Deep Learning - MAI

Introduction to cluster usage

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The basics

- One account per student
  - Access and credentials are private. *Illegal* to share.
  - You are responsible of your own account
  - All data will be lost after the semester
- BSC clusters downtimes will be notified through Raco
  - Deadlines will be adapted if appropriate

The clusters

- CTE-Power9: GPU compute clusters (“plogin1.bsc.es”)
  - Run jobs
- Data Transfer: Cluster for file management (“dt01.bsc.es”)
  - Upload/Download (scp) Copy (dtcp) files, Password change
- Manuals online (“user guide XXX”)
  - ssh for connecting
  - home dir: /home/nct01/nct01XXX
  - **Change you pass!** “passwd” in dt01

Software

- Many DL frameworks out there
  - Caffe2 (Berkeley), CNTK (Microsoft), MXNet (Apache), PyTorch (Facebook), TF (Google), PaddlePaddle (Baidu), Keras ….
- Use whatever you want. Examples will be provided in Keras
- P9 software cannot be changed or upgraded
  - Even containers (PowerPC)
  - PyTorch, TF, Keras available (careful, not the latest version)

Managing Software

- Software is organized in modules. *Load* to use.
  - module list: currently loaded modules
  - module avail: available modules
  - module purge: remove all modules
  - module load X: load module X
- Order matters!
- module python/3.7.4_ML
  - TF, PyTorch, Keras, SciKit, Numpy, …
  - Beware of dependencies

Running jobs

- Cluster jobs are enqueued and executed in order
  - Resources requested, time length, previous consumption
  - Do not wait until the last week for experimentation
  - Use infrequent times
- Launcher file should include (see user guide for more detail):
  - queue (see available with “bsc_queues”)
  - “training” (max 48h), “debug” (max 1h)

    #SBATCH --qos=debug

Launcher parameters

- Execution time (hard limit!)

  #SBATCH --time=HH:MM:SS

- Initial execution path

  #SBATCH --workdir=pathname

- Error & Log file (%j means jobId)

  #SBATCH --error=file_name_%j.err

  #SBATCH --output=file_name_%j.out

- Resources (40 CPUs per GPU!)

  #SBATCH --cpus-per-task=40 **#SBATCH --gres gpu:1**

Launcher sample

```
#!/bin/bash
#SBATCH --job-name=”test_job”
#SBATCH --qos=debug
#SBATCH --workdir=.
#SBATCH --output=test_job_%j.out
#SBATCH --error=test_job_%j.err
#SBATCH --cpus-per-task=40
#SBATCH --gres gpu:1
#SBATCH --time=00:02:00

module purge; module load gcc/8.3.0 ffmpeg/4.2.1 cuda/10.2 cudnn/7.6.4 nccl/2.4.8 tensorrt/6.0.1 openmpi/4.0.1 atlas/3.10.3 scalapack/2.0.2 fftw/3.3.8 szip/2.1.1 opencv/4.1.1 python/3.7.4_ML

python some_code.py
```

Managing jobs

- Launch job

  sbatch launcher_file

- Check status of jobs (the --start flag gives an estimate for entry time)

  squeue

- Kill a job

  scancel *jobId*

- Interactive jobs (1h limit)

  squeue (get jobId) **ssh id_node** (from within login node)

Before the first lab...

make sure you can run the following

Testing the environment

1. Download the MNIST dataset:

https://storage.hpai.bsc.es/dl-labs/mnist.npz?Content-Disposition=attachment%3B%20filename%3D%22mnist.npz%22&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=hpai-minio%2F20210927%2F%2Fs3%2Faws4_request&X-Amz-Date=20210927T131851Z&X-Amz-Expires=604800&X-Amz-SignedHeaders=host&X-Amz-Signature=7cfaf87a6b7ebeb2b149d29dfc8aa9294aa3fa2609cc4333ca072ddde44a6b27

this link will die in a week

Testing the environment

2. Upload it to the cluster:

scp mnist.npz nct01**XXX**@dt01.bsc.es:/home/nct01/nct01**XXX**/.keras/datasets/

you will need to create the .keras and datasets directories first!

3. Write or upload the code:

https://raw.githubusercontent.com/UPC-MAI-DL/UPC-MAI-DL.github.io/master/_codes/1.FNN-CNN/mnist_fnn_example.py

4. Submit job:

   sbatch launcher.sh

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