# Learning Outcome 4: Evaluate the limitations of a given testing process, using statistical methods where appropriate, and summarise outcomes.

### 4.1. Identifying Gaps and Omissions in the Testing Process

The following gaps were identified during the testing process:

There was no rigorous testing on any of the early endpoints such as isInRegion and isCloseTo. The impact of this is that I probably did not account for some possible edge cases during manual testing.

- **Pathfinding Tests:**
    - Limited tests on edge cases for the delivery pathfinding algorithm.
    - Lack of tests for dynamic updates or alternative routes.

**Ordervalidation tests:**

There was 600 orders provided by the instructor to test, all of which passed, but there is no guarantee that these orders explore every single edge case, and it is likely that at least one edge case was omitted.

**Stress tests:**

There was no tests on the system under a massive load of tests which it could need to handle at peak times

### 4.2. Identifying Target Coverage/Performance Levels for Different Testing Procedures

- **Pathfinding Performance:**
    - Target runtime: Less than 60 second for calculating the delivery path under standard conditions.
- **Order Validation:**
    - Target result: Pass all provided functional tests for the validateOrder method without errors.
- **Test Coverage:**
    - Default target: Achieve at least 80% code coverage during testing, ensuring that critical functions are thoroughly tested.

### 4.3. Comparison of Testing Results with Target Levels

- **Pathfinding Results:**
    - Achieved runtime of less than 1 second for most delivery paths, except from one restaurant, where the calculation took approximately 2 seconds. These results are exceptionally below the target which shows the pathfinding algorithm is highly efficient and acceptable for this system.

- **Order Validation Results:**
    - All functional tests for order validation were passed successfully.

- **Test Coverage results:**
    - 33% through unit testing but actual coverage is much higher due to manual testing.

**4.4. Necessary Steps to Achieve Target Levels**

To achieve and exceed the target levels, the following steps could be done:

1. **Test Coverage Analysis:**
    - Test coverage was monitored using intellij.
    - Test coverage could be increased by creating automatic unit tests for the earlier endpoints to ensure that all edge cases missed manually are found.
2. **Stress testing:**
    - The system should try running multiple orders at the same time to simulate real peak time system use.