Structural prediction of super-diffusion in multiplex networks

Supplementary Material

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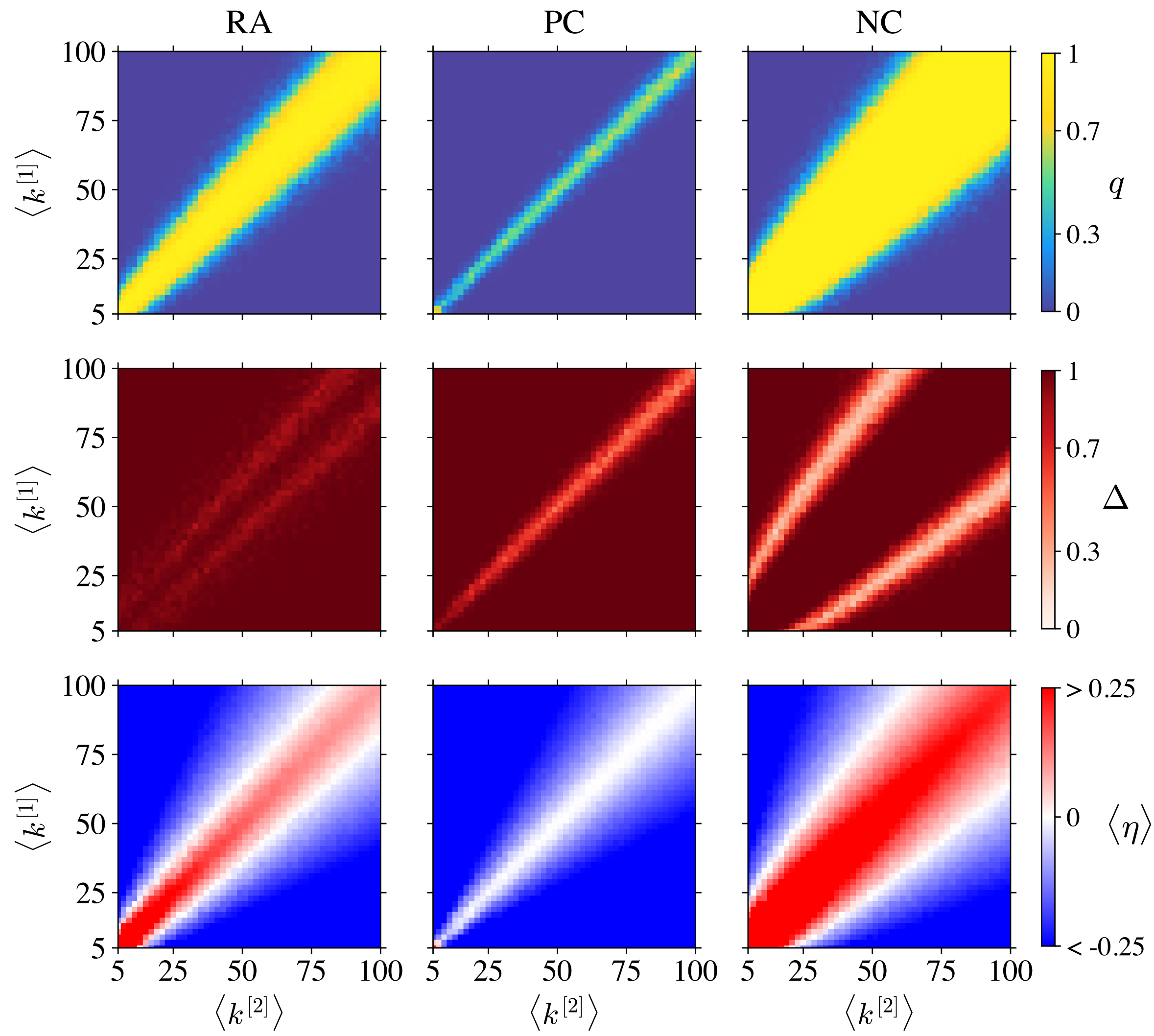

Figure S1: Super-diffusion probability q (top row), prediction accuracy Δ (middle row), and average structural parameter $\langle \eta \rangle$ (bottom row) as a function of the average degrees of the layers, for duplex networks composed by two unweighted ER layers and with $N = 500$. Each column corresponds to one of the three different models of inter-layer connection: RA, PC, and NC. We compute 50 different duplex networks for each combination of $p^{[1]}$ and $p^{[2]}$, with these connection probabilities ranging from $5/(N-1)$ to $100/(N-1)$ in steps of $1/(N-1)$, and ensuring that the layers are connected networks.

