft
- /ilifu/users (**Limited to 2TB**)
- /ilifu/software
- Exception for ilifu projects:
 - /ilifu/astro/projects
 - /ilifu/bio/projects

Directory Structure - Typical workflow



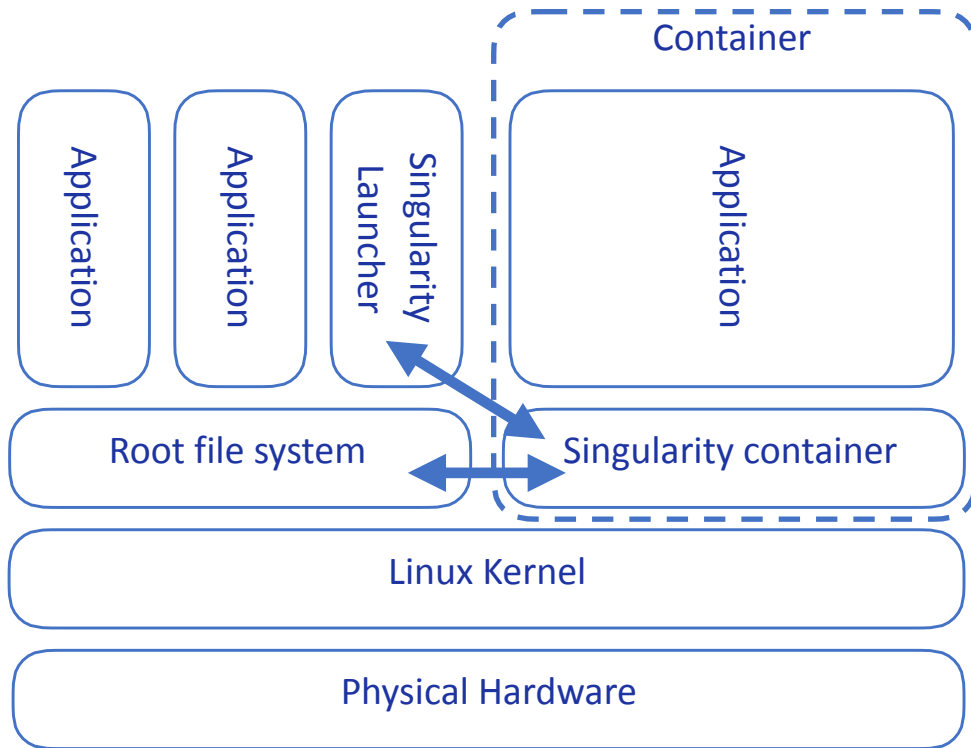
*/n/data generally read-only

n = idia, cbio, ilifu



- [illegible]

Software environment - Singularity containers



Software environment - Singularity containers

Supported Containers:

- CASA 5, CASA 6
- Astronomy container (ASTRO-PY3, ASTRO-PY3.8, ASTRO-PY3.10)
- KERN suite
- GPU Python container
- Project containers:
 - MeerLICHT, LADUMA, HI Intensity mapping
- lots of others

Directories:

- /software
- /idia/software/containers
- /ilifu/software/containers



Software environment - Singularity containers

Open container as an interactive shell:

```
singularity shell /path/to/container
```

Example:

```
$ singularity shell /idia/software/containers/ASTRO-PY3.10.sif
```



Run a script/workflow using a container environment:

```
singularity exec /path/to/container <software> <script/input_parameters>
```

```
$ singularity exec /idia/software/containers/casa-6.simg python myscript.py
```

Look at what is inside a container by viewing its build script:

```
singularity inspect -d /path/to/container
```

```
$ singularity inspect -d /idia/software/containers/casa-6.simg
```



