Comet Tutorial

Why use a platform like Comet?

- Easy to integrate to PyTorch, Keras, Tensorflow frameworks
- Accessible online → collaborative work

- Track hyperparameters, metrics, code and output
- Track environment packages and GPU usage

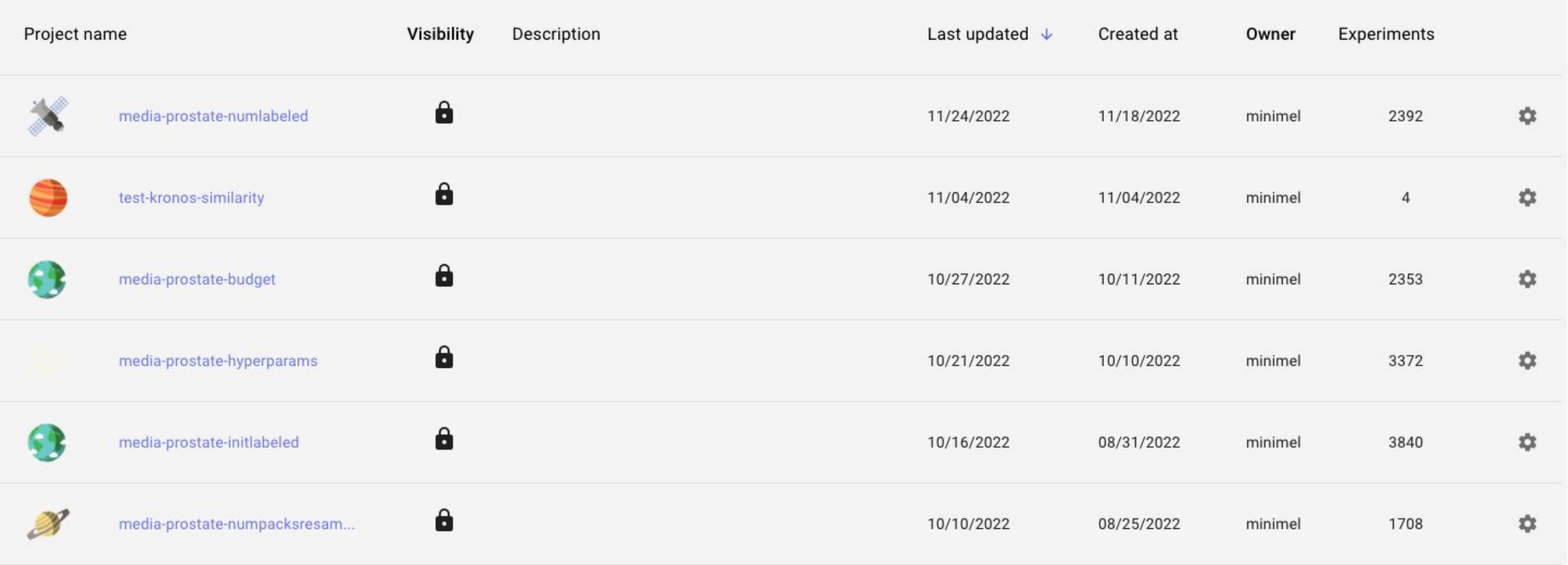
→ **Reproducibility**

Easy to integrate

```
import comet_ml
experiment = comet_ml.Experiment(
    api_key="<Your API Key (mandatory)>",
    project_name="<Your Project Name (prefered)>",
    experiment_name="<Your Experiment Name (optional)>")

def training_step():
    with experiment.train():
        …
def validation_step():
    with experiment.validate():
        …
```

```
def test():
    with experiment.test():
        …
```

Organizing research projects



Project name	Visibility	Description	Last updated ↓	Created at	Owner	Experiments	
media-prostate-numlabeled	🔒		11/24/2022	11/18/2022	minimel	2392	⚙
test-kronos-similarity	🔒		11/04/2022	11/04/2022	minimel	4	⚙
media-prostate-budget	🔒		10/27/2022	10/11/2022	minimel	2353	⚙
media-prostate-hyperparams	🔒		10/21/2022	10/10/2022	minimel	3372	⚙
media-prostate-initlabeled	🔒		10/16/2022	08/31/2022	minimel	3840	⚙
media-prostate-numpacksresam...	🔒		10/10/2022	08/25/2022	minimel	1708	⚙

