Assignment 4

Parallel sorting

Assignment 4: Implement a parallel sorting method

- Your assignment is to modify *mergeSort* so that each partition is sorted in parallel.
- In order to do that, you will have to learn about programming asynchronous function calls in Java8.
- So, you will need to create two classes: *Main.java* and *ParSort.java*.
- You will run experiments using different parallelizing strategies: involving cutoff and number of threads. Please see the instructions on Blackboard for more detail on this.
- I will give you a sample *Main.java*:

Assignment 4: Main.java (sample)

- ```
  package edu.neu.coe.info6205;

  import java.util.Random;

  public class Main {

      public static void main(String[] args) {
          if (args.length>0) ParSort.cutoff = Integer.parseInt(args[0]);
          Random random = new Random(0L);
            int[] array = new int[2000];
            for (int i = 0; i < array.length; i++) array[i] = random.nextInt(10000);
            ParSort.sort(array, 0, array.length);
          if (array[0]==11) System.out.println("Success!");
      }
  }
  ```
  ```

Assignment 4: *CompletableFuture*

- Creating a *CompletableFuture* that returns a result (template):

```
CompletableFuture.supplyAsync(
        () -> {
                int size = …
                int[] result = new int[size];
                // get the values for result
                return result;
        }
);
```

Assignment 4: composing *CompletableFutures*

- Composing two *CompletableFutures* (cf1 and cf2) into one (template):

```
cf1.thenCombine(cf2, (xs1, xs2) -> {
            int[] result = new int[xs1.length + xs2.length];
            // set up result
            return result;
        });
```

Assignment 4: waiting for *CompletableFutures*

- Waiting for a *CompletableFuture* that returns a result (template):

```
cf.whenComplete((result, throwable) -> // do something with result
cf.join();
```

Assignment 4: Sample *ParSort.java* (template)

```
package edu.neu.coe.info6205;

import java.util.concurrent.CompletableFuture;

class ParSort {
    public static int cutoff = 1000;
    public static void sort(int[] array, int from, int to) {
        int size = from - to + 1;
        if (size < cutoff) Arrays.sort(array, from, to);
        else {
            CompletableFuture<int[]> cf1 = …

            CompletableFuture<int[]> cf2 = …

            CompletableFuture<int[]> cf= cf1.
                    thenCombine(cf2, (xs1, xs2) -> {…});

            cf.whenComplete((result, throwable) -> …);
        }
    }
}
```