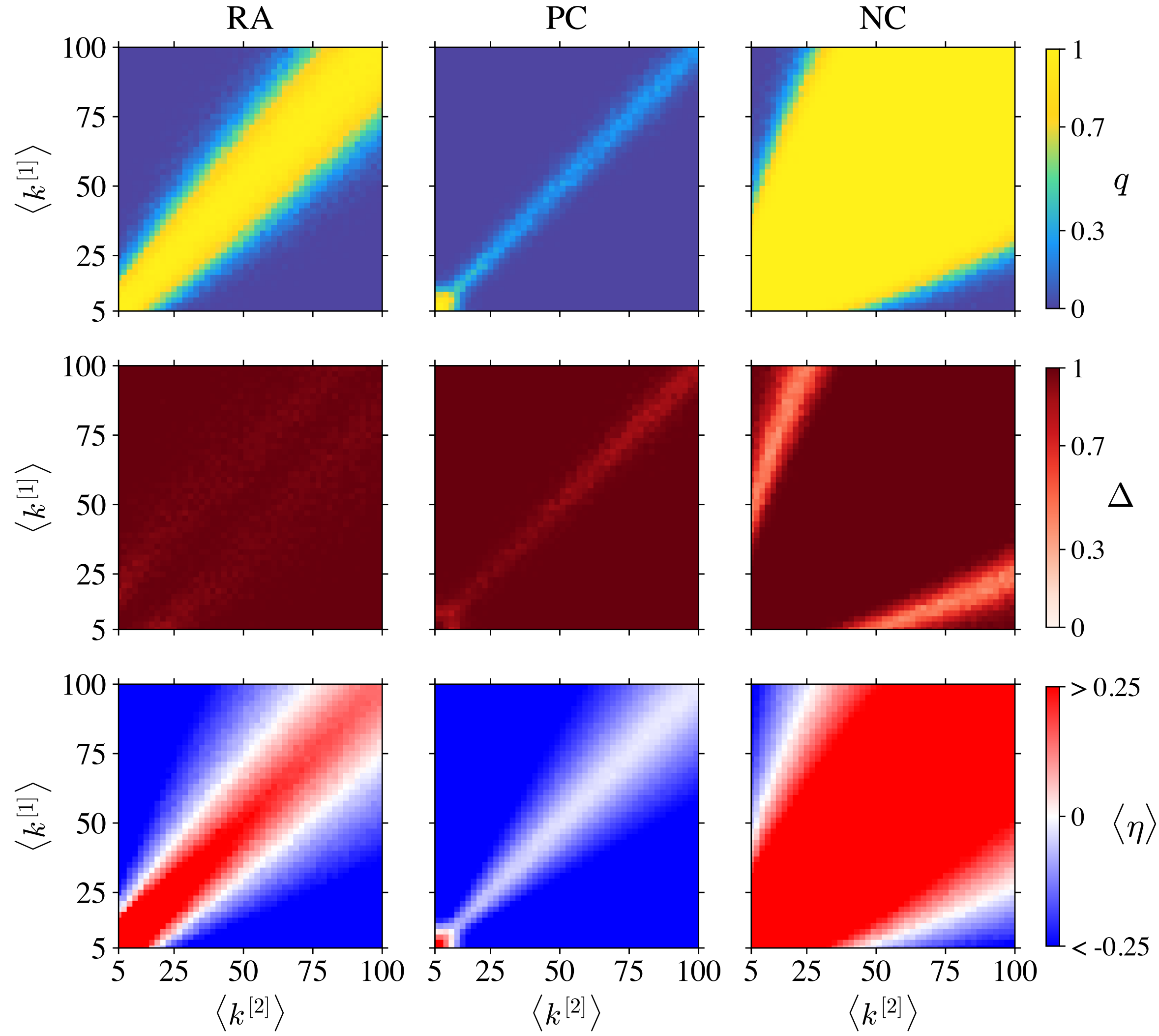

Figure S2: Super-diffusion probability q (top row), prediction accuracy Δ (middle row), and average structural parameter $\langle \eta \rangle$ (bottom row) as a function of the average degrees of the layers, for duplex networks composed by two unweighted SF layers and with $N = 500$. Each column corresponds to one of the three different models of inter-layer connection: RA, PC, and NC. We compute 50 different duplex networks for each combination of $M^{[1]}$ and $M^{[2]}$, with these number of links ranging from $5N$ to $100N$ in steps of N, and ensuring that the layers are connected networks.