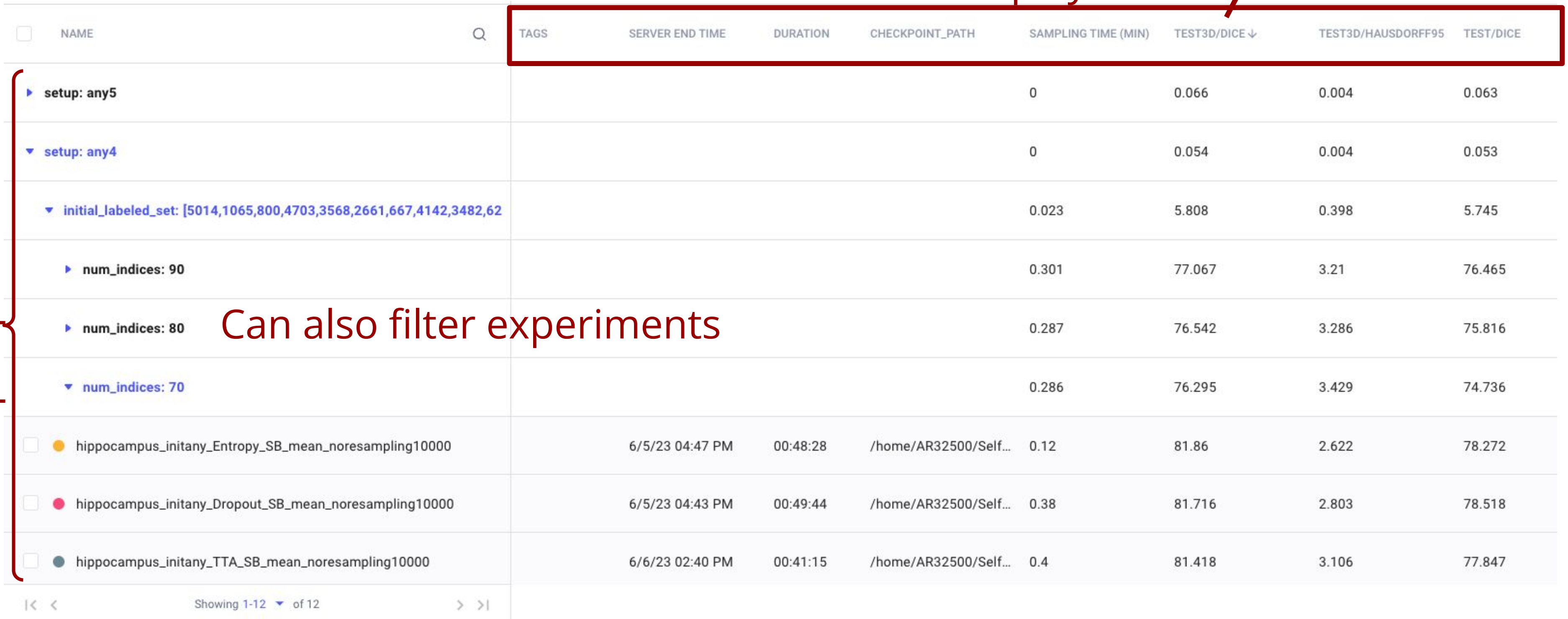
Organizing experiments

Sort the results

Choose the columns to display

Group experiments

Can also filter experiments

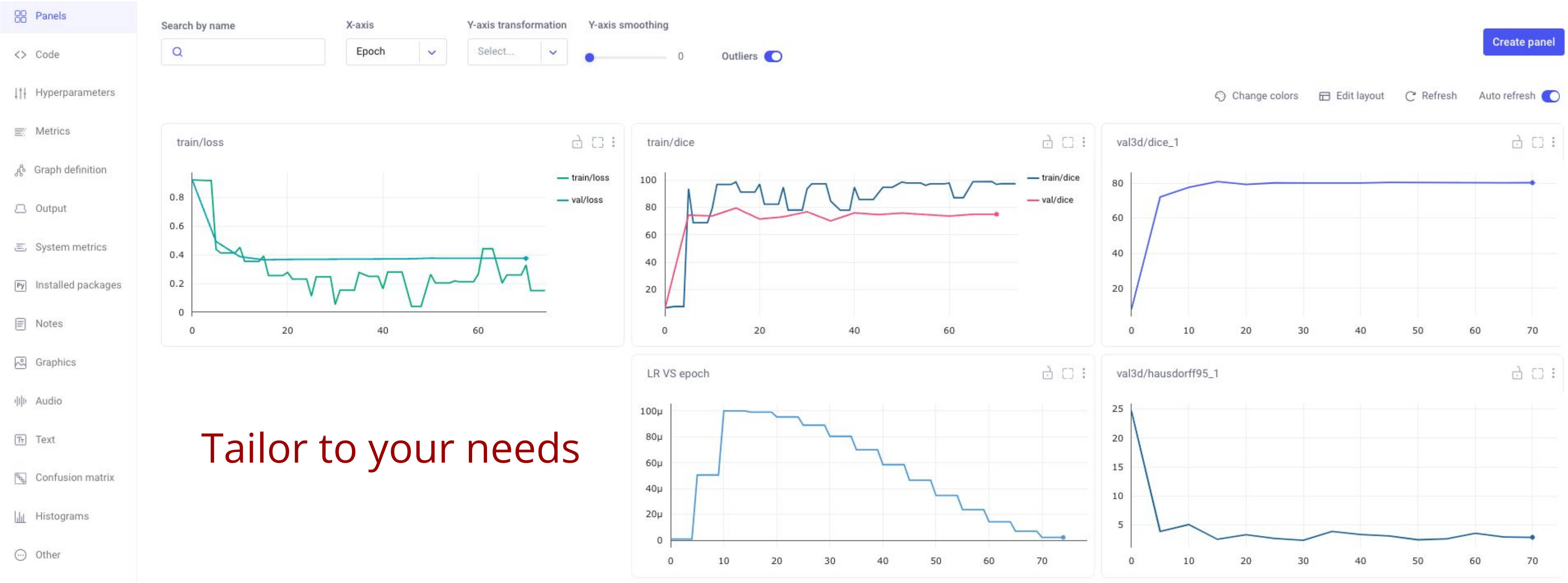


□ NAME	TAGS	SERVER END TIME	DURATION	CHECKPOINT_PATH	SAMPLING TIME (MIN)	TEST3D/DICE ↓	TEST3D/HAUSDORFF95	TEST/DICE
▸ setup: any5					0	0.066	0.004	0.063
▾ setup: any4					0	0.054	0.004	0.053
▾ initial_labeled_set: [5014,1065,800,4703,3568,2661,667,4142,3482,62					0.023	5.808	0.398	5.745
▸ num_indices: 90					0.301	77.067	3.21	76.465
▸ num_indices: 80					0.287	76.542	3.286	75.816
▾ num_indices: 70					0.286	76.295	3.429	74.736
□ ● hippocampus_initany_Entropy_SB_mean_noresampling10000		6/5/23 04:47 PM	00:48:28	/home/AR32500/Self...	0.12	81.86	2.622	78.272
□ ● hippocampus_initany_Dropout_SB_mean_noresampling10000		6/5/23 04:43 PM	00:49:44	/home/AR32500/Self...	0.38	81.716	2.803	78.518
□ ● hippocampus_initany_TTA_SB_mean_noresampling10000		6/6/23 02:40 PM	00:41:15	/home/AR32500/Self...	0.4	81.418	3.106	77.847

|< < Showing 1-12 ▾ of 12 > >|

Visualizing experiments in real time

Note: Loss is automatically logged



X-axis
Epoch

Y-axis transformation
Select...

