

Table 4. A comparison of the Cross Project Prediction performances. In the last row, the number in the parentheses shows the percentage improvement over GNN (i.e., Grace) [29]. The best result is marked in bold.

| System (# faults) | Techniques | Top-1 | Top-3 | Top-5 | Top-10 | MFR | MAR |
|-------------------|--------------------------|----------------------|----------------------|----------------------|----------------------|--------------------|--------------------|
| Cli (39) | GNN | 9.25 | 14.917 | 17.5 | 21.667 | 15.156 | 17.694 |
| | DepGraph w/o Code Change | 9.846 | 17.462 | 21 | 26.846 | 8.13 | 9.511 |
| | DepGraph | 13.083 | 19.583 | 22.417 | 28.417 | 6.702 | 8.011 |
| Closure (174) | GNN | 32.456 | 63.986 | 78.492 | 94.432 | 24.611 | 29.011 |
| | DepGraph w/o Code Change | 38.231 | 70.231 | 92.538 | 115.923 | 17.55 | 22.039 |
| | DepGraph | 41.545 | 73.111 | 97.736 | 116.672 | 14.753 | 21.555 |
| Codec (18) | GNN | 5.333 | 10.5 | 12.083 | 14.917 | 4.093 | 6.21 |
| | DepGraph w/o Code Change | 5.923 | 11.385 | 13 | 15.462 | 3.208 | 4.489 |
| | DepGraph | 6.667 | 10.667 | 12.583 | 16.083 | 2.99 | 5.549 |
| Collections (4) | GNN | 1.25 | 1.5 | 1.833 | 1.833 | 2.958 | 2.958 |
| | DepGraph w/o Code Change | 1.154 | 1.538 | 1.923 | 2 | 1.192 | 1.192 |
| | DepGraph | 1.667 | 2 | 2 | 2 | 0.25 | 0.25 |
| Compress (47) | GNN | 14.833 | 23.833 | 28 | 33.417 | 11.406 | 13.686 |
| | DepGraph w/o Code Change | 17.846 | 27.846 | 32.077 | 37.769 | 6.494 | 7.73 |
| | DepGraph | 21.417 | 31.833 | 36.417 | 41.333 | 4.619 | 5.696 |
| Csv (16) | GNN | 5.583 | 7.75 | 9.167 | 10.75 | 10.578 | 11.083 |
| | DepGraph w/o Code Change | 6 | 8.615 | 10.769 | 12.923 | 5.947 | 6.106 |
| | DepGraph | 6.75 | 8.417 | 10.5 | 12.5 | 7.203 | 7.451 |
| Gson (18) | GNN | 7.417 | 10.167 | 11.75 | 13.167 | 13.784 | 14.23 |
| | DepGraph w/o Code Change | 9.231 | 11.615 | 12.692 | 14.308 | 4.195 | 4.509 |
| | DepGraph | 7.917 | 11.667 | 13.5 | 15 | 6.475 | 6.739 |
| JacksonCore (26) | GNN | 0.917 | 3.167 | 3.667 | 5.417 | 41.851 | 47.374 |
| | DepGraph w/o Code Change | 7.154 | 12.462 | 13.462 | 15.385 | 4.822 | 6.171 |
| | DepGraph | 8.667 | 12.667 | 13.833 | 14.75 | 8.246 | 9.823 |
| JacksonXml (6) | GNN | 0.75 | 1.667 | 1.917 | 3 | 25.733 | 25.733 |
| | DepGraph w/o Code Change | 1.538 | 2.615 | 3.077 | 4.154 | 4.215 | 4.215 |
| | DepGraph | 2 | 3.333 | 4.333 | 4.833 | 2.15 | 2.15 |
| Jsoup (93) | GNN | 25.667 | 42.833 | 53.417 | 61.667 | 29.87 | 36.572 |
| | DepGraph w/o Code Change | 36.231 | 50.154 | 61.462 | 69.846 | 11.028 | 13.879 |
| | DepGraph | 43.25 | 60.583 | 68.917 | 77.5 | 4.766 | 7.503 |
| Lang (64) | GNN | 34.583 | 48.25 | 52.583 | 57.333 | 3.035 | 3.584 |
| | DepGraph w/o Code Change | 37.462 | 50.077 | 54.538 | 60 | 1.935 | 2.241 |
| | DepGraph | 42.667 | 53.583 | 57.75 | 60.75 | 1.507 | 1.795 |
| Math (106) | GNN | 41 | 60.583 | 69.5 | 82.25 | 8.452 | 9.302 |
| | DepGraph w/o Code Change | 46.923 | 71.077 | 82.615 | 94.538 | 2.922 | 3.297 |
| | DepGraph | 55.25 | 82.917 | 91.917 | 99.417 | 1.748 | 2.103 |
| Mockito (38) | GNN | 10.417 | 18 | 20.167 | 24.083 | 21.514 | 28.657 |
| | DepGraph w/o Code Change | 13.385 | 25.231 | 28.846 | 32.538 | 3.788 | 4.852 |
| | DepGraph | 17.5 | 27.083 | 30.917 | 33.167 | 2.618 | 3.474 |
| Time (26) | GNN | 7.5 | 11.75 | 14.333 | 17 | 19.587 | 22.058 |
| | DepGraph w/o Code Change | 10.769 | 14.692 | 16.154 | 18.385 | 10.893 | 11.752 |
| | DepGraph | 11.083 | 15.333 | 17.417 | 20 | 8.948 | 10.034 |
| Total (675) | GNN | 196.956 | 318.903 | 374.409 | 440.933 | 16.616 | 19.154 |
| | DepGraph w/o Code Change | 241.693 (23%) | 375 (18%) | 444.153 (19%) | 520.077 (18%) | 6.166 (63%) | 7.285 (62%) |
| | DepGraph | 279.463 (42%) | 412.777 (29%) | 480.237 (28%) | 542.422 (23%) | 5.213 (68%) | 6.581 (65%) |