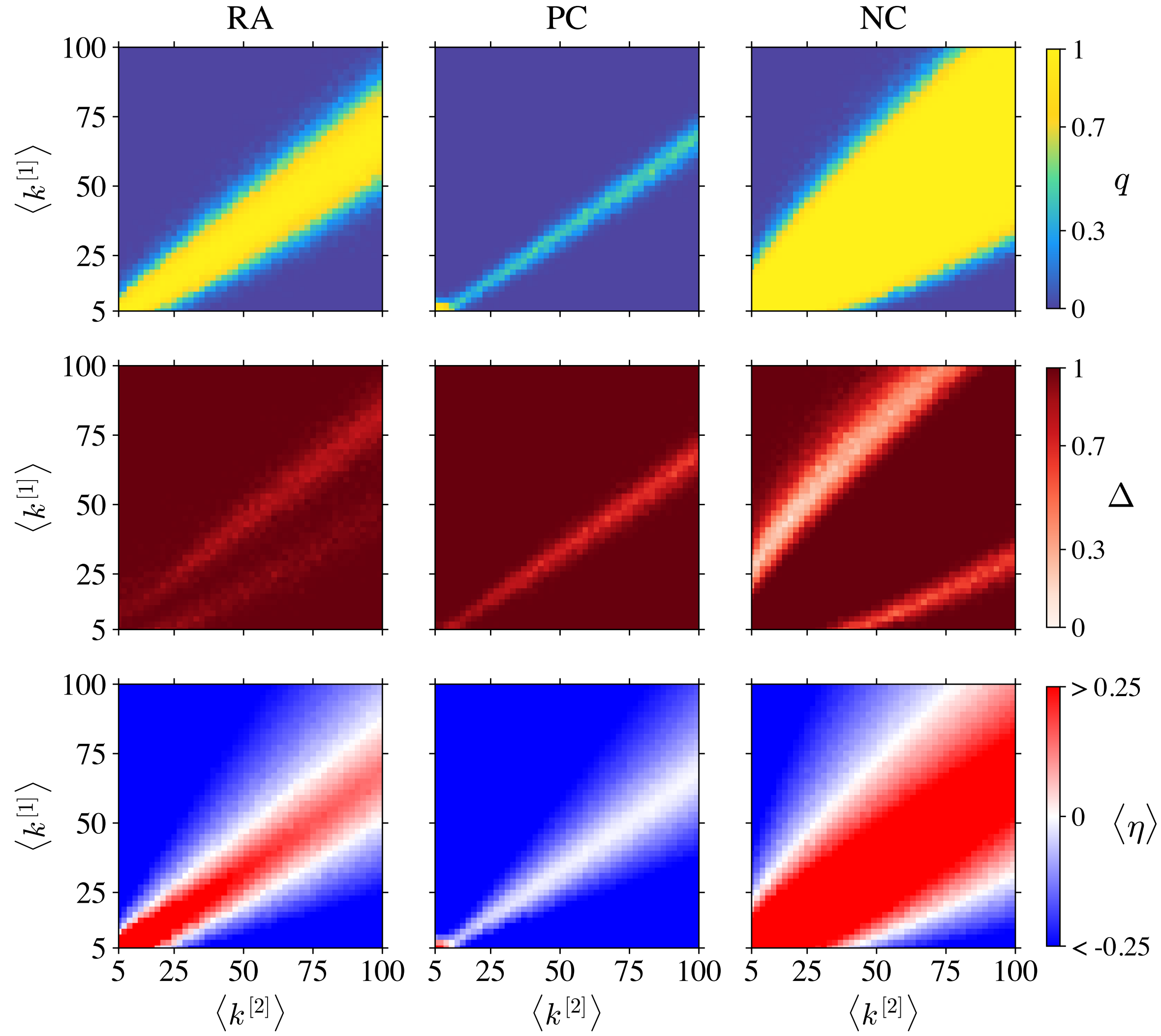

Figure S3: Super-diffusion probability q (top row), prediction accuracy Δ (middle row), and average structural parameter $\langle \eta \rangle$ (bottom row) as a function of the average degrees of the layers, for duplex networks composed by one unweighted ER layer and one unweighted SF layer with $N = 500$. Each column corresponds to one of the three different models of inter-layer connection: RA, PC, and NC. We compute 50 different duplex networks for each combination of connection probability $p^{[1]}$ ranging from $5/(N-1)$ to $100/(N-1)$ in steps of $1/(N-1)$ and number of links $M^{[2]}$ ranging from $5N$ to $100N$ in steps of N, and ensuring that the layers are connected networks.