Y-axis smoothing
0

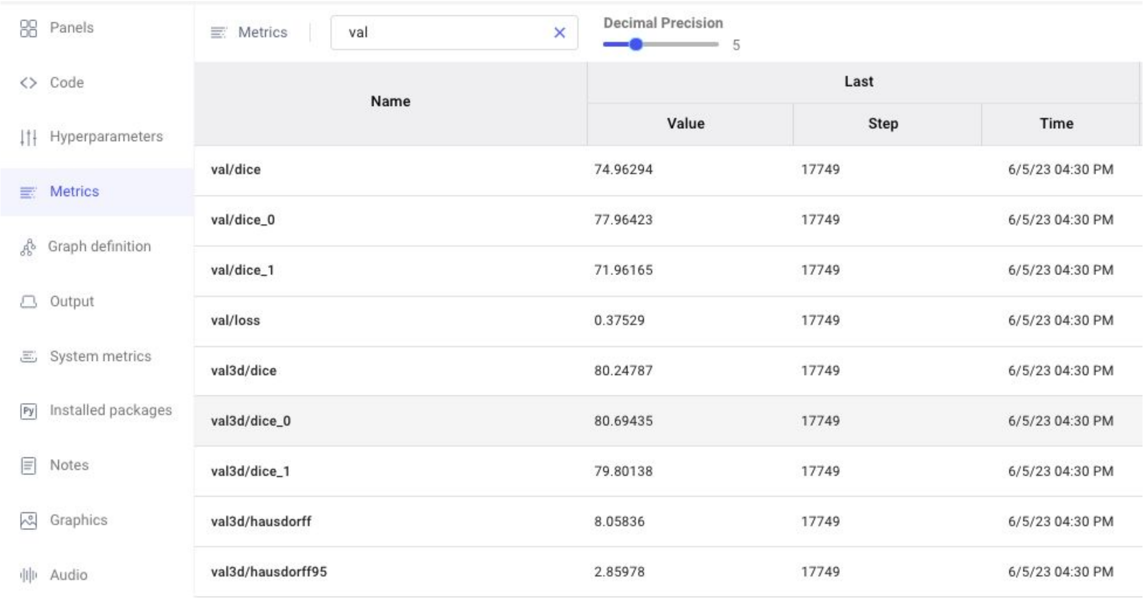
Outliers

Auto refresh

Tailor to your needs

Logging metrics

- `experiment.log_metric(‘metric_name’, metric, step=step)`
- `experiment.log_metrics(metrics_dict, prefix=’best’)`



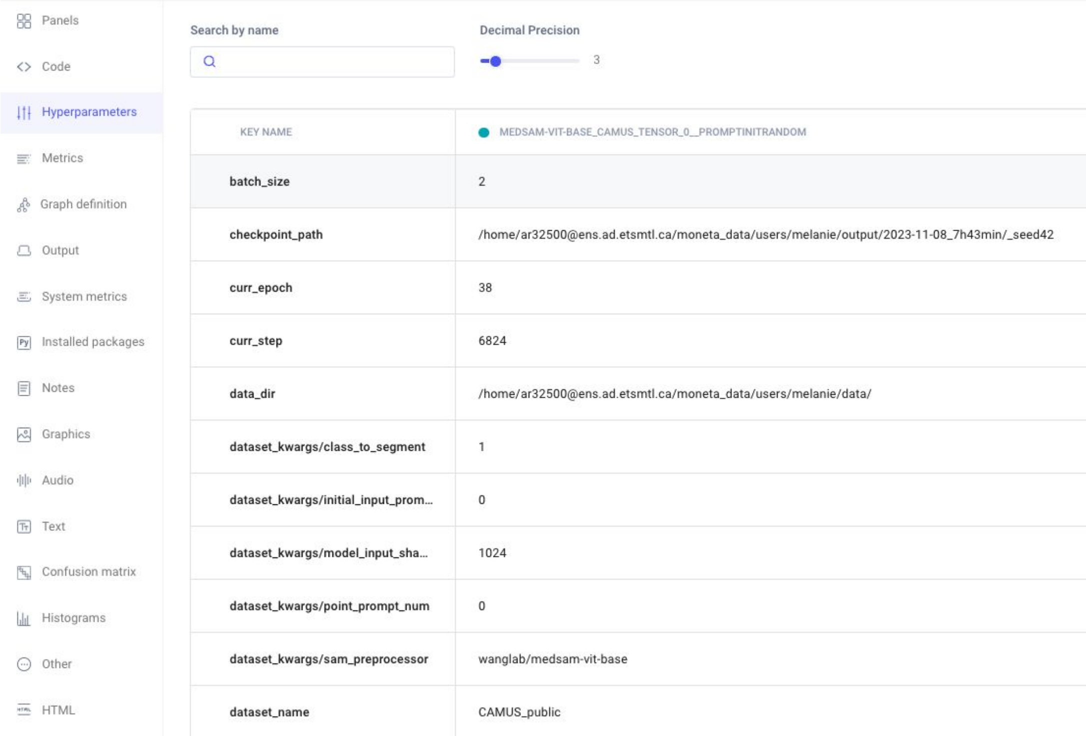
val

Decimal Precision 5

Name	Last		
	Value	Step	Time
val/dice	74.96294	17749	6/5/23 04:30 PM
val/dice_0	77.96423	17749	6/5/23 04:30 PM
val/dice_1	71.96165	17749	6/5/23 04:30 PM
val/loss	0.37529	17749	6/5/23 04:30 PM
val3d/dice	80.24787	17749	6/5/23 04:30 PM
val3d/dice_0	80.69435	17749	6/5/23 04:30 PM
val3d/dice_1	79.80138	17749	6/5/23 04:30 PM
val3d/hausdorff	8.05836	17749	6/5/23 04:30 PM
val3d/hausdorff95	2.85978	17749	6/5/23 04:30 PM

Logging hyperparameters

```
experiment.log_parameters({‘param_name’: value})
```



