Pythia on HPC

What is Pythia?

Pythia is a physics event generator used to simulate high-energy physics processes. It's a software tool used by particle physicists to generate simulated events that can be used to study and understand the behavior of particles and interactions in high-energy physics experiments. It incorporates a range of models and algorithms to simulate the interactions of subatomic particles in a wide range of physics processes, including those involving hadrons, leptons, and photons. The output of Pythia can be used in the analysis of experimental data and to test and validate theoretical models.

Links:

[Official Website](#)

[Documentation](#)

Versions Available:

The following versions are available on the cluster:

- Pythia 8

How to load Pythia?

To load Pythia, use the following commands:

```
#Load the Pythia module
module load physical/pythia/8.12
```

To verify if the module is loaded correctly, use the following command,

```
# List all the module loaded in the environment
module list
```

In a fresh environment, this should show only Pythia as loaded module.

How to use Pythia?

Pythia can be used as a library in a larger program, allowing you to incorporate its simulation capabilities into your own custom applications. To use Pythia as a library, you need to compile it as a library and then link it to your program.

Here is a sample test code,

```cpp
#include "Pythia8/Pythia.h"
#include <iostream>

int main() {
  // Initialize Pythia
  Pythia8::Pythia pythia;
  pythia.readString("Beams:eCM = 13000.");
  pythia.readString("HardQCD:all = on");
  pythia.init();

  // Generate events
  for (int iEvent = 0; iEvent < 5; ++iEvent) {
    if (!pythia.next()) break;
    std::cout << "Event " << iEvent << ": " << pythia.event.size() <<
" particles" << std::endl;
    for (int iParticle = 0; iParticle < pythia.event.size();
++iParticle) {
      std::cout << "  " << iParticle << ": id=" <<
pythia.event[iParticle].id()
                << ", pT=" << pythia.event[iParticle].pT()
                << ", eta=" << pythia.event[iParticle].eta()
                << ", phi=" << pythia.event[iParticle].phi() <<
std::endl;
    }
  }

  // Done
  pythia.stat();
```

```
    return 0;
}
```

Use the following slurm script to compile and execute,

```bash
#!/bin/bash
#SBATCH --partition=main
#SBATCH --qos main
#SBATCH --nodes=1
#SBATCH --ntasks-per-node=1
#SBATCH --time=00:30:00
#SBATCH --mem=2GB
#SBATCH --output=pythia_test.out

module load physical/pythia/8.12

g++ -o pythia_test pythia_test.cpp $(pythia8-config --cflags --libs)

./pythia_test
```

Submit to the scheduler,

```bash
# Submit the job
sbatch myscript.sbatch
```

Additional documentation is available on the software's official website.

Where to find help?

If you are confused or need help at any point, please contact OIT at the following address.

https://ua-app01.ua.edu/researchComputingPortal/public/oitHelp