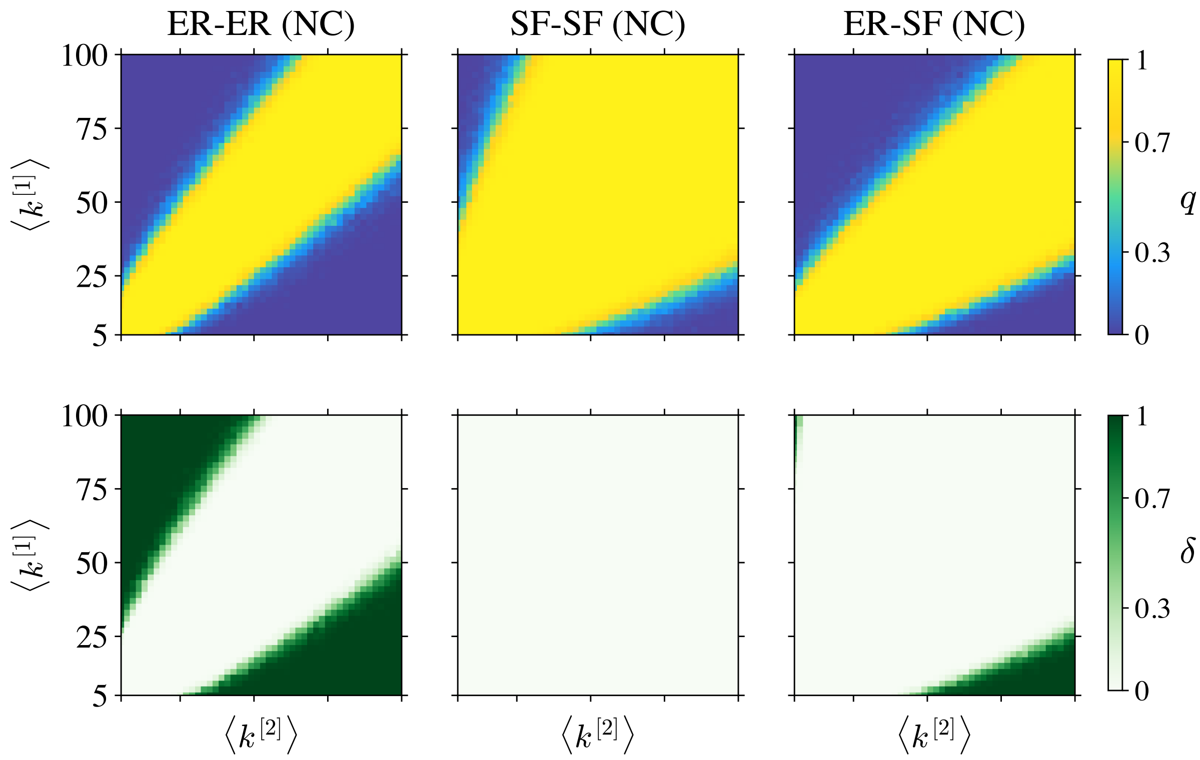

Figure S4: Super-diffusion probability q (top row), and ratio of duplex networks that verify the restricting super-diffusion condition δ: $s^{[1]}_{\text{min}} > s^{[2]}_{\text{max}}$ or $s^{[2]}_{\text{min}} > s^{[1]}_{\text{max}}$ (bottom row) as a function of the average degrees of the layers, for duplex networks with $N = 500$. Each column corresponds to one of the three different configurations: ER-ER (NC), SF-SF (NC), and ER-SF (NC). We compute 50 different duplex networks for each combination of structural parameters and ensure that the