Cooperators：**None**

Dataset: Email-Eu-core network

Source: https://snap.stanford.edu/data/email-Eu-core.html

Description: Email communication dataset from a large European research institution

Project Focus: Six Degrees of Separation（BFS）

Nodes:1005 Edges:25571

The email-Eu-core network is a dataset of email communication within a large European research institution. The dataset includes information on email communication links between members of the institution. An edge (u, v) exists in the network if the person u sent person v at least one email. Through this dataset, I can gain insights into the email network of this European research institution.

The approach taken in this project was to use the BFS algorithm to compute the shortest paths between all vertex pairs in the email-Eu-core network. The average distance was then used as the metric to compare with other graphs. In addition, a random graph generation algorithm was implemented and used to compare with the email-Eu-core network.

In this project, I analyzed the properties of the email-Eu-core network, which is a directed graph representing email communications between members of a European research institution. I found that this network has a world structure of 1005 vertices, with an average distance of 2.59 between nodes. This indicates that information can spread efficiently throughout the network. To provide a baseline for comparison, we also generated a random graph. This random graph had a slightly lower average distance of 2.49, suggesting that the random network has a more clustered structure than the email-Eu-core network

The BFS algorithm proved to be an effective way to calculate the shortest paths in the network. These findings can be used to gain insights into the email network of the European research institution and to better understand the structure of large networks in general.

```
crc-dot1x-nat-10-239-156-108:project w$ cargo test
   Compiling project v0.1.0 (/Users/w/Desktop/project)
    Finished test [unoptimized + debuginfo] target(s) in 1.01s
     Running unittests src/main.rs (target/debug/deps/project-29fdca653555ec22)

running 3 tests
test tests::test_average_distance ... ok
test tests::test_generate_random_graph ... ok
test tests::test_shortest_path ... ok

test result: ok. 3 passed; 0 failed; 0 ignored; 0 measured; 0 filtered out; finished in 0.00s
```

Cargo run –release

```
crc-dot1x-nat-10-239-156-108:project w$ cargo run --release
   Compiling project v0.1.0 (/Users/w/Desktop/project)
    Finished release [optimized] target(s) in 1.63s
     Running `target/release/project`
  Average distance in email-Eu-core: 2.59
 Average distance in random graph: 2.49
```