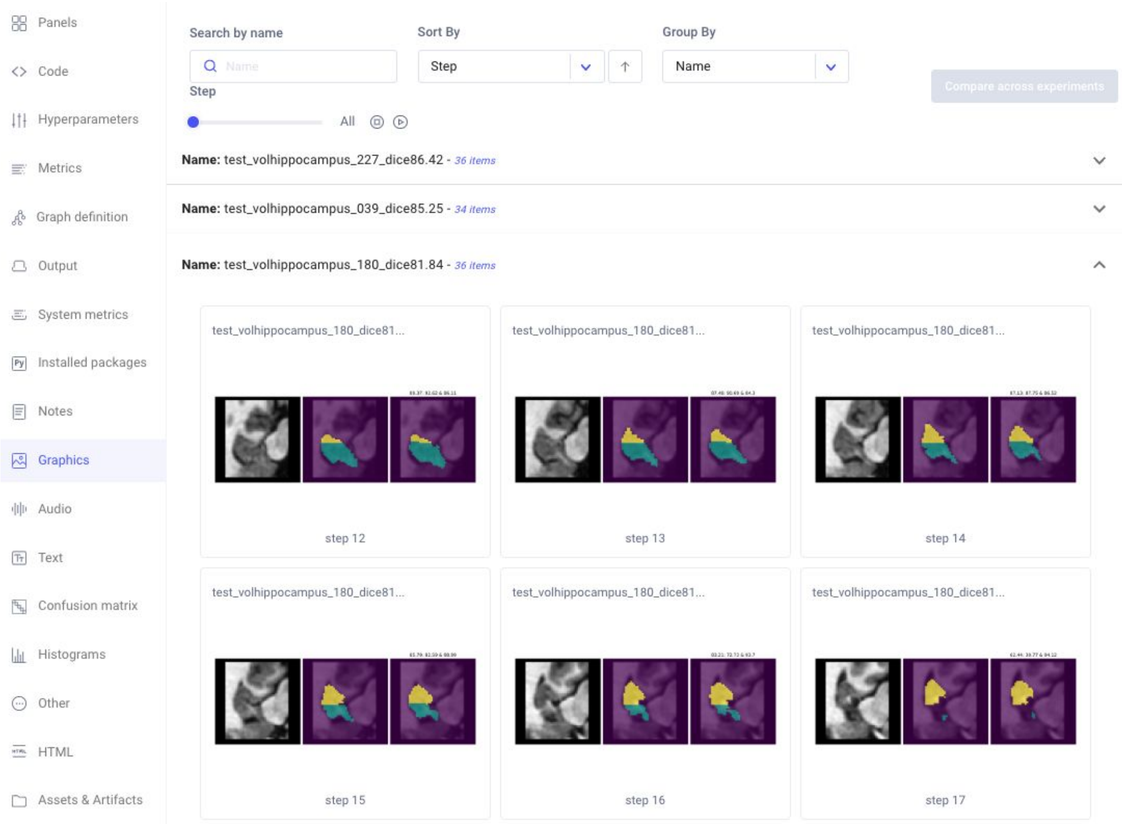
Search by name

Decimal Precision 3

KEY NAME	● MEDSAM-VIT-BASE_CAMUS_TENSOR_0__PROMPTINITRANDOM
batch_size	2
checkpoint_path	/home/ar32500@ens.ad.etsmtl.ca/moneta_data/users/melanie/output/2023-11-08_7h43min/_seed42
curr_epoch	38
curr_step	6824
data_dir	/home/ar32500@ens.ad.etsmtl.ca/moneta_data/users/melanie/data/
dataset_kwargs/class_to_segment	1
dataset_kwargs/initial_input_prom...	0
dataset_kwargs/model_input_sha...	1024
dataset_kwargs/point_prompt_num	0
dataset_kwargs/sam_preprocessor	wanglab/medsam-vit-base
dataset_name	CAMUS_public

Logging images

- `experiment.log_image( img, name='query_img', step=10)`
- `experiment.log_figure( figure=plt, figure_name=title, step=0)`