layers are connected networks. Note that, for SF networks, this condition is hard to accomplish because of the broad degree distribution.

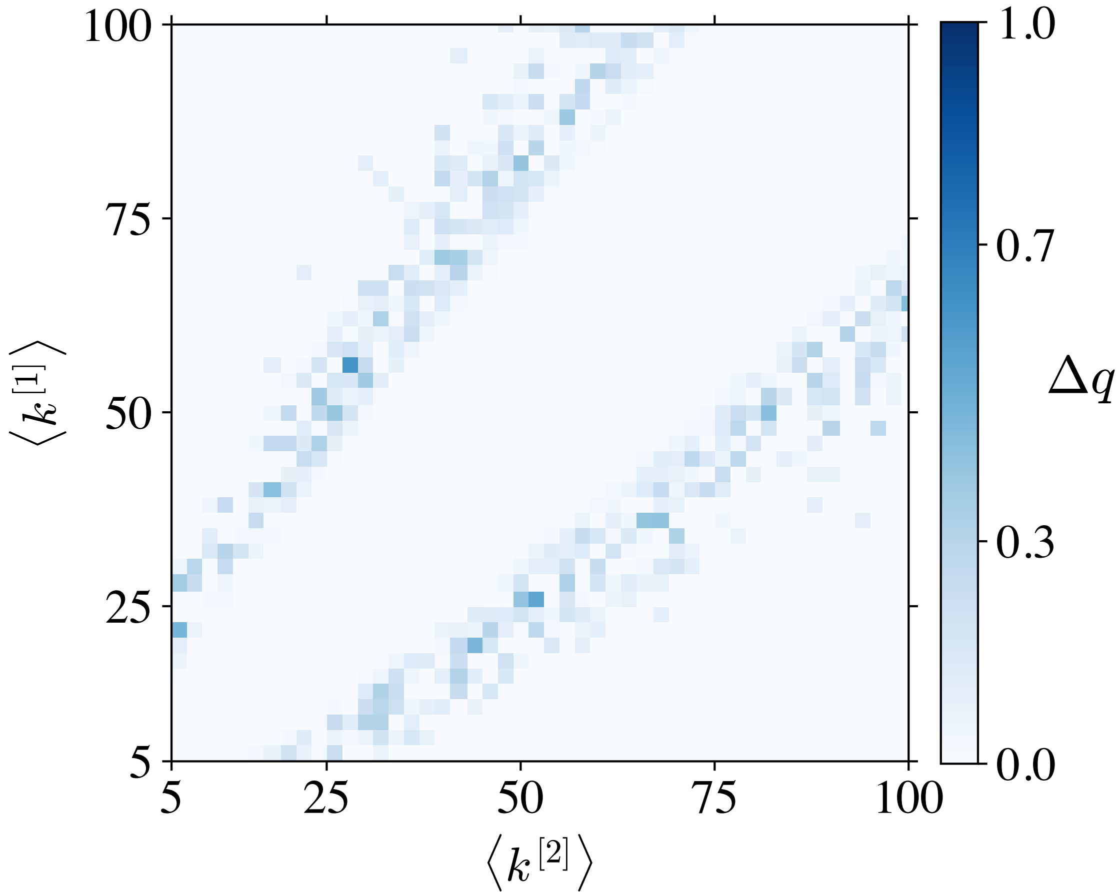

Figure S5: Super-diffusion probability increment after a restricted SA optimization process of 10^3 steps on each duplex networks as a function of their average connectivity. Duplex networks formed by two unweighted ER layers with $N = 1000$. We compute 50 different duplex networks for each combination of structural parameters and ensure that the layers are connected networks. Inter-layer connections are NC.

