MNIST Classification Case Study using Advanced Computing Resources

1. Transfer the **mnist** files to any of the ARC clusters (**cedar**, **narval**, **beluga**, **graham**).

   On your computer, navigate to the **mnist** folder and open a terminal.
   Run the following command to transfer the files:

   ```
   scp -r mnist USER@whichCLUSTER.alliancecan.ca:~/scratch
   ```

   - Replace **USER** with your username
   - Replace **whichCLUSTER** with the name of one of the ARC clusters

2. Log in to the ARC cluster you selected before.

   ```
   ssh USER@whichCLUSTER.alliancecan.ca
   ```

   - Replace **USER** with your username
   - Replace **whichCLUSTER** with the name the ARC cluster you used.

3. Navigate to the scratch directory.

   ```
   cd scratch
   cd mnist
   ls
   ```

4. Edit the **submit_job.sh** script using **nano** (or any other editor)
   - Fill in your email
   - Fill in your user group (if you are part of multiple groups)

5. Submit the job script by running the command:

   ```
   sbatch submit_job.sh
   ```

   You may get an error about incorrect line endings. In this case, run the command:

   ```
   dos2unix submit_job.sh
   ```

   This will change the line endings to use Unix line endings.

6. Check the status of your job by running:

   ```
   sq
   ```

   - **PD** = pending
   - **R** = running

   Take note of your **`job ID`**, we will need this later to check the output.

7. Check the output of the job by running:

   ```
   cat slurm-XXXX.out
   ```

   where **XXXX** is your job ID.

8. Congratulations! You trained a neural network on a supercomputer!

If you have time, you can:

- Check out Globus, an alternative method for transferring files
  - https://docs.alliancecan.ca/wiki/Globus
- Explore different neural network architectures
  - https://pytorch.org/tutorials/beginner/basics/buildmodel_tutorial.html
- Explore more advanced AI and Big Data libraries such as
  - **Dask**
  - **Accelerate**
- Learn about **Mixed Precision Training** to speed up AI computations