

# Proposal for Lightsheet Microscopy Software Pipeline

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# Lightserv

Lightserv: a web application to submit light sheet microscope experiments

- ▶ Goals:
  - 1 Minimize human intervention and overhead when running the software pipeline
  - 2 Enable user-friendly quality control of light sheet data
  - 3 Make clearing and imaging parameters easier to log and access electronically
  - 4 Introduce a visualization tool for light sheet/whole brain data

## Advantages of a web application

A web application accomplishes the four goals and has the following advantages over other methods:

- 🚫 No need to download and install a program
- 🚫 Not operating system dependent
- 🚫 No programming knowledge required
- 🚫 Processing/visualization do not use your computer's resources because everything is run on HPCs
- ✅ Version control: When you access the website, you are always using the latest version

The code will still be there if you want to run it yourself.

# Lightserv User Interface

Lightserv Home

New Request Logout

Logged in as: ahoag

## Your Light Sheet Experiments:

username	experiment_id	title	description	species	clearing_protocol	fluorophores	primary_antibody	secondary_antibody	image_resolution
ahoag	1	20190507_Wanglab_exp	Image c-fos in whole brains at 1.3x.	mouse	iDISCO+	None	Anti cfos 1:1000	Donkey antirabbit AF647	1.3x
ahoag	2	20190304_LW_m340	Detect placement of optical fiber tip	mouse	iDISCO abbreviated clearing	GCampxDat-Cre Double Transgenic Mouse	None	None	1.3x
ahoag	3	201905_atlas00x where x=1:n	Brody lab rat atlas, iDisco + 1.3x	rat	iDISCO abbreviated clearing	None	None	None	1.3x
ahoag	4	an1-31	Recover mcherry expression in cerebellum. Morphology analysis.	mouse	iDISCO+	mcherry	rabbit anti-RFP 1:1000	Donkey antiRabbit 647 1:450	1.3x

