SUPPORTING MATERIAL FOR

# Prediction of lethal and synthetically lethal knock-outs in regulatory networks

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## I. VARIATION OF SYSTEM SIZE

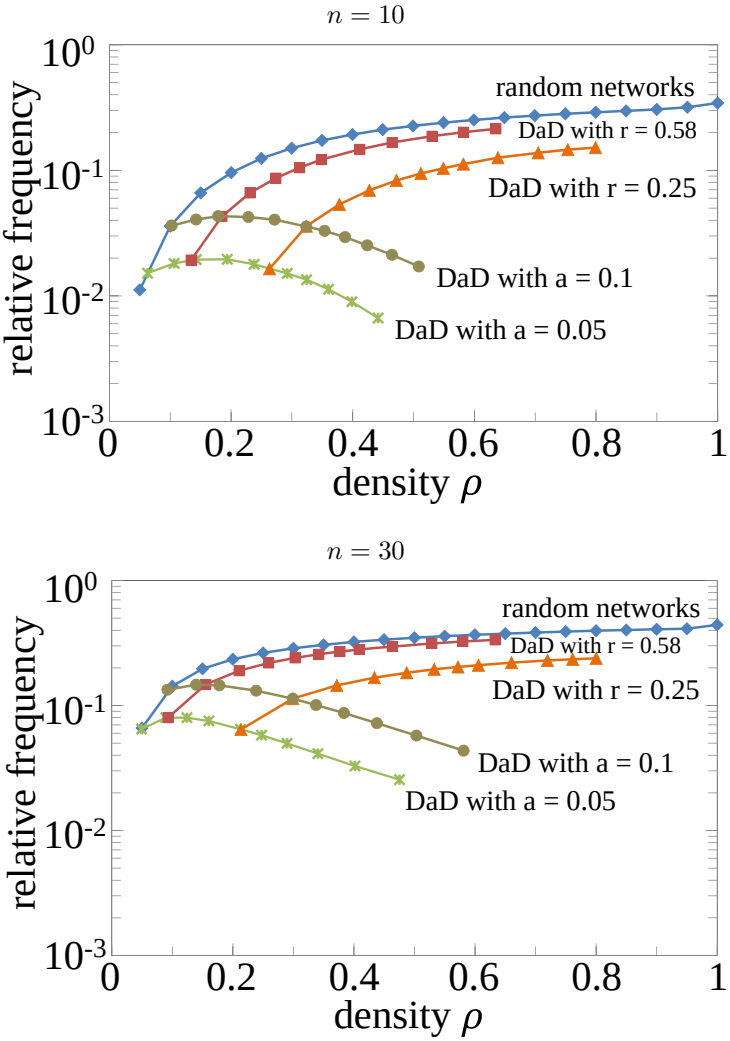


FIG. S1: Probability of lethal single node knock-outs as a function of density $\rho$ in networks with $n = 10$ (upper panel) and $n = 30$ nodes (lower panel). Other details are as in Figure 3 in the main article.