Software environment - modules

module avail

```
$ module avail
```

----- /software/modules/astro -----						
atnfcat/2.0.1	casa/5.7.2-4	casa/6.2	casa/6.5.0	cfitsio/4.3.1 (D)	pybdsf/1.9.2	splinter/a968918
bbarolo/1.6.1	casa/5.8.0	casa/6.3	casa/6.5.5	pgplot/5.2	pybdsf/1.10.1 (D)	tempo/0b487e2
bbarolo/1.6.7 (D)	casa/6.1.0-118-monolithic	casa/6.4	casa/6.6.0	psrcat/1.50	qd/2.3.12	tempo2/2024.02.1
calceph/2.3.2	casa/6.1.2.7-pipeline	casa/6.4.3	casa/6.6.4 (D)	psrdada/008afa7	sigproc/28ba4f4	
casa/5.7.0	casa/6.1.2.7-modular	casa/6.4.4	cfitsio/3.450	psrxml/1.01	sofa/20180130	
----- /software/modules/bio -----						
ClinSV/ClinSV_1.0.0	filtlong/0.2.1	mercury/1.3		samtools/1.18		
DIANN/1.8.1	fragpipe/18.0	meryl/1.3		samtools/1.19		
GenomeBrowser/cli	gatk/gatk 4.2.6.1	meryl/1.4.1	(D)	samtools/1.19.2		
ambertools/23	gatk/4.2.5.0	minimap2/2.24		samtools/1.20		(D)
annovar/2020-06-07	gatk/4.3.0.0	miniwdl/1.12.1		savvysuite/git		
bamtools/2.5.2	gatk/4.4.0.0	mttoolbox/1.2.1.1		seqkit/2.6.0		
bcbio/bcbio_container	gatk/4.5.0.0 (D)	multiqc/1.17		seqtk/1.4		
bcbio/1.2.3	gemini/gemini	multiqc/1.22.3	(D)	seqwish/0.7.9-2		
bcbio/1.2.9 (D)	gemma/0.98.5	mummer/4.0.0rc1		shapeit5/5.1.1		
bcftools/1.10.2	genomestrip/2.00.1958	nanocomp/1.23.1		snpeff/5.1		
bcftools/1.17	gfastats/1.3.6	nanofilt/2.8.0		snpsites/2.5.1		
bcftools/1.19 (D)	glimpse/2.0.0	nanoplot/1.41.0				
... ----- /software/modules/common -----						
LAPACK/3.9.0	cuda/11.0.2 450.51.05	gnuplot/default		neovim/0.8.2	python/3.9.7	
LAPACK/3.10.1	cuda/11.4.2 470.57.02	go/1.16.3		neovim/0.9.4 (D)	python/3.9.12	
LAPACK/3.12.0 (D)	cuda/11.6.0 510.39.01	go/1.17.3		nodejs/18.13.0	python/3.9.16	
R/RStudio1.2.5042-R4.0.0	cuda/11.7.0 515.43.04	go/1.18.4		nodejs/19.4.0 (D)	python/3.9.19	
R/RStudio1.2.5042-R4.0.4	cuda/11.8.0 520.61.05	go/1.20.4		openBLAS/0.3.9	python/3.10.0	
R/RStudio1.2.5042-R4.2.0	cuda/12.1.0 530.30.02	go/1.21.6		openBLAS/0.3.20	python/3.10.1	
R/RStudio1.2.5042-R4.2.1	cuda/12.2.0 535.54.03	go/1.22.4 (D)		openBLAS/0.3.25 (D)	python/3.10.4	
R/RStudio2022.12.0-353-R4.2.2	cuda/12.4.0 550.54.14 (D)	graphviz/2.49.1		openmpi/2.1.1	python/3.10.9	
... ----- /opt/lmod/lmod/modulefiles/Core -----						
lmod settarg						
Where:						
L: Module is loaded						
D: Default Module						

Software environment - modules

- module avail
- module help <module>

```
$ module help python
```

```
----- Module Specific Help for "python/3.10.1" -----  
This module configures Python 3.10.1 for use
```

- module load <module>
- module list
- module purge
- module --help



JupyterHub

<https://gateway.idia.ac.za>

OR

<https://jupyter.ilifu.ac.za>

ilifu

Sign in to your ilifu account

Username

Password

Sign In

Or sign in with / link account to

eduGAIN / SAFIRE

New user? [Register](#)

A screenshot of the ilifu dashboard. The header includes the IDIA logo (Inter-University Institute for Data Intensive Astronomy) and the ilifu logo. Below the header, a message states: "This page provides access to the IDIA / ilifu web based services. This include ones that enable users to access their group usage information and to manage SSH public keys." A grid of service tiles is displayed. The first tile, labeled "jupyter", is highlighted with a red border. Other tiles include CARTA, Globus Transfers, Usage Data, SSH Key Management, File Systems, ilifu Status, openstack, Container Registry, and Public Data. The top navigation bar shows "board", "Apps", and "Files". The top right corner indicates "Help" and "Logged in as jeremy".



