

# Unit Testing Progress Report for EasyGraph

July 1, 2025

## 1 Coverage Statistics

The table below compares the coverage before and after the recent testing improvements:

Table 1: Test Coverage Improvement

Metric	Before	After
Total Number of Tests	261	786
Classes Module Coverage	57%	67%
Functions Module Coverage	38%	67%

## 2 Visualizations

### 2.1 Growth in Total Number of Tests

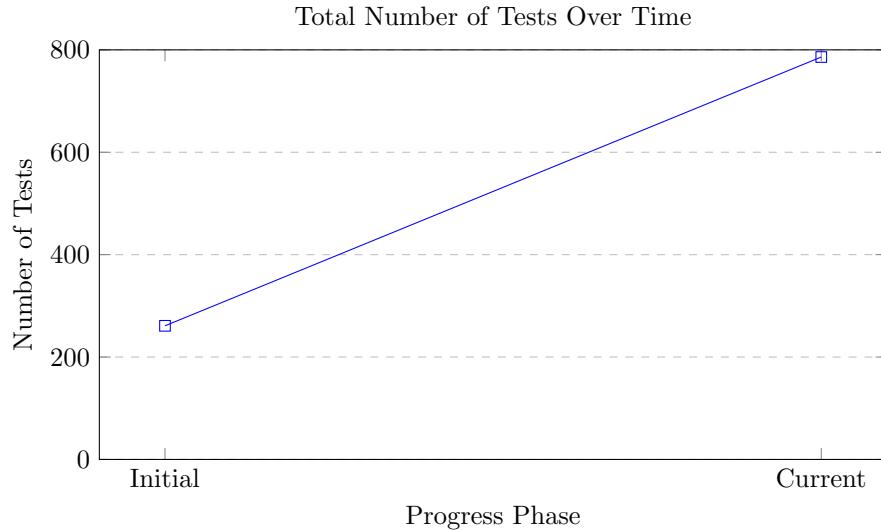


Figure 1: Growth in Total Unit Tests

## 2.2 Coverage Improvement by Module



Figure 2: Code Coverage Improvement by Module

## 3 Coverage Report Screenshots

### 3.1 Total tests comparison

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
tests/test_convert.py ....
=====
short test summary info =====
SKIPPED [1] readwrite/tests/test_graphviz.py:7: could not import 'pygraphviz'; No module named 'pygraphviz'
SKIPPED [1] classes/tests/test_hypergraph.py:973: skip
SKIPPED [1] readwrite/tests/test_graphml.py:1104: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1110: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1122: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1128: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1141: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1186: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1212: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1229: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1244: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1257: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1270: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1284: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1295: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1319: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1363: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1422: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1438: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1454: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1464: could not import 'lxml.etree'; No module named 'lxml'
SKIPPED [1] readwrite/tests/test_graphml.py:1477: could not import 'lxml.etree'; No module named 'lxml'
=====
261 passed, 22 skipped, 62 warnings in 7.26s =====

```

Figure 3: Previous total tests

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
tests/test_convert.py ....
=====
786 passed, 22 skipped, 88 warnings in 33.74s =====
** On entry to DGEEV parameter number 5 had an illegal value
** On entry to DGEEV parameter number 5 had an illegal value

```

Figure 4: Current total tests

### 3.2 Classes module test coverage comparison

```
===== tests coverage =====
coverage: platform linux, python 3.10.12-final-0

Name           Stmts  Miss  Cover
-----
classes/_init_.py      14      2  86%
classes/base.py        373    157  58%
classes/directed_graph.py 379    247  35%
classes/directed_multigraph.py 144    42  71%
classes/graph.py       512    154  70%
classes/graphviews.py   11      7  36%
classes/hypergraph.py   956    378  60%
classes/multigraph.py   170     69  59%
classes/operation.py    111     87  22%
classes/test_base_graph_class.py 14     14  0%
-----
TOTAL           2684   1157  57%
===== short test summary info =====
SKIPPED [1] classes/tests/test_hypergraph.py:973: skip
(venv) sam@node0:~/easyGraphTests/Easy-Graph/easygraph$ 48 passed, 1 skipped, 1 warning in 4.14s
SSH: amd181.utah.cloudlab.us  Easy-Graph  pybind11*  0  0  0  0  0  0

