```
AION batch
                  97.46%
  IRIS batch
                 93.45%
                  71.88%
  IRIS
        gpu
  IRIS
        bigmem
                  70.98%
 Gitlab Issue #28 - SIU Network maintenance completed
  https://gitlab.com/uniluxembourg/hpc/support/infra/-/issues/28
  ULHPC live status: https://hpc.uni.lu/live-status/motd
Last login: Tue Nov 5 14:03:41 2024 from 83.99.11.129
(base) 0 [scui@access1 ~]$ cd ml_hpc
(base) 0 [scui@access1 ml_hpc]$ jupyter console
0.00s - Debugger warning: It seems that frozen modules are being used, which may
0.00s - make the debugger miss breakpoints. Please pass -Xfrozen_modules=off
0.00s - to python to disable frozen modules.
0.00s - Note: Debugging will proceed. Set PYDEVD_DISABLE_FILE_VALIDATION=1 to disable this validation.
0.00s - Debugger warning: It seems that frozen modules are being used, which may
0.00s - make the debugger miss breakpoints. Please pass -Xfrozen_modules=off
0.00s - to python to disable frozen modules.
0.00s - Note: Debugging will proceed. Set PYDEVD_DISABLE_FILE_VALIDATION=1 to disable this validation.
Jupyter console 6.6.3
Python 3.12.2 | packaged by Anaconda, Inc. | (main, Feb 27 2024, 17:35:02) [GCC 11.2.0]
Type 'copyright', 'credits' or 'license' for more information
IPython 8.20.0 -- An enhanced Interactive Python. Type '?' for help.
 n [1]: # from KNNClassifier import KNNClassifier
   ...: import numpy as np
...: from joblib import Parallel, delayed
 in [2]: # Example with random data
   ...: rows = 100000
     .: cols = 500
    ...: np.random.seed(699)
   ...: X_train = np.random.rand(rows * cols).reshape((rows, cols))
   ...: y_train = np.random.randint(2, size=rows)
    ...: print(f'X_train shape {X_train.shape} - y_train shape {y_train.shape}')
   ...: # Create random indices to test
    ...: test_size = 100
        X_test = np.random.randint(rows, size=test_size)
 _train_shape (100000, 500) - y_train_shape (100000,)
```

Version With Parallel Processing on HPC

```
Run 1: Correct Predictions = 743, Time = 25.2052 seconds
Run 2: Correct Predictions = 743, Time = 24.4197 seconds
Run 3: Correct Predictions = 743, Time = 24.3513 seconds
Run 4: Correct Predictions = 743, Time = 24.3775 seconds
Run 5: Correct Predictions = 743, Time = 24.5291 seconds
Run 6: Correct Predictions = 743, Time = 24.7461 seconds
Run 7: Correct Predictions = 743, Time = 24.6920 seconds
Run 7: Correct Predictions = 743, Time = 24.6920 seconds
Run 8: Correct Predictions = 743, Time = 24.6381 seconds
Run 9: Correct Predictions = 743, Time = 24.5881 seconds
Run 10: Correct Predictions = 743, Time = 24.5697 seconds
Run 11: Correct Predictions = 743, Time = 24.5257 seconds
Run 12: Correct Predictions = 743, Time = 24.5613 seconds
Run 13: Correct Predictions = 743, Time = 24.6120 seconds
Run 14: Correct Predictions = 743
Run 14: Correct Predictions = 743, Time = 24.7778 seconds
Run 15: Correct Predictions = 743, Time = 24.7406 seconds
Run 16: Correct Predictions = 743, Time = 24.6300 seconds
Run 17: Correct Predictions = 743, Time = 24.5915 seconds
Run 18: Correct Predictions = 743, Time = 24.5588 seconds
Run 19: Correct Predictions = 743, Time = 24.2201 seconds
Run 19: Correct Predictions = 743, Time = 24.2201 seconds
Run 20: Correct Predictions = 743, Time = 24.0001 seconds
Run 21: Correct Predictions = 743, Time = 24.4811 seconds
Run 22: Correct Predictions = 743, Time = 24.4979 seconds
Run 23: Correct Predictions = 743, Time = 23.9794 seconds
Run 24: Correct Predictions = 743, Time = 23.9733 seconds
Run 25: Correct Predictions = 743, Time = 23.8449 seconds
Run 26: Correct Predictions = 743, Time = 24.2664 seconds
Run 27: Correct Predictions = 743
Run 27: Correct Predictions = 743, Time = 24.0370 seconds
Run 28: Correct Predictions = 743, Time = 24.1283 seconds
Run 29: Correct Predictions = 743, Time = 24.2254 seconds
Run 30: Correct Predictions = 743, Time = 24.2535 seconds
Average Correct Predictions over 30 runs: 743.0
Total Execution Time over 30 runs: 733.0219 seconds
```

Version Without Parallel Processing on HPC

```
Starting run 30...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 5/6 completed in Run 30
Run 30: Correct Predictions = 743, Time = 627.3151 seconds
Average Correct Predictions over 30 runs: 743.0
Total Execution Time over 30 runs: 18687.8560 seconds
```

Below are the **detailed outcomes** for each iteration of KNN predictions (**Without Parallel Processing**).