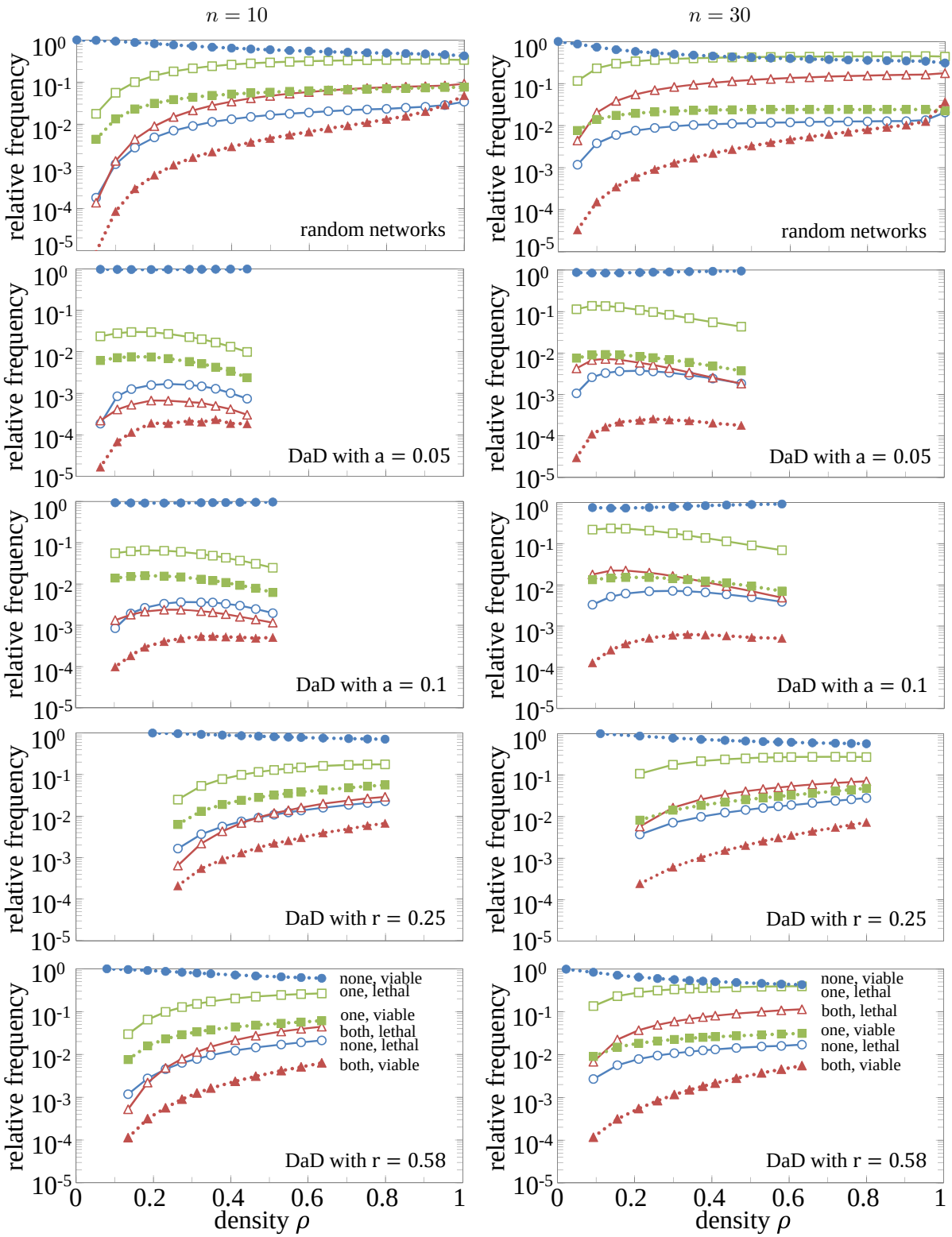


FIG. S2: Lethality of knock-outs as a function of density $\rho$ in networks with $n = 10$ (left panels) and $n = 30$ nodes (right panels). Other details are as in Figure 4 in the main article.

TABLE S1: Overview of the area under the ROC curves for prediction of single node knock-outs in networks with $n = 10$ nodes. Other details are as in Table 1 in the main article.

| | struct. lethality | out-deg. out | + in-deg. out | − in-deg. | betw.centr. | in-deg. |
|---|---|---|---|---|---|---|
| $p = 0.21$ | 0.710 | 0.662 | 0.637 | 0.595 | 0.572 | 0.476 |
| $a = 0.05$, $r = 0.58$ | 0.750 | 0.703 | 0.621 | 0.671 | 0.584 | 0.469 |
| $p = 0.28$ | 0.668 | 0.637 | 0.612 | 0.584 | 0.563 | 0.488 |
| $a = 0.1$, $r = 0.58$ | 0.726 | 0.688 | 0.616 | 0.653 | 0.583 | 0.483 |
| $p = 0.32$ | 0.651 | 0.626 | 0.601 | 0.579 | 0.561 | 0.492 |
| $a = 0.05$, $r = 0.25$ | 0.697 | 0.678 | 0.629 | 0.623 | 0.596 | 0.527 |
| $p = 0.37$ | 0.634 | 0.614 | 0.590 | 0.572 | 0.556 | 0.494 |
| $a = 0.1$, $r = 0.25$ | 0.678 | 0.663 | 0.618 | 0.613 | 0.584 | 0.523 |

TABLE S2: Overview of the area under the ROC curves for prediction of single node knock-outs in networks with $n = 30$ nodes. Other details are as in Table 1 in the main article.

