# INFO 6205-PROGRAM STRUCTURE AND ALGORITHMS
# ASSIGNMENT-4

**Sai Kashyap Cheruku**
**NU-ID- 002756849**

**Task:**
A Weighted Union Find with Path Compression API is expected to be implemented, and run unit tests to verify the performance of created class. Implement the class in a client class and obtain the number of connections created for a given number of nodes.

**Relationship Conclusion:**

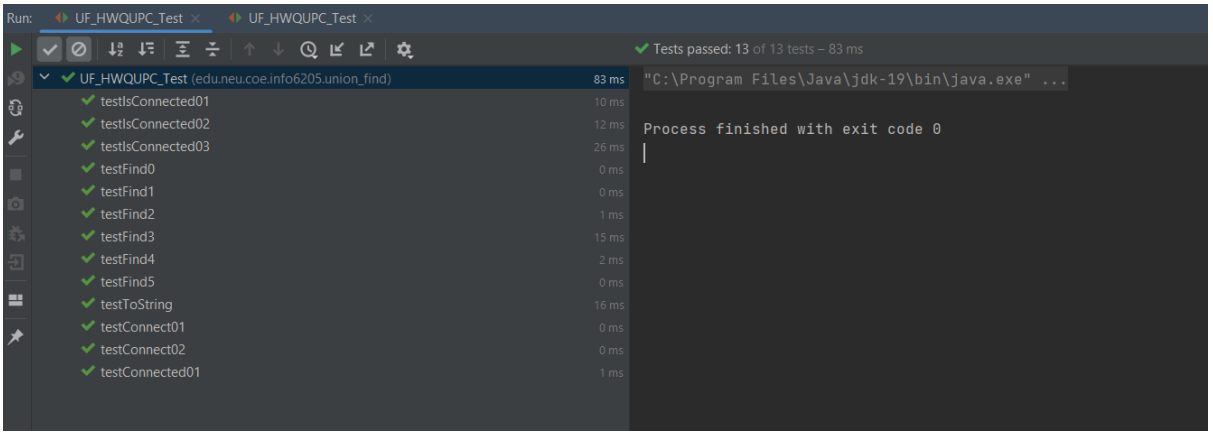
The relationship between the number of nodes and the number of pairs needed to form a single fully connected component depends on the number of successful union operations and the order in which the operations are performed. The ideal number of operations needed to form such a connection would be (n-1) operations,where n is the number of nodes/sites.
After setting condition of the  parent of each node pointing to a single element as the criterion for a fully connected component, a series of sample inputs are given and the number of connections are calculated as given as the output, which are the total number of successful union operations performed on the nodes.

**Evidence:**

```
"C:\Program Files\Java\jdk-19\bin\java.exe" ...
100 connections are being created to form a single fully connected component from 100 sites
639 connections are being created to form a single fully connected component from 500 sites
6848 connections are being created to form a single fully connected component from 2500 sites
39770 connections are being created to form a single fully connected component from 12500 sites
239420 connections are being created to form a single fully connected component from 62500 sites

Process finished with exit code 0
```

**Unit Tests:**


Run:
UF_HWQUPC_Test
UF_HWQUPC_Test
Tests passed: 13 of 13 tests – 83 ms
UF_HWQUPC_Test (edu.neu.coe.info6205.union_find) 83 ms
testIsConnected01 10 ms
testIsConnected02 12 ms
testIsConnected03 26 ms
testFind0 0 ms
testFind1 0 ms
testFind2 1 ms
testFind3 15 ms
testFind4 2 ms
testFind5 0 ms
testToString 16 ms
testConnect01 0 ms
testConnect02 0 ms
testConnected01 1 ms
"C:\Program Files\Java\jdk-19\bin\java.exe" ...
Process finished with exit code 0