```
Starting run 2...
Processed batch 1/5
Processed batch 2/5
Starting run 1...
Processed batch 1/5
Processed batch 2/5
                                                                                                                         Processed batch 3/5
Processed batch 3/5
                                                                                                                        Processed batch 4/5
Chunk 1/6 completed in Run 2
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 1/6 completed in Run 1
Processed batch 1/5
Processed batch 2/5
                                                                                                                        Processed batch
Processed batch 3/5
                                                                                                                       Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 2
Processed batch 1/5
Processed batch 2/5
^[[C^[[DProcessed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 2
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 1
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 1
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                        Processed batch 3/5
                                                                                                                        Processed batch 4/5
Chunk 4/6 completed in Run 2
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 4/6 completed in Run 1
Processed batch 1/5
Processed batch 2/5
                                                                                                                         Processed batch 3/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                        Processed batch 4/5
Chunk 5/6 completed in Run 2
Run 2: Correct Predictions = 743, Time = 621.9362 seconds
Chunk 5/6 completed in Run 1
Run 1: Correct Predictions = 743, Time = 619.9264 seconds
```

```
Starting run 4...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
 Starting run 3...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                          Processed batch 4/5
Chunk 1/6 completed in Run 3
Processed batch 1/5
Processed batch 2/5
                                                                                                          Chunk 1/6 completed in Run 4
Processed batch 1/5
Processed batch 2/5
Processed batch 2/5
Processed batch 4/5
Chunk 2/6 completed in Run 3
Processed batch 1/5
Processed batch 2/5
                                                                                                          Processed batch 2/5
Processed batch 4/5
Chunk 2/6 completed in Run 4
Processed batch 1/5
Processed batch 2/5
 Processed batch 3/5
Processed batch 4/5
                                                                                                          Processed batch 3/5
Processed batch 4/5
Processed batch 4/5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                          Chunk 3/6 completed in Run 4
                                                                                                          Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 3
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                          Processed batch 4/5
                                                                                                          Chunk 4/6 completed in Run 4
Processed batch 1/5
Processed batch 2/5
                                                                                                           Processed batch 3/5
 Processed batch 4/5
                                                                                                          Processed batch 4/5
Chunk 5/6 completed in Run 3

Chunk 5/6 completed in Run 4

Run 3: Correct Predictions = 743, Time = 620.6519 seconds

Run 4: Correct Predictions = 743, Time = 622.7364 seconds
                                                                                                         Starting run 6...