# Lightserv User Interface

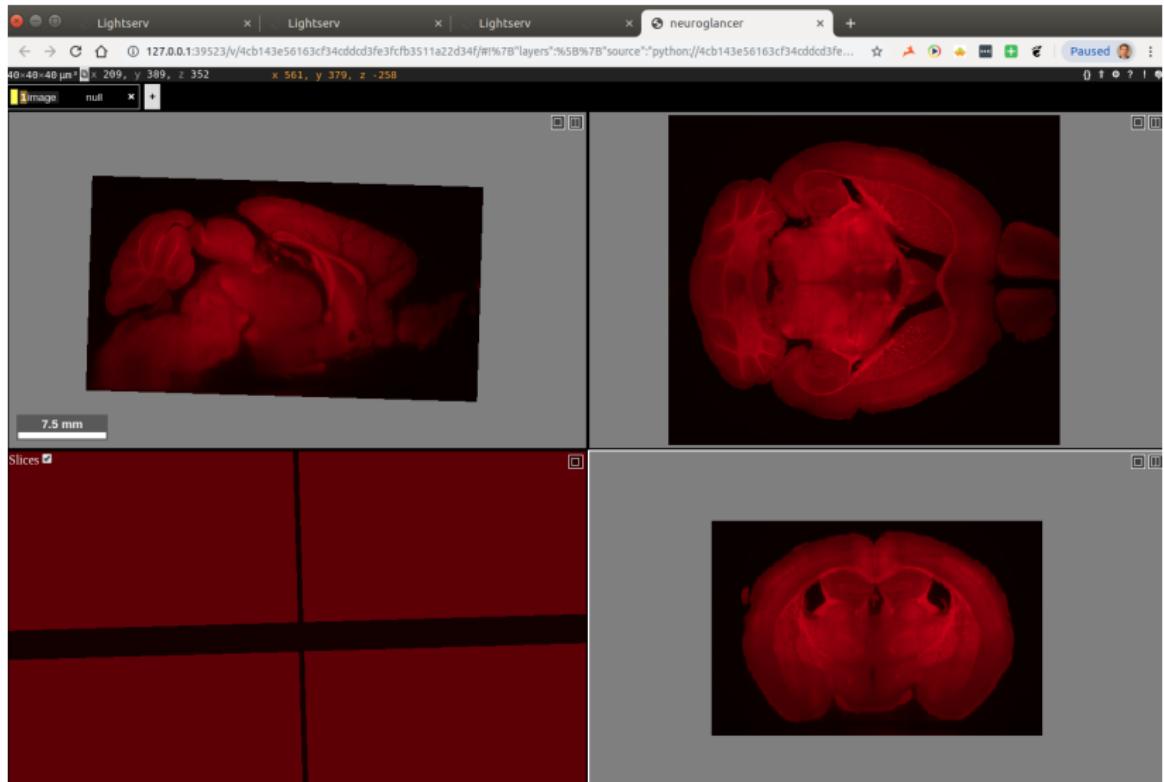
Lightserv Home New Request Logout

Experiment: 1 Delete

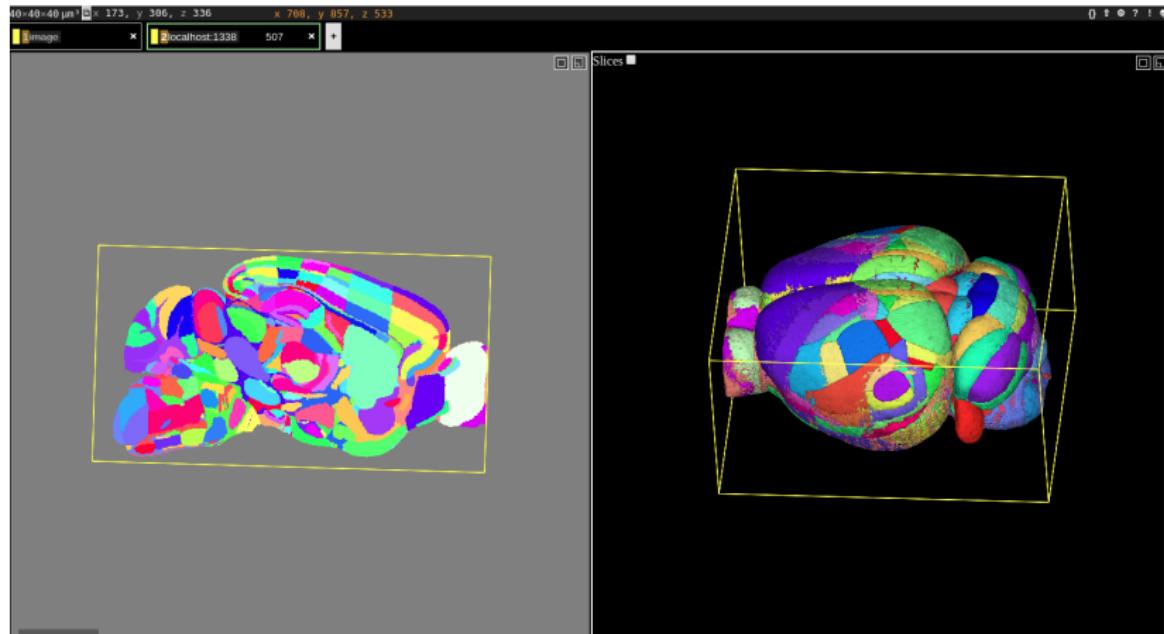
[View Your Data](#) [View Allen Brain Atlas](#)

username	experiment_id	title	description	species	clearing_protocol	fluorophores	primary_antibody	secondary_antibody	image_resolution
ahoag	1	20190507_Wanglab_exp	Image c-fos in whole brains at 1.3x.	mouse	iDISCO+	None	Anti cfos 1:1000	Donkey antirabbit AF647	1.3x