Search by name: Name

Sort By: Step

Group By: Name

Step

Name: test_volhippocampus_227_dice86.42 - *36 items*

Name: test_volhippocampus_039_dice85.25 - *34 items*

Name: test_volhippocampus_180_dice81.84 - *36 items*

test_volhippocampus_180_dice81... step 12

test_volhippocampus_180_dice81... step 13

test_volhippocampus_180_dice81... step 14

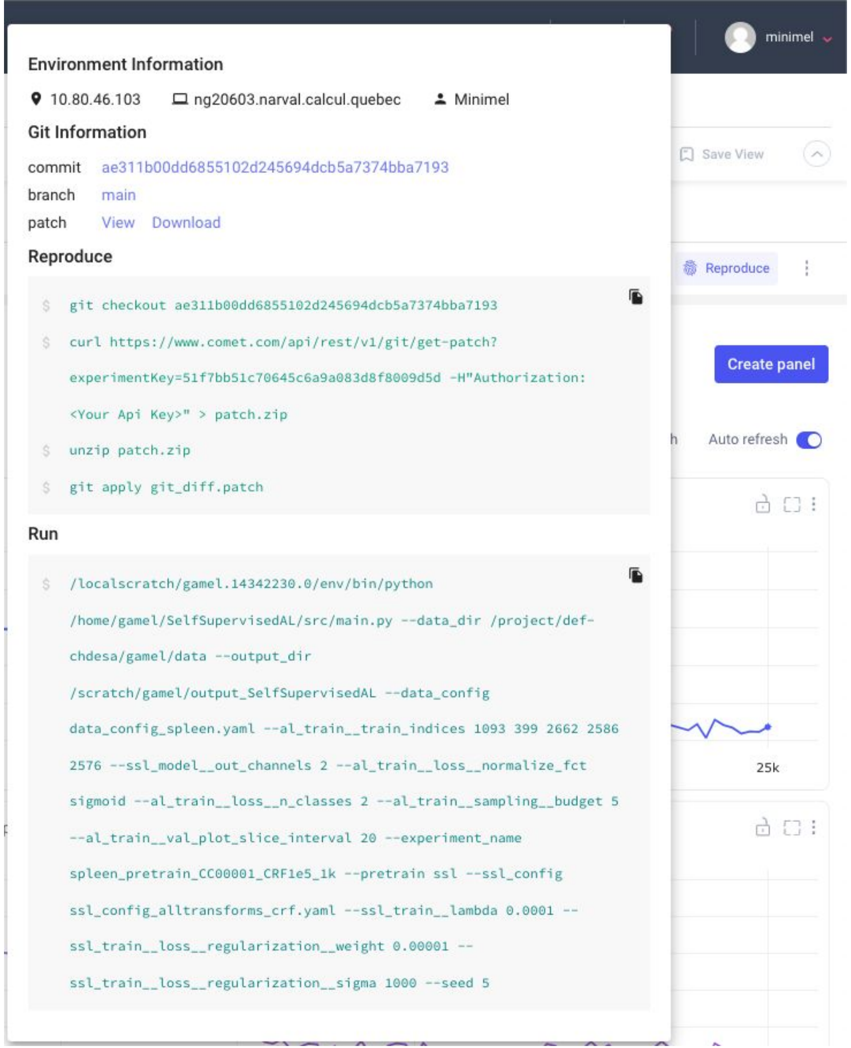
test_volhippocampus_180_dice81... step 15