| | struct. lethality | out-deg. out | + in-deg. out | − in-deg. | betw.centr. | in-deg. |
|---|---|---|---|---|---|---|
| $p = 0.11$ | 0.657 | 0.642 | 0.613 | 0.588 | 0.567 | 0.484 |
| $a = 0.05$, $r = 0.58$ | 0.708 | 0.692 | 0.625 | 0.647 | 0.586 | 0.490 |
| $p = 0.20$ | 0.605 | 0.597 | 0.574 | 0.563 | 0.557 | 0.493 |
| $a = 0.1$, $r = 0.58$ | 0.648 | 0.640 | 0.592 | 0.605 | 0.573 | 0.496 |
| $p = 0.26$ | 0.587 | 0.580 | 0.561 | 0.552 | 0.549 | 0.495 |
| $a = 0.05$, $r = 0.25$ | 0.673 | 0.668 | 0.624 | 0.609 | 0.590 | 0.528 |
| $p = 0.31$ | 0.575 | 0.570 | 0.553 | 0.546 | 0.544 | 0.496 |
| $a = 0.1$, $r = 0.25$ | 0.625 | 0.620 | 0.585 | 0.582 | 0.567 | 0.513 |

TABLE S3: Overview of the area under the ROC curves for prediction of double node knock-outs which exhibit synthetic lethality. Networks have $n = 10$ nodes. Other details are as in Table 2 in the main article.

| | struct. syn. let. | out-overlap | repl. centr. | evol. distance | in-overlap |
|---|---|---|---|---|---|
| $p = 0.21$ | 0.895 (0.903) | 0.840 (0.849) | 0.598 (0.601) | - | 0.494 (0.493) |
| $a = 0.05$, $r = 0.58$ | 0.908 (0.915) | 0.881 (0.888) | 0.598 (0.602) | 0.619 (0.618) | 0.519 (0.517) |
| $p = 0.28$ | 0.828 (0.838) | 0.768 (0.780) | 0.587 (0.590) | - | 0.497 (0.497) |
| $a = 0.1$, $r = 0.58$ | 0.887 (0.896) | 0.851 (0.860) | 0.593 (0.597) | 0.570 (0.570) | 0.514 (0.512) |
| $p = 0.32$ | 0.790 (0.802) | 0.731 (0.744) | 0.582 (0.586) | - | 0.499 (0.500) |
| $a = 0.05$, $r = 0.25$ | 0.817 (0.828) | 0.790 (0.795) | 0.620 (0.627) | 0.634 (0.632) | 0.585 (0.581) |
| $p = 0.37$ | 0.746 (0.759) | 0.690 (0.705) | 0.578 (0.582) | - | 0.500 (0.500) |
| $a = 0.1$, $r = 0.25$ | 0.777 (0.791) | 0.749 (0.759) | 0.604 (0.610) | 0.595 (0.593) | 0.561 (0.560) |

TABLE S4: Overview of the area under the ROC curves for prediction of double node knock-outs which exhibit synthetic lethality. Networks have $n = 30$ nodes. Other details are as in Table 2 in the main article.

| | struct. syn. let. | out-overlap | repl. centr. | evol. distance | in-overlap |
|---|---|---|---|---|---|
| $p = 0.11$ | 0.895 (0.901) | 0.874 (0.879) | 0.605 (0.609) | - | 0.502 (0.501) |
| $a = 0.05$, $r = 0.58$ | 0.912 (0.919) | 0.897 (0.903) | 0.601 (0.604) | 0.585 (0.586) | 0.533 (0.533) |
| $p = 0.20$ | 0.761 (0.768) | 0.728 (0.738) | 0.579 (0.583) | - | 0.501 (0.501) |
| $a = 0.1$, $r = 0.58$ | 0.827 (0.837) | 0.802 (0.813) | 0.590 (0.595) | 0.538 (0.538) | 0.518 (0.518) |
| $p = 0.26$ | 0.700 (0.706) | 0.661 (0.673) | 0.562 (0.566) | - | 0.500 (0.500) |
| $a = 0.05$, $r = 0.25$ | 0.792 (0.803) | 0.768 (0.782) | 0.595 (0.598) | 0.599 (0.597) | 0.566 (0.566) |
| $p = 0.31$ | 0.666 (0.670) | 0.621 (0.634) | 0.551 (0.554) | - | 0.500 (0.500) |
| $a = 0.1$, $r = 0.25$ | 0.710 (0.719) | 0.674 (0.693) | 0.573 (0.577) | 0.557 (0.556) | 0.538 (0.538) |

