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Antifragility of stochastic transport on networks with damage

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A system is called antifragile when damage acts as a constructive element improving the performance of a global function. In this work, we analyze the emergence of antifragility in the movement of random walkers on networks with modular structures or communities. The random walker hops considering the capacity of transport of each link, whereas the links are susceptible to random damage that accumulates over time. We show that in networks with communities and high modularity, the localization of damage in specific groups of nodes leads to a global antifragile response of the system improving the capacity of stochastic transport to more easily reach the nodes of a network. Our findings give evidence of the mechanisms behind antifragile response in complex systems and pave the way for their quantitative exploration in different fields.

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