test_volhippocampus_180_dice81... step 16

test_volhippocampus_180_dice81... step 17

Reproducibility

Find back code used to run experiment via git



Environment Information

10.80.46.103 ng20603.narval.calcul.quebec Minimel

Git Information

commit ae311b00dd6855102d245694dcb5a7374bba7193
branch main
patch View Download

Reproduce

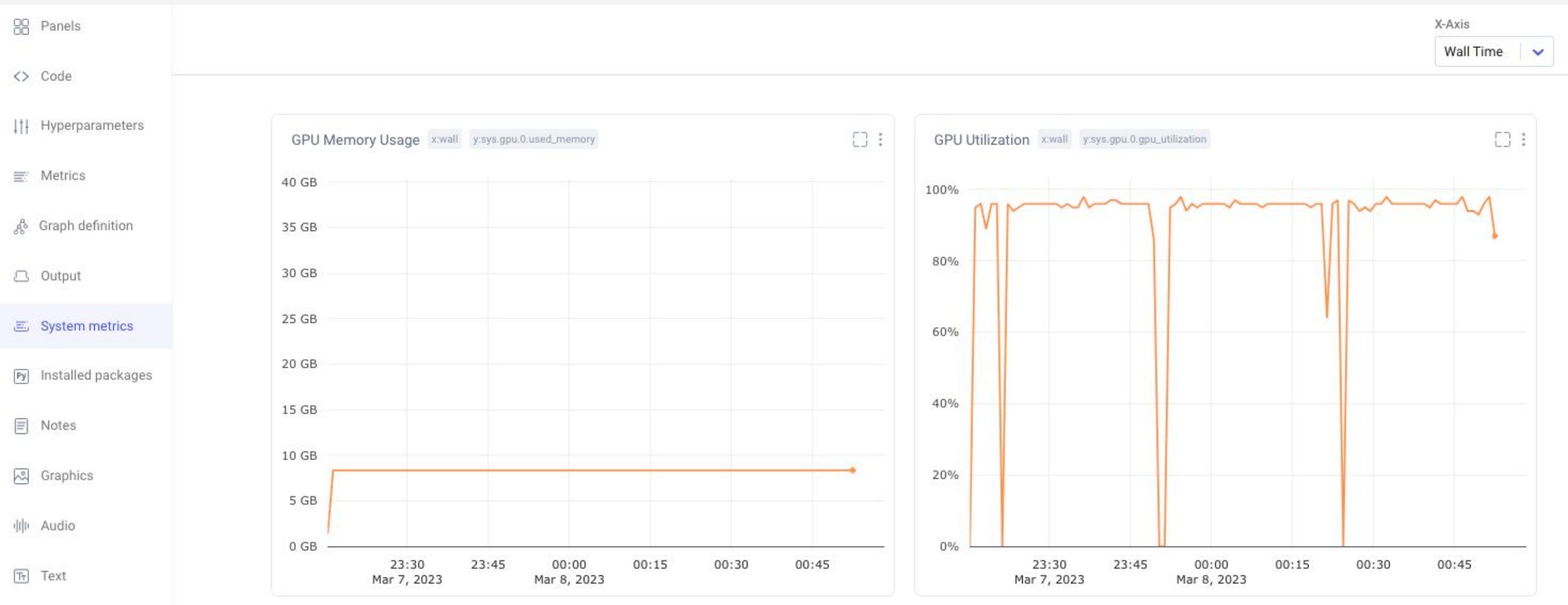
```
$ git checkout ae311b00dd6855102d245694dcb5a7374bba7193

$ curl https://www.comet.com/api/rest/v1/git/get-patch?
  experimentKey=51f7bb51c70645c6a9a083d8f8009d5d -H"Authorization:
  <Your Api Key>" > patch.zip

$ unzip patch.zip

$ git apply git_diff.patch
```

Run

```
$ /localscratch/gamel.14342230.0/env/bin/python
  /home/gamel/SelfSupervisedAL/src/main.py --data_dir /project/def-
  chdesa/gamel/data --output_dir
  /scratch/gamel/output_SelfSupervisedAL --data_config
  data_config_spleen.yaml --al_train__train_indices 1093 399 2662 2586
  2576 --ssl_model__out_channels 2 --al_train__loss__normalize_fct
  sigmoid --al_train__loss__n_classes 2 --al_train__sampling__budget 5
  --al_train__val_plot_slice_interval 20 --experiment_name
  spleen_pretrain_CC00001_CRF1e5_1k --pretrain ssl --ssl_config
  ssl_config_alltransforms_crf.yaml --ssl_train__lambda 0.0001 --
  ssl_train__loss__regularization__weight 0.00001 --
  ssl_train__loss__regularization__sigma 1000 --seed 5
```

