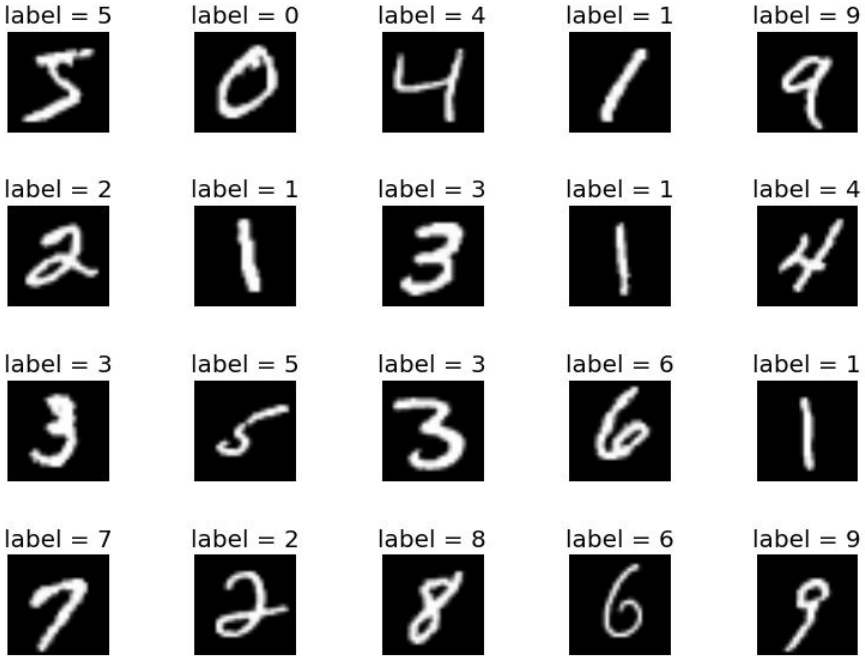
OpenACC
Lab3

Deep Neural Network(DNN)

- MNIST hand written digits classification Inference



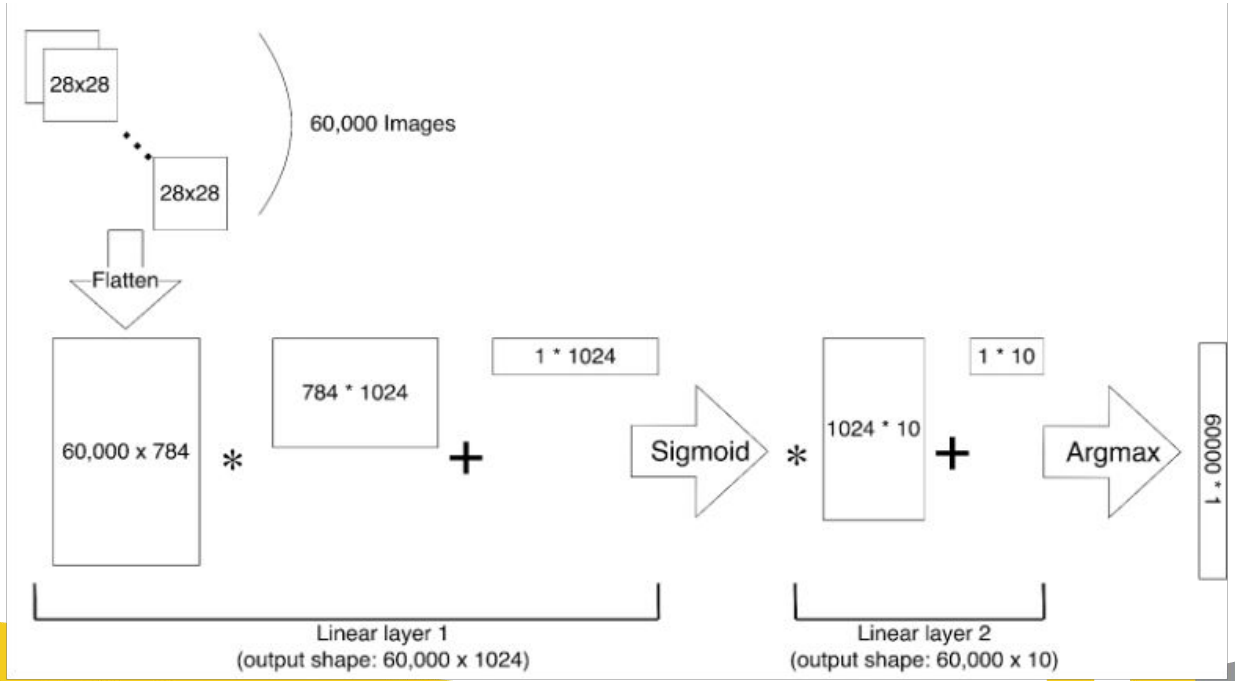
Deep Neural Network(DNN)