Processed batch 1/5
Processed batch 2/5
Starting run 5...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                         Processed batch 3/5
                                                                                                         Processed batch 4/5
 Processed batch 4/5
                                                                                                         Chunk 1/6 completed in Run 6
Processed batch 1/5
Chunk 1/6 completed in Run 5
Processed batch 1/5
Processed batch 2/5
                                                                                                         Processed batch 2/5
                                                                                                         Processed batch 3/5
 Processed batch 3/5
                                                                                                         Processed batch 4/5
Processed batch 4/5
Chunk 2/6 completed in Run 5
Processed batch 1/5
                                                                                                         Chunk 2/6 completed in Run 6
Processed batch 1/5
Processed batch 2/5
Processed batch 2/5
                                                                                                         Processed batch 3/5
Processed batch 3/5
 Processed batch 4/5
                                                                                                         Processed batch 4/5
Chunk 3/6 completed in Run 5
Processed batch 1/5
Processed batch 2/5
                                                                                                         Chunk 3/6 completed in Run 6
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                         Processed batch 3/5
                                                                                                         Processed batch 4/5
Chunk 4/6 completed in Run 6
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 4/6 completed in Run 5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                         Processed batch 3/5
Processed batch 4/5
Chunk 5/6 completed in Run 5
Run 5: Correct Predictions = 743, Time = 623.1817 seconds
Run 6: Correct Predictions = 743, Time = 621.1811 seconds
                                                                                                       Starting run 8...
Processed batch 1/5
Starting run 7...
Processed batch 1/5
Processed batch 2/5
                                                                                                        Processed batch 2/5
 Processed batch 3/5
                                                                                                       Processed batch 3/5
                                                                                                        Processed batch 4/5
Processed batch 4/5
Chunk 1/6 completed in Run 7
Processed batch 1/5
                                                                                                        Chunk 1/6 completed in Run 8
                                                                                                        Processed batch 1/5
                                                                                                        Processed batch 2/5
Processed batch 2/5
                                                                                                        Processed batch 3/5
Processed batch 3/5
                                                                                                        Processed batch 4/5
 Processed batch 4/5
Chunk 2/6 completed in Run 7
Processed batch 1/5
                                                                                                       Chunk 2/6 completed in Run 8
Processed batch 1/5
Processed batch 2/5
 Processed batch 2/5
                                                                                                       Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 8
 Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 7
Processed batch 1/5
Processed batch 2/5
                                                                                                       Processed batch 1/5
Processed batch 2/5
                                                                                                       Processed batch 3/5
Processed batch 4/5
Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 7
Processed batch 1/5
Processed batch 2/5
                                                                                                        Chunk 4/6 completed in Run 8
                                                                                                       Processed batch 1/5
Processed batch 2/5
                                                                                                        Processed batch 3/5
 Processed batch 3/5
Processed batch 4/5
Processed batch 4/5
Chunk 5/6 completed in Run 7
Chunk 5/6 completed in Run 8
Run 7: Correct Predictions = 743, Time = 628.5884 seconds Run 8: Correct Predictions = 743, Time = 621.6760 seconds
```

```
Processed batch 1/5
                                                                                                                             Processed batch 1/5
Processed batch 2/5
 Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                              Processed batch 3/5
                                                                                                                             Processed batch 4/5
Chunk 1/6 completed in Run 10
Processed batch 1/5
Chunk 1/6 completed in Run 9
Processed batch 1/5
Processed batch 2/5
                                                                                                                             Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
 Processed batch 3/5
Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 9
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                             Chunk 2/6 completed in Run 10
Processed batch 1/5
Processed batch 2/5
                                                                                                                             Processed batch 3/5
Processed batch 4/5
                                                                                                                             Chunk 3/6 completed in Run 10
Processed batch 1/5
Processed batch 2/5
Chunk 3/6 completed in Run 9
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                              Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 9
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                             Processed batch 4/5
Chunk 4/6 completed in Run 10
Processed batch 1/5
                                                                                                                              Processed batch 2/5
                                                                                                                              Processed batch 3/5
 Processed batch 4/5
                                                                                                                              Processed batch 4/5
Chunk 5/6 completed in Run 9

Chunk 5/6 completed in Run 10

Run 9: Correct Predictions = 743, Time = 622.3218 seconds

Run 10: Correct Predictions = 743, Time = 622.8520 seconds
                                                                                                                               Starting run 12...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Starting run 11...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                               Processed batch 4/5
Chunk 1/6 completed in Run 12
Processed batch 1/5
Processed batch 2/5
Chunk 1/6 completed in Run 11
Processed batch 1/5
Processed batch 2/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 11
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                               Processed batch 3/5
Processed batch 4/5
                                                                                                                                Chunk 2/6 completed in Run 12
                                                                                                                               Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
 Processed batch 4/5
                                                                                                                                Processed batch 4/5
Chunk 3/6 completed in Run 11
Processed batch 1/5
Processed batch 2/5
                                                                                                                                Chunk 3/6 completed in Run 12
                                                                                                                                Processed batch 1/5
                                                                                                                                Processed batch 2/5
Processed batch 2/5
Processed batch 4/5
Chunk 4/6 completed in Run 11
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                                Processed batch 3/5
                                                                                                                               Processed batch 4/5
Chunk 4/6 completed in Run 12
Processed batch 1/5
Processed batch 2/5
                                                                                                                                Processed batch 3/5
  Processed batch 4/5
                                                                                                                                Processed batch 4/5
Chunk 5/6 completed in Run 11 Chunk 5/6 completed in Run 12
Run 11: Correct Predictions = 743, Time = 624.5161 seconds Run 12: Correct Predictions = 743, Time = 625.0209 seconds
                                                                                                                                Starting run 14...