```

Figure 5: Previous classes test coverage

```
===== tests coverage =====
coverage: platform linux, python 3.10.12-final-0

Name           Stmts  Miss  Cover
-----
classes/_init_.py      14      2  86%
classes/base.py        373    157  58%
classes/directed_graph.py 379    184  73%
classes/directed_multigraph.py 144    28  81%
classes/graph.py       512    135  74%
classes/graphviews.py   11      7  36%
classes/hypergraph.py   956    378  60%
classes/multigraph.py   170     32  81%
classes/operation.py    111     28  75%
classes/test_base_graph_class.py 14     14  0%
-----
TOTAL           2684   885  67%
===== short test summary info =====
SKIPPED [1] classes/tests/test_hypergraph.py:973: skip
(venv) sam@node0:~/easyGraphTests/Easy-Graph/easygraph$ 131 passed, 1 skipped, 1 warning in 4.27s
SSH: amd181.utah.cloudlab.us  Easy-Graph  pybind11*  0  0  0  0  0  0

```

Figure 6: Current classes test coverage

### 3.3 Functions module test coverage comparisson

```

functions/hypergraph/null_model/lattice.py      15   11   27%
functions/hypergraph/null_model/random.py      174  156  18%
functions/hypergraph/null_model/simple.py      21   16   24%
functions/hypergraph/null_model/uniform.py     158  140  11%
functions/isolate.py                          7    3    57%
functions/path/_init_.py                     5    0    100%
functions/path/average_shortest_path_length.py 31   27   13%
functions/path/bridges.py                    81   3    96%
functions/path/diameter.py                  28   10   64%
functions/path/mst.py                      182  90   51%
functions/path/path.py                     144  2    99%
functions/structural_holes/AP_Greedy.py      183  65   64%
functions/structural_holes/HM.py            134  122  9%
functions/structural_holes/HTS.py          64   53   17%
functions/structural_holes/ICC.py          179  165  8%
functions/structural_holes/MaxD.py        248  219  12%
functions/structural_holes/WOB.py          98   88   10%
functions/structural_holes/SHIT_metric.py  187  187  0%
functions/structural_holes/_init_.py        8    0    100%
functions/structural_holes/evaluation.py    221  195  12%
functions/structural_holes/maxBlock.py     376  376  0%
functions/structural_holes/metrics.py      221  204  8%
functions/structural_holes/weakTie.py      197  197  0%
-----
TOTAL                                         7698 4763 38%
=====
102 passed, 7 warnings in 12.12s =====
○ (venv) sam@node01:~/easyGraphTests/Easy-Graph/easygraph$ █
SSH: amd181.utah.cloudlab.us  Easy-Graph 2 pybind11*  0 0 0 0 0 0

```

Figure 7: Previous functions test coverage

```

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
functions/hypergraph/null_model/simple.py      21   16   24%
functions/hypergraph/null_model/uniform.py     158  140  11%
functions/isolate.py                          7    3    57%
functions/path/_init_.py                     5    0    100%
functions/path/average_shortest_path_length.py 31   2    94%
functions/path/bridges.py                    83   1    99%
functions/path/diameter.py                  28   2    93%
functions/path/mst.py                      182  83   54%
functions/path/path.py                     144  1    99%
functions/structural_holes/AP_Greedy.py      183  4    98%
functions/structural_holes/HM.py            140  5    96%
functions/structural_holes/HTS.py          68   0    100%
functions/structural_holes/ICC.py          183  35   81%
functions/structural_holes/MaxD.py        248  3    99%
functions/structural_holes/WOB.py          106  3    97%
functions/structural_holes/SHIT_metric.py  187  187  0%
functions/structural_holes/_init_.py        9    0    100%
functions/structural_holes/evaluation.py    221  92   58%
functions/structural_holes/maxBlock.py     376  98   74%
functions/structural_holes/metrics.py      221  13   94%
functions/structural_holes/weakTie.py      197  104  47%
-----
TOTAL                                         7746 2583 67%
=====
477 passed, 31 warnings in 85.10s (0:01:25) =====
** On entry to DGEEV parameter number 5 had an illegal value
** On entry to DGEEV parameter number 5 had an illegal value
○ (venv) sam@node01:~/easyGraphTests/Easy-Graph/easygraph$ █
SSH: amd181.utah.cloudlab.us  Easy-Graph 2 feature/tests*  0 0 0 0 0 0

```

Figure 8: Current functions test coverage

## 4 Conclusion

The number of unit tests in EasyGraph increased by over  $3\times$ , from 261 to 786. Test coverage for the `classes` module rose from 57% to 67%, and for the `functions` module from 38% to 67%. These improvements significantly enhance code reliability, encourage safe refactoring, and contribute to the long-term quality of the project.