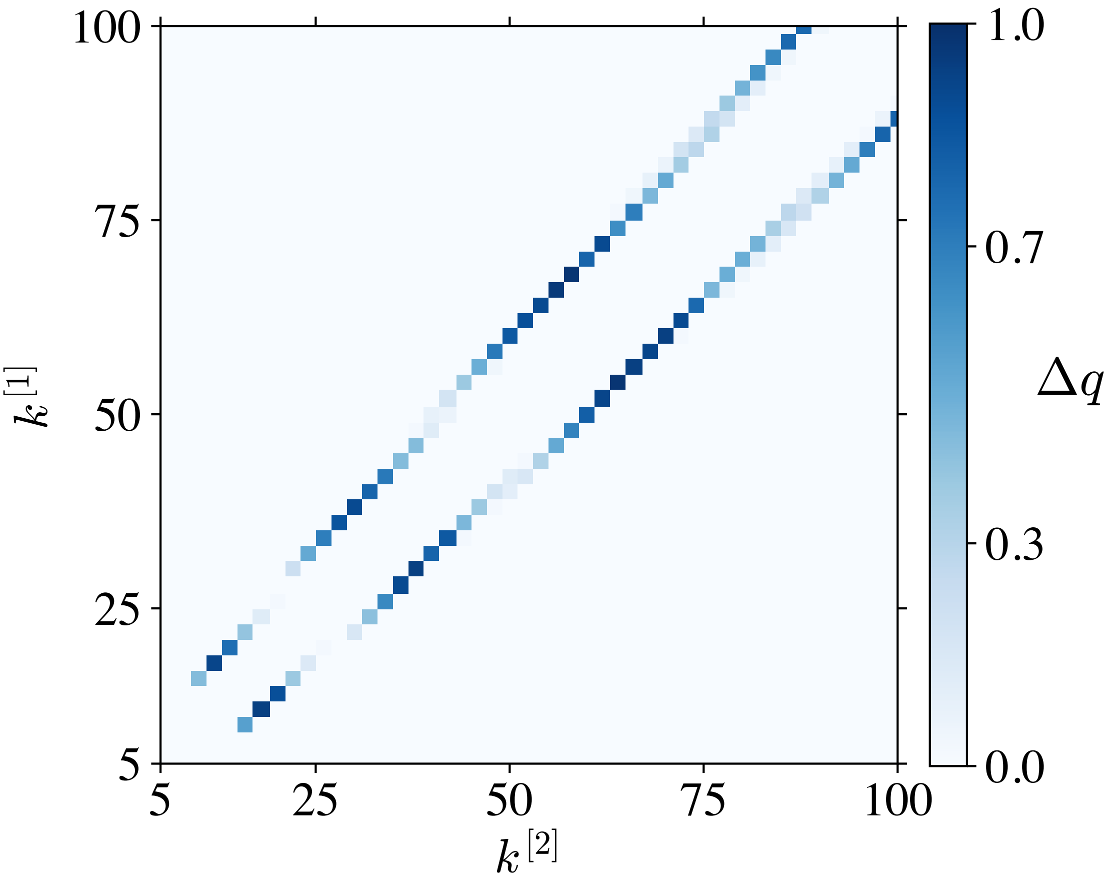

Figure S6: Super-diffusion probability increment after a restricted SA optimization process of 10^3 steps on each duplex networks as a function of their average connectivity. Duplex networks formed by two unweighted RR layers with $N = 1000$. We compute 50 different duplex networks for each combination of structural parameters and ensure that the layers are connected networks.