Study explores how antifragility in complex dynamical systems could revolutionize cancer treatment

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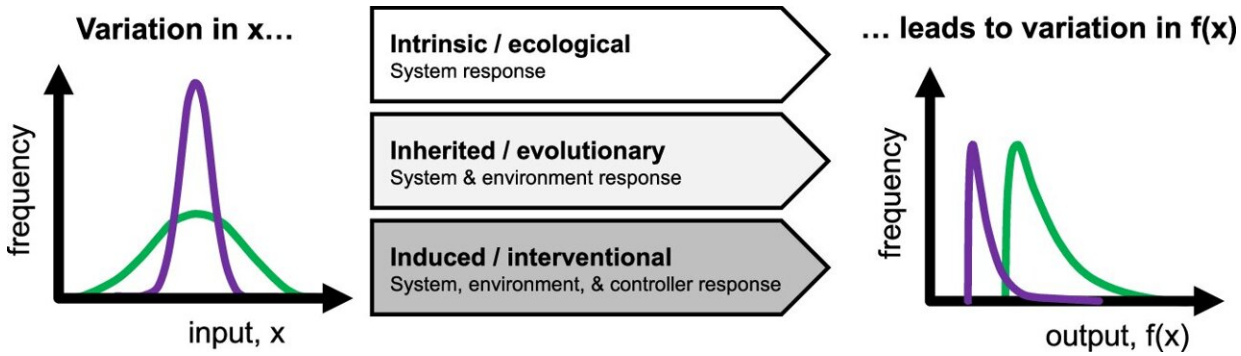

Antifragility-associated terms, defined for technical and natural (biological) systems. Credit: *npj Complexity* (2024). DOI: 10.1038/s44260-024-00014-y

Researchers constantly seek innovative approaches to tackle cancer. One concept gaining traction is antifragility, a property where systems not only withstand stress but improve because of it. In cancer research, this concept is particularly relevant for tumors that adapt and evolve in response to treatment. Understanding antifragility could lead to more effective therapies.

In a new study published in *npj Complexity*, Moffitt Cancer Center researchers offer a new perspective on antifragility, proposing a unified framework for understanding the property across different complex

systems.

The study, led by Jeffrey West, Ph.D., and in collaboration with investigators from the international Applied Antifragility Working Group, suggests that understanding antifragility could lead to more effective cancer therapies. For instance, recent clinical trials in adaptive therapy may capitalize on the tumor's poor response to microenvironmental perturbations induced by periodic, adaptive treatment administration.

"By applying principles of antifragility to cancer treatment, we may be able to design therapies that are dynamic and responsive to the way tumors evolve and adapt," said West, study author and assistant member of the Integrated Mathematical Oncology Department at Moffitt. "This could potentially lead to better outcomes for patients."

The researchers also highlight how antifragility applies to other complex systems, from traffic management to ecosystem stability. This broad applicability underscores the potential impact of antifragility theory across various scientific domains in both technological systems, as well as natural, living systems such as cancer.

This publication is the result of a new collaborative working group that brings together scientists with backgrounds in engineering, mathematics and biological sciences. While the study is largely theoretical, the creation of the working group lays important groundwork for research in practical applications. Further investigation is needed to translate these concepts into tangible benefits for fields like medicine, ecology and engineering.

"The Applied Antifragility Working Group represents an exciting opportunity to bring ideas from outside fields into cancer research. We're excited about the possibilities it opens, not just for cancer

research, but for tackling a wide range of challenges in our increasingly complex world," West said.

More information: Cristian Axenie et al, Antifragility in complex dynamical systems, *npj Complexity* (2024). DOI: 10.1038/s44260-024-00014-y

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