- Two fully-connected layer

```
simpleNN(
  (nn): Sequential(
    (0): Flatten(start_dim=1, end_dim=-1)
    (1): Linear(in_features=784, out_features=1024, bias=True)
    (2): Sigmoid()
    (3): Linear(in_features=1024, out_features=10, bias=True)
    (4): Softmax(dim=None)
  )
)
```

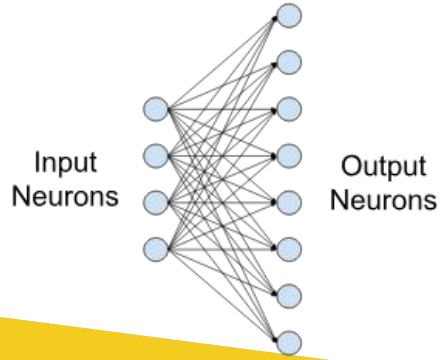
Deep Neural Network(DNN)

- Two fully-connected layer

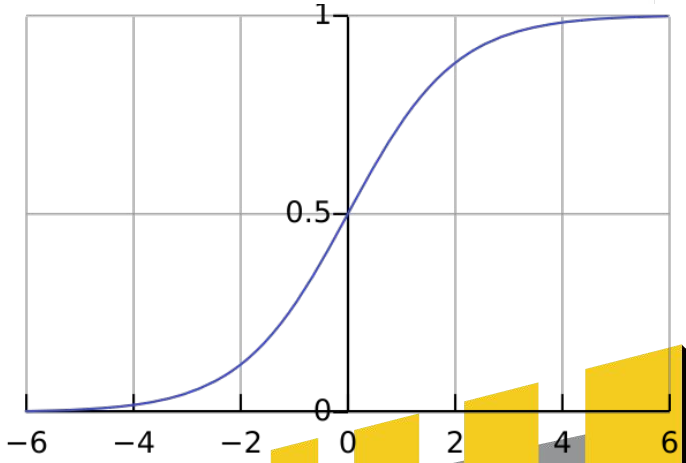


Deep Neural Network(DNN)

- Two fully-connected layer
  - First Linear Layer + Sigmoid Activation Function
  - Second Linear Layer + Argmax



$$\text{Sigmoid}(x) = \sigma(x) = \frac{1}{1 + \exp(-x)}$$



Task

- Given the sequential version of DNN code that runs on CPU.
- Try to parallel the matrix computation in the neural network.
- Using OpenACC
- The sequential code requires about 30~40 seconds

Task

- Provided files:
  - Sequential code
  - pretrained model weights(since the task is inference)
  - Makefile
- Please only modify the functions with TODO label.

Workflow

1. cp -r /home/pp24/share/lab-mnist ~/lab_mnist
2. cd ~/lab_mnist
3. module load nvhpc-nompi/24.9
4. Parallel the TODOs
5. compile the program : make
6. run the DNN program : srun --gres=gpu:1 ./mnist
7. judge: lab-mnist-judge
8. Scoreboard: mnist

Result

- Inference accuracy should be **97.8183%** (the parallelization should not affect the accuracy)

Result

```
Inference accuracy: 97.8183%

-----     STATS      -----
Time for initializing CUDA device:     473 m.s.
Time for reading MNIST data & weights: 375 m.s.
Time for inferencing                 : 366 m.s.
Time for calculating accuracy        : 7 m.s.
----- END OF STATS  -----
```

Judge Result

```
   MNIST  350.00   accepted
ExtMNIST 1395.00   accepted
```

Submission

Submit your code and Makefile (optional) to eeclass before 10/31 23:59

- mnist.cpp
- Makefile (Optional)