## II. UNIFORM CHOICE OF FIXED POINT

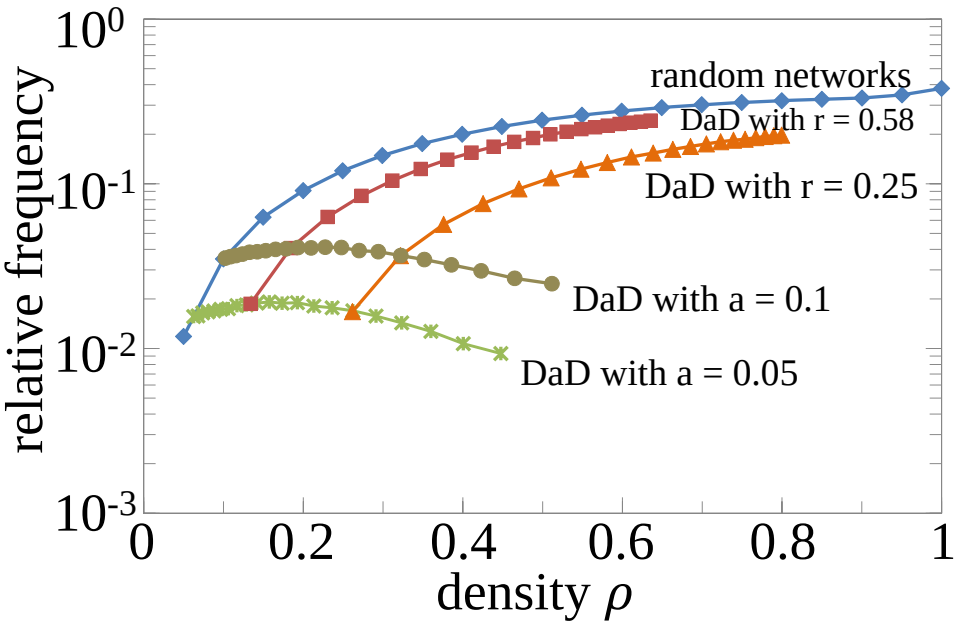


FIG. S3: Probability of lethal single node knock-outs as a function of density $\rho$ in networks with $n = 10$ using uniform choice of the functional fixed point. Other details are as in Figure 3 in the main article.

TABLE S5: Overview of the area under the ROC curves for prediction of single node knock-outs in networks with $n = 10$ nodes using uniform choice of the functional fixed point. Other details are as in Table 1 in the main article.

| | struct. lethality | out-deg. out + in-deg. out − in-deg. | betw.centr. in-deg. | |
|---|---|---|---|---|
| $p = 0.21$ | 0.695 | 0.625 | 0.596 | 0.582 | 0.569 | 0.496 |
| $a = 0.05$, $r = 0.58$ | 0.743 | 0.658 | 0.594 | 0.622 | 0.578 | 0.480 |
| $p = 0.28$ | 0.652 | 0.606 | 0.576 | 0.573 | 0.548 | 0.503 |
| $a = 0.1$, $r = 0.58$ | 0.710 | 0.640 | 0.591 | 0.600 | 0.574 | 0.503 |
| $p = 0.32$ | 0.630 | 0.592 | 0.566 | 0.564 | 0.539 | 0.504 |
| $a = 0.05$, $r = 0.25$ | 0.686 | 0.625 | 0.590 | 0.583 | 0.565 | 0.518 |
| $p = 0.37$ | 0.612 | 0.583 | 0.560 | 0.558 | 0.534 | 0.503 |
| $a = 0.1$, $r = 0.25$ | 0.657 | 0.610 | 0.582 | 0.569 | 0.549 | 0.521 |

