**Program Structures & Algorithms**

**Spring 2022**

**Assignment No. N3**

Name: Shijie Zhang

(NUID): 001537250

* **Task**
* **Output screenshot**
* **Relationship Conclusion**
* **Evidence / Graph**
* **Unit tests result**
* **Task**

**STEP ONE:**

1. Implement height-weighted Quick Union with Path Compression.
2. Check that the unit tests for this class all work. You must show "green" test results in your submission

**STEP TWO:**

1. Using your implementation of UF\_HWQUPC, develop a UF ("union-find") client that takes an integer value n from the command line to determine the number of "sites." Then generates random pairs of integers between 0 and n-1, calling connected () to determine if they are connected and union () if not. Loop until all sites are connected then print the number of connections generated. Package your program as a static method count () that takes n as the argument and returns the number of connections; and a main () that takes n from the command line, calls count () and prints the returned value.

**STEP THREE:**

1. Determine the relationship between the number of objects (*n*) and the number of pairs (*m*) generated to accomplish this (i.e., to reduce the number of components from *n* to 1). Justify your conclusion in terms of your observations and what you think might be going on.

* **Output screenshot**

**图形用户界面, 文本, 应用程序

描述已自动生成**

**Picture 1- Runs the experiment for a fixed set of n values**

**图形用户界面, 文本

描述已自动生成**

**Picture 2- Runs the experiment for n values input in command line**

* **Relationship Conclusion**
* **Evidence / Graph**

**图表

描述已自动生成**

**Picture 3- Evidence of Relationship Conclusion**

* **Unit tests result**

(Part 1) unit tests in *UF\_HWQUPC\_Test*.

**电脑萤幕的截图

描述已自动生成**

**Picture 4-unit tests in UF\_HWQUPC**