Processed batch 1/5
Processed batch 2/5
Starting run 13...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                                Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 14
Chunk 1/6 completed in Run 13
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                                Processed batch 1/5
Processed batch 2/5
                                                                                                                                Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 14
Chunk 2/6 completed in Run 13
Processed batch 1/5
Processed batch 2/5
                                                                                                                                 Processed batch 1/5
                                                                                                                                Processed batch 2/5
                                                                                                                                Processed batch 3/5
Processed batch 4/5
Processed batch 3/5
Processed batch 4/5
                                                                                                                                Chunk 3/6 completed in Run 14
Chunk 3/6 completed in Run 13
Processed batch 1/5
Processed batch 2/5
                                                                                                                               Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 13
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                                Chunk 4/6 completed in Run 14
                                                                                                                                Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
 Processed batch 4/5
                                                                                                                                Processed batch 4/5
```

Chunk 5/6 completed in Run 14

Run 13: Correct Predictions = 743, Time = 624.3044 seconds Run 14: Correct Predictions = 743, Time = 624.1924 seconds

Chunk 5/6 completed in Run 13

```
Starting run 15...
Processed batch 1/5
Processed batch 2/5
                                                                                                     Starting run 16
                                                                                                    Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 15
Processed batch 1/5
Processed batch 2/5
                                                                                                    Chunk 1/6 completed in Run 16
Processed batch 1/5
Processed batch 2/5
                                                                                                    Processed batch 2/5
Processed batch 4/5
Chunk 2/6 completed in Run 16
Processed batch 1/5
Processed batch 2/5
 Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 15
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                    Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 15
                                                                                                    Chunk 3/6 completed in Run 16
                                                                                                    Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                    Processed batch 4/5
Chunk 4/6 completed in Run 15
Processed batch 1/5
Processed batch 2/5
                                                                                                    Chunk 4/6 completed in Run 16
Processed batch 1/5
Processed batch 2/5
 Processed batch 3/5
                                                                                                     Processed batch 3/5
Processed batch 4/5
Chunk 5/6 completed in Run 15
Run 15: Correct Predictions = 743, Time = 623.2131 seconds
Run 16: Correct Predictions = 743, Time = 623.9377 seconds
Starting run 17...
Processed batch 1/5
                                                                                                     Starting run 18...
Processed batch 1/5
Processed batch 2/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                     Processed batch 3/5
                                                                                                     Processed batch 4/5
Chunk 1/6 completed in Run 17
                                                                                                     Chunk 1/6 completed in Run 18
                                                                                                     Processed batch 1/5
Processed batch 2/5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                     Processed batch 3/5
Processed batch 4/5
Processed batch 4/5
Chunk 2/6 completed in Run 17
                                                                                                     Chunk 2/6 completed in Run 18
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                     Processed batch 1/5
Processed batch 2/5
                                                                                                     Processed batch 3/5
Processed batch 4/5
                                                                                                     Processed batch 4/5
Processed batch 4/5
Chunk 3/6 completed in Run 17
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                     Chunk 3/6 completed in Run 18
                                                                                                     Processed batch 1/5
Processed batch 2/5
                                                                                                     Processed batch 3/5
Processed batch 4/5
                                                                                                     Processed batch 4/5
Chunk 4/6 completed in Run 17
Processed batch 1/5
Processed batch 2/5
                                                                                                     Chunk 4/6 completed in Run 18
                                                                                                     Processed batch 1/5
Processed batch 2/5
 Processed batch 3/5
                                                                                                     Processed batch 3/5
Processed batch 4/5
                                                                                                     Processed batch 4/5
Chunk 5/6 completed in Run 17

Chunk 5/6 completed in Run 18

Run 17: Correct Predictions = 743, Time = 622.8844 seconds Run 18: Correct Predictions = 743, Time = 624.7317 seconds
Starting run 19...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                     Starting run 20...