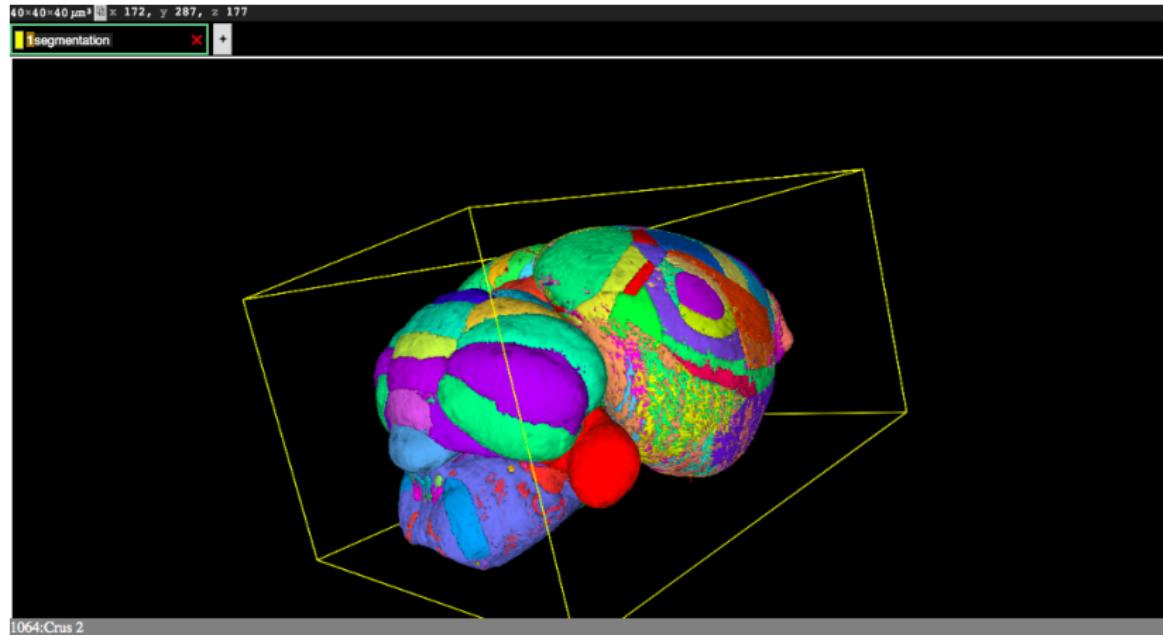
## Viewing your data in Neuroglancer



# Viewing Princeton Mouse Atlas in Neuroglancer



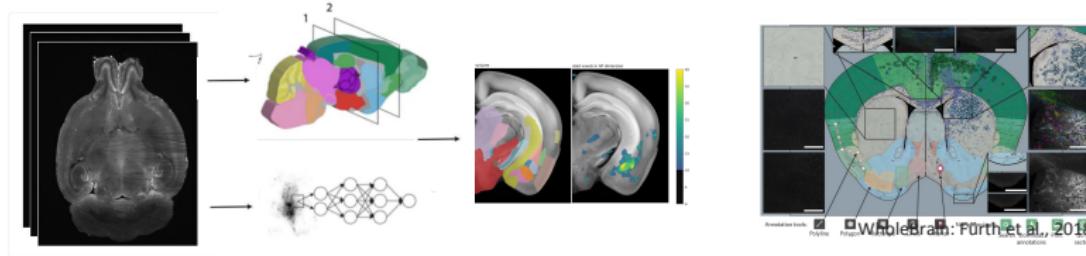
# Displaying brain region names in Neuroglancer



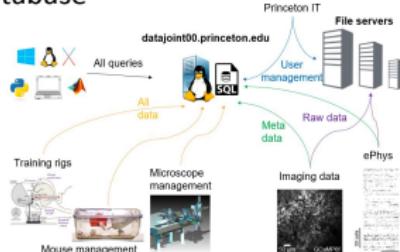
# Connectivity within the U19

## Future goals

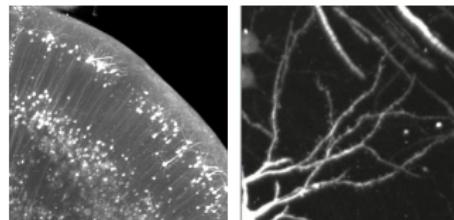
Streamline image processing and analysis software for improved user interaction



Link these data sets to the relational database



Expand imaging capability with improved resolution



# Access the databases directly with Datajoint

localhost:8888/notebooks/python\_demo.ipynb

jupyter python\_demo Last Checkpoint: Last Monday at 11:05 AM (autosaved)

File Edit View Insert Cell Kernel Widgets Help

Not Trusted lightserv

### Reconstruct classes from the database directly

In [4]:

```
acquisition = dj.create_virtual_module('acquisition', 'pni_acquisition')
subject = dj.create_virtual_module('subject', 'pni_subject')
action = dj.create_virtual_module('action', 'pni_action')
```

Now let's have some serious fun with the database, with some queries

In [5]: # Very fat mice

```
subject.Subject() & 'initial_weight > 35'
```

Out[5]:

user_id username	subject_id nickname	genomics_id number from the facility	sex sex	dob birth date	head_plate_mark little drawing on the head plate for mouse identification	location	protocol protocol number	line name	subject_description description	initial_weight
edward	E79	None	Male	2017-05-03	=BLOB=	vivarium	1910	C57BL6J		36.6
edward	E80	None	Male	None	=BLOB=	valhalla	1910	C57BL6J		41.9
lucas	vg12	None	Male	None	=BLOB=	vivarium	1910	Unknown		35.5
lucas	vg30	None	Male	2017-08-26	=BLOB=	vivarium	1910	VGAT-ChR2-EYFP		35.8
lucas	vg31	None	Male	2017-08-26	=BLOB=	vivarium	1910	VGAT-ChR2-EYFP		36.3

Total: 5

In [6]: subject.Subject() & 'dob between "2019-01-01" and "2019-03-01"' & 'initial\_weight > 15'

Out[6]:

user_id username	subject_id nickname	genomics_id number from the facility	sex sex	dob birth date	head_plate_mark little drawing on the head plate for mouse identification	location	protocol protocol number	line name	subject_description description	initial_weight
mioffe	M10_604	None	Female	2019-02-10	=BLOB=	vivarium	1910	Thy1-GP5.3		24.1
testuser	T01	None	Female	2019-01-23	=BLOB=	vivarium	1910	Thy1-GP5.3		26.0
testuser	T02	None	Male	2019-01-25	=BLOB=	vivarium	1910	C57BL6J		20.0