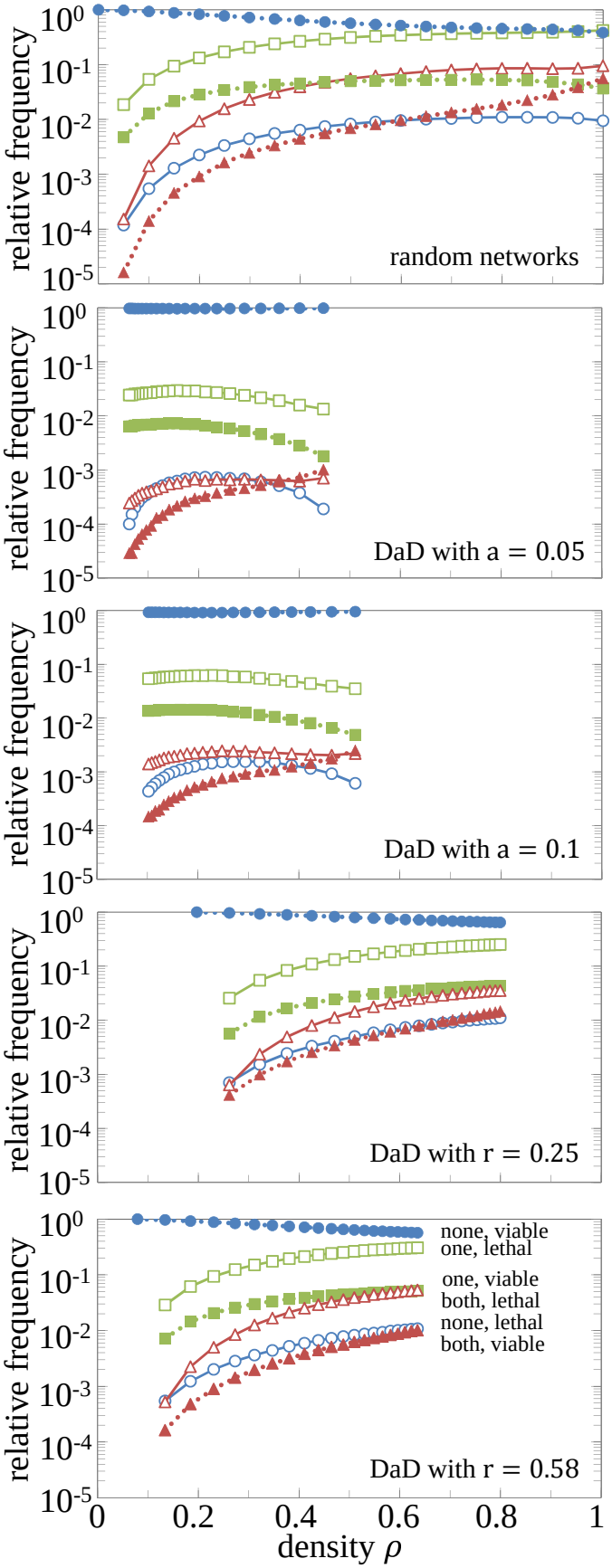


FIG. S4: Lethality of knock-outs as a function of density $\rho$ in networks with $n = 10$ using uniform choice of the functional fixed point. Other details are as in Figure 4 in the main article.

TABLE S6: Overview of the area under the ROC curves for prediction of double node knock-outs which exhibit synthetic lethality. Networks have $n = 10$ nodes. The functional fixed point is determined by uniform choice. Other details are as in Table 2 in the main article.

| | struct. syn. let. | out-overlap | repl. centr. | evol. distance | in-overlap |
|---|---|---|---|---|---|
| $p = 0.21$ | 0.910 (0.918) | 0.854 (0.863) | 0.612 (0.616) | - | 0.497 (0.498) |
| $a = 0.05$, $r = 0.58$ | 0.921 (0.929) | 0.896 (0.904) | 0.594 (0.599) | 0.621 (0.620) | 0.523 (0.522) |
| $p = 0.28$ | 0.844 (0.855) | 0.776 (0.788) | 0.592 (0.596) | - | 0.498 (0.499) |
| $a = 0.1$, $r = 0.58$ | 0.903 (0.912) | 0.866 (0.875) | 0.594 (0.598) | 0.571 (0.570) | 0.514 (0.513) |
| $p = 0.32$ | 0.803 (0.814) | 0.733 (0.746) | 0.586 (0.590) | - | 0.500 (0.501) |
| $a = 0.05$, $r = 0.25$ | 0.835 (0.847) | 0.807 (0.819) | 0.600 (0.608) | 0.630 (0.628) | 0.582 (0.580) |
| $p = 0.37$ | 0.760 (0.771) | 0.689 (0.703) | 0.575 (0.579) | - | 0.498 (0.500) |
| $a = 0.1$, $r = 0.25$ | 0.802 (0.816) | 0.764 (0.778) | 0.596 (0.603) | 0.604 (0.602) | 0.568 (0.569) |