Processed batch 1/5
Processed batch 2/5
                                                                                                      Processed batch 3/5
 Processed batch 4/5
                                                                                                      Processed batch 4/5
Chunk 1/6 completed in Run 19
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                      Chunk 1/6 completed in Run 20
                                                                                                      Processed batch 1/5
Processed batch 2/5
                                                                                                      Processed batch 3/5
 Processed batch 4/5
                                                                                                      Processed batch 4/5
Chunk 2/6 completed in Run 19
Processed batch 1/5
Processed batch 2/5
                                                                                                      Chunk 2/6 completed in Run 20
Processed batch 1/5
Processed batch 2/5
 Processed batch 3/5
                                                                                                      Processed batch
                                                                                                                                 3/5
 Processed batch 4/5
                                                                                                      Processed batch 4/5
Chunk 3/6 completed in Run 19
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                      Chunk 3/6 completed in Run 20
Processed batch 1/5
Processed batch 2/5
                                                                                                      Processed batch
Processed batch 4/5
                                                                                                      Processed batch 4/5
                                                                                                      Chunk 4/6 completed in Run 20
Processed batch 1/5
Processed batch 2/5
Chunk 4/6 completed in Run 19
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                      Processed batch 3/5
                                                                                                      Processed batch 4/5
Processed batch 4/5
Chunk 5/6 completed in Run 19

Chunk 5/6 completed in Run 20

Run 19: Correct Predictions = 743, Time = 622.4388 seconds Run 20: Correct Predictions = 743, Time = 624.1565 seconds
```

```
Starting run 21...
Processed batch 1/5
                                                                                   Starting run 22...
Processed batch 1/5
 Processed batch 2/5
                                                                                   Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 21
                                                                                   Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 22
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 1/5
                                                                                   Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 21
                                                                                   Chunk 2/6 completed in Run 22
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 22
Processed batch 3/5
Processed batch 4/5
Chunk 3/6 completed in Run 21
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 1/5
                                                                                   Processed batch 2/5
                                                                                   Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 22
Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 21
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 1/5
Processed batch 2/5
                                                                                  Processed batch 3/5
Processed batch 4/5
Processed batch 3/5
Processed batch 4/5
Chunk 5/6 completed in Run 21
                                                                                   Chunk 5/6 completed in Run 22
Run 21: Correct Predictions = 743, Time = 622.8064 seconds Run 22: Correct Predictions = 743, Time = 621.9014 seconds
Starting run 23...
Processed batch 1/5
Processed batch 2/5
                                                                                   Starting run 24...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 3/5
                                                                                   Processed batch 4/5
                                                                                   Chunk 1/6 completed in Run 24
Chunk 1/6 completed in Run 23
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 3/5
                                                                                   Processed batch 4/5
Chunk 2/6 completed in Run 23
                                                                                   Chunk 2/6 completed in Run 24
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 3/5
Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 4/5
                                                                                   Chunk 3/6 completed in Run 24
Processed batch 1/5
Processed batch 2/5
Chunk 3/6 completed in Run 23
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 3/5
Processed batch 3/5
                                                                                   Processed batch 4/5
Processed batch 4/5
                                                                                   Chunk 4/6 completed in Run 24
Processed batch 1/5
Processed batch 2/5
Chunk 4/6 completed in Run 23
Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 3/5
Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 4/5
Chunk 5/6 completed in Run 23

Chunk 5/6 completed in Run 24

Run 23: Correct Predictions = 743, Time = 621.0513 seconds Run 24: Correct Predictions = 743, Time = 621.6864 seconds
Starting run 25...
