

Auto-Tuning Tutorial

ACTS Seeding Algorithm

ROCKY BALA GARG
STANFORD UNIVERSITY

ACTS Developers Workshop, CERN
Sept 26th – 30th



Link to Auto-Tuning Scripts and documentation

- ✓ The auto-tuning scripts for Optuna and Orion for seeding algorithm:

[acts/Examples/Scripts/Optimization](#)

- ✓ The documentation explaining how to run these scripts:

[https://acts.readthedocs.io/en/latest/howto/run_ckf_auto_tuning.html](#)

Pre-requisites

```
$ source /cvmfs/sft.cern.ch/lcg/views/LCG_100/x86_64-centos7-gcc10-opt/setup.sh
$ python3 -m venv PYTHON_VIRTUAL_ENV
$ source PYTHON_VIRTUAL_ENV/bin/activate
$ export PYTHONPATH=
$ python -m pip install --upgrade pip
$ pip install -r acts/Examples/Python/tests/requirements.txt
$ pip install pytest --upgrade
$ pip install cmake dataclasses sphinxcontrib-applehelp sphinxcontrib-jsmath
  sphinxcontrib-serializinghtml argparse sphinxcontrib-devhelp sphinxcontrib-
  htmlhelp sphinxcontrib-qthelp AppDirs filelock joblib pandas plotly psutil
  pyYAML requests scipy tabulate cloudpickle scikit-learn orion==0.2.2
  cloudpickle==1.6.0 optuna matplotlib
```

Pre-requisites

Build ACTS with python bindings and pythia8 support:

```
$ cmake -DACTS_BUILD_EXAMPLES_PYTHIA8=ON -  
  DACTS_BUILD_PLUGIN_DD4HEP=OFF -DACTS_BUILD_PLUGIN_JSON=ON -  
  DACTS_BUILD_PLUGIN_TGEO=ON -DACTS_BUILD_EXAMPLES=ON -  
  DACTS_BUILD_EXAMPLES_DD4HEP=OFF -  
  DACTS_BUILD_EXAMPLES_GEANT4=ON -  
  DACTS_BUILD_INTEGRATIONTESTS=OFF -DACTS_BUILD_UNITTESTS=OFF -  
  DACTS_BUILD_EXAMPLES_PYTHON_BINDINGS=ON -  
  DACTS_BUILD_ODD=OFF -DCMAKE_BUILD_TYPE=Release -  
  DCMAKE_CXX_STANDARD=17 -S . -B build/
```

```
$ make
```

```
$ source build/python/setup.sh
```

Pre-requisites

Once ready, at each new login, just do:

```
$ source /cvmfs/sft.cern.ch/lcg/views/LCG_100/x86_64-centos7-gcc10-opt/setup.sh
```

```
$ source PYTHON_VIRTUAL_ENV/bin/activate
```

```
$ export PYTHONPATH=
```

```
$ source build/python/setup.sh
```

Orion vs Default

Number of trials = 100, $k = 5$

Tracking efficiency

Duplication rate