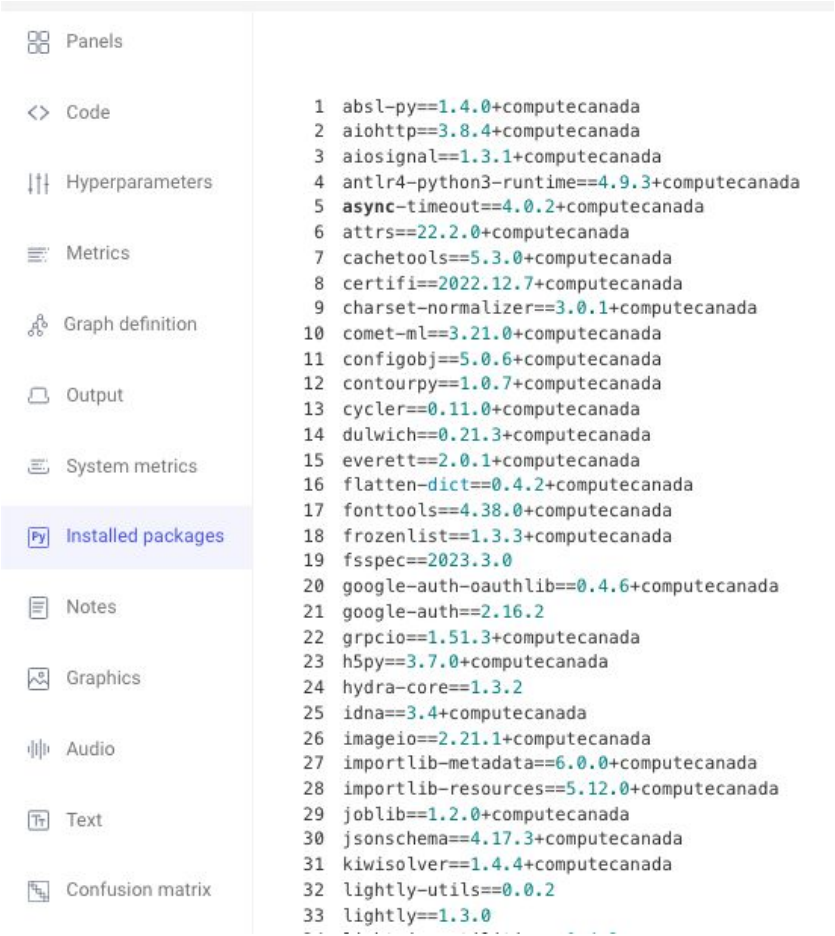
Information on GPU usage

→ Good to know for CC GPU runs



Information on environment & packages used

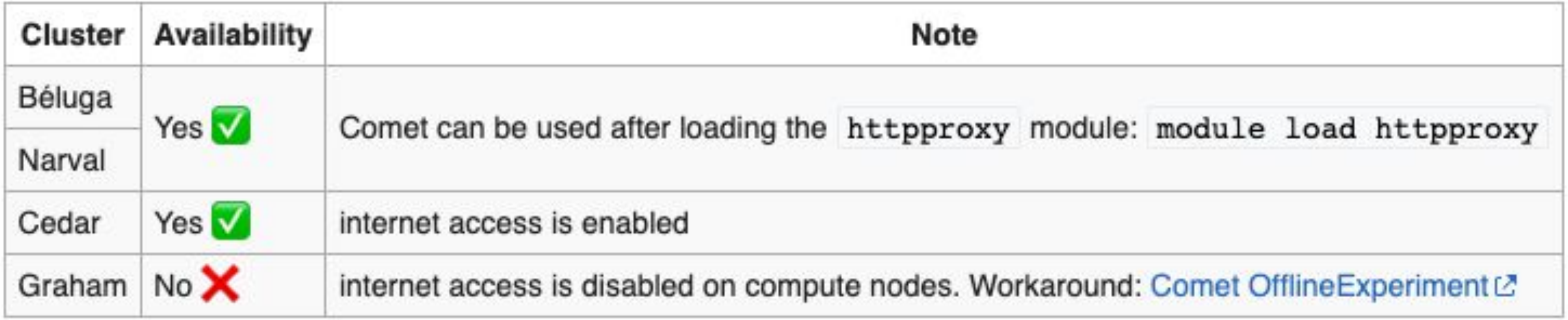
Downloadable .txt file



```
absl-py==1.4.0+computecanada
aiohttp==3.8.4+computecanada
aiosignal==1.3.1+computecanada
antlr4-python3-runtime==4.9.3+computecanada
async-timeout==4.0.2+computecanada
attrs==22.2.0+computecanada
cachetools==5.3.0+computecanada
certifi==2022.12.7+computecanada
charset-normalizer==3.0.1+computecanada
comet-ml==3.21.0+computecanada
configobj==5.0.6+computecanada
contourpy==1.0.7+computecanada
cycler==0.11.0+computecanada
dulwich==0.21.3+computecanada
everett==2.0.1+computecanada
flatten-dict==0.4.2+computecanada
fonttools==4.38.0+computecanada
frozenlist==1.3.3+computecanada
fsspec==2023.3.0
google-auth-oauthlib==0.4.6+computecanada
google-auth==2.16.2
grpcio==1.51.3+computecanada
h5py==3.7.0+computecanada
hydra-core==1.3.2
idna==3.4+computecanada
imageio==2.21.1+computecanada
importlib-metadata==6.0.0+computecanada
importlib-resources==5.12.0+computecanada
joblib==1.2.0+computecanada
jsonschema==4.17.3+computecanada
kiwisolver==1.4.4+computecanada
lightly-utils==0.0.2
lightly==1.3.0
```

Comet with Compute Canada

Easily usable with CC clusters:



Cluster	Availability	Note
Béluga	Yes ✅	Comet can be used after loading the `httpproxy` module: `module load httpproxy`
Narval		
Cedar	Yes ✅	internet access is enabled
Graham	No ❌	internet access is disabled on compute nodes. Workaround: Comet OfflineExperiment

OfflineExperiment → log experiment data locally (before uploading it online)

```
$ comet upload /path/to/*.zip
```

Many more features

- Dataset versioning
- Model registry
- Adding collaborators to the workspace
- Hyperparameter tuning with Comet’s Optimizer