Processed batch 1/5
Processed batch 2/5
                                                                                   Starting run 26...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                   Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 26
Processed batch 4/5
Chunk 1/6 completed in Run 25
Processed batch 1/5
                                                                                   Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 2/5
Processed batch
                                                                                   Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 26
Processed batch 4/5
Chunk 2/6 completed in Run 25
Processed batch 1/5
                                                                                   Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 2/5
Processed batch
                                                                                   Processed batch 3/5
Processed batch 4/5
Processed batch 4/5
Chunk 3/6 completed in Run 25
                                                                                   Chunk 3/6 completed in Run 26
Processed batch 1/5
                                                                                   Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                   Processed batch 2/5
                                                                                   Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 4/5
Chunk 4/6 completed in Run 25
                                                                                   Chunk 4/6 completed in Run 26
Processed batch 1/5
                                                                                   Processed batch 1/5
Processed batch 2/5
                                                                                   Processed batch 2/5
Processed batch 3/5
                                                                                   Processed batch 3/5
Processed batch 4/5
                                                                                   Processed batch 4/5
Chunk 5/6 completed in Run 25
                                                                                   Chunk 5/6 completed in Run 26
Run 25: Correct Predictions = 743, Time = 622.4911 seconds Run 26: Correct Predictions = 743, Time = 621.6343 seconds
```

```
Starting run 27...
Processed batch 1/5
Processed batch 2/5
                                                                                                 Starting run 28...
Processed batch 1/5
                                                                                                 Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                 Processed batch 3/5
Processed batch 4/5
Chunk 1/6 completed in Run 27
                                                                                                 Chunk 1/6 completed in Run 28
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 2/6 completed in Run 27
                                                                                                 Chunk 2/6 completed in Run 28
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
                                                                                                 Processed batch 4/5
Chunk 3/6 completed in Run 27
                                                                                                 Chunk 3/6 completed in Run 28
Processed batch 1/5
Processed batch 1/5
Processed batch 2/5
                                                                                                 Processed batch 2/5
Processed batch 3/5
Processed batch 4/5
Chunk 4/6 completed in Run 27
                                                                                                 Processed batch 3/5
                                                                                                 Processed batch 4/5
                                                                                                 Chunk 4/6 completed in Run 28
Processed batch 1/5
Processed batch 2/5
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                 Processed batch 3/5
Processed batch 4/5
                                                                                                 Processed batch 4/5
Chunk 5/6 completed in Run 27
                                                                                                 Chunk 5/6 completed in Run 28
Run 28: Correct Predictions = 743, Time = 618.6766 seconds
Run 27: Correct Predictions = 743, Time = 623.4657 seconds
                                                                                                Processed batch 1/5
Processed batch 2/5
```

```
Starting run 29...
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                     Processed batch 3/5
                                                                                                                     Processed batch 4/5
                                                                                                                     Chunk 1/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 1/6 completed in Run 29
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                     Processed batch 3/5
                                                                                                                     Processed batch 4/5
                                                                                                                    Chunk 2/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 2/6 completed in Run 29
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                    Processed batch 3/5
Processed batch 4/5
                                                                                                                    Chunk 3/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 3/6 completed in Run 29
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                     Processed batch 3/5
                                                                                                                     Processed batch 4/5
                                                                                                                    Chunk 4/6 completed in Run 30
Processed batch 1/5
Processed batch 2/5
Processed batch 4/5
Chunk 4/6 completed in Run 29
Processed batch 1/5
Processed batch 2/5
Processed batch 3/5
                                                                                                                     Processed batch 3/5
                                                                                                                     Processed batch 4/5
                                                                                                                    Chunk 5/6 completed in Run 30
Run 30: Correct Predictions = 743, Time = 627.3151 seconds
Processed batch 4/5
Chunk 5/6 completed in Run 29

Average Correct Predictions over 30 runs: 743.0

Run 29: Correct Predictions = 743, Time = 622.3800 seconds

Total Execution Time over 30 runs: 18687.8560 seconds
```