JupyterHub

Session size

Launch Jupyter Lab

Hi jeremy. Remember to try and choose the smallest profile that fits your task. This helps us to make sure that everyone has access to the resources they need. Please visit the [user documentation](#) to learn more about Jupyter on ilifu. If you have any more questions, please send an email to [ilifu support](#).

The following table shows the job profiles available on the ilifu cluster (as at 2024-08-30 10:41):

Job Profile	Available Jobs
GPU Session (16 cores, 1 GPU)	3
Minimum Session (1 core, dedicated)	17
Small Session (2 cores, dedicated)	8
Medium Session (4 cores, dedicated)	4
Large Session (8 cores, dedicated)	2
Half-Max Session (16 cores, dedicated)	0
Max Session (32 cores, dedicated)	0

Select a job profile:

Development Session - 2 core, 3 GB RAM, shared, 18 hrs idle timeout, max 14 days lifespan

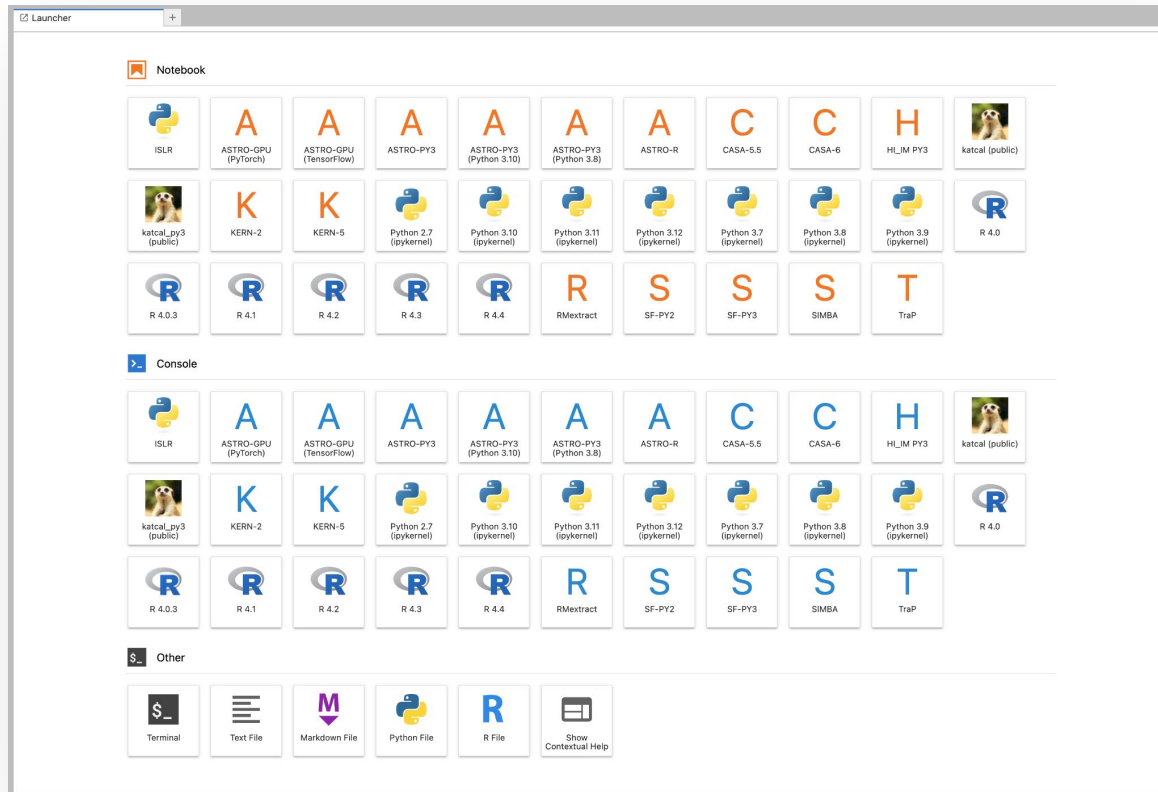


Start



JupyterHub

Choose kernel
in launcher





Demo

Demo resources

https://github.com/ilifu/ilifu_user_training

