

Intricate high synergy brain regions likely explanation for complex thinking

[Researchers at the University of Cambridge are studying] a new aspect of brain organization: synergy between brain regions. Some networks of the brain are more synergistic than others, and synergistic networks tend to be involved in complex cognition.

So what is synergy? [Andrea] Luppi et al. define it in accordance with the mathematical framework called [MMI-PID](#). Two variables are said to have a synergistic interaction to the extent that the future state of both variables can only be predicted from the past state of both variables together, not from the past state of either variable alone.

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What Luppi et al. do is divide the brain into 232 regions, and then for each pair of regions, calculate the degree of synergy between the two activity timecourses in that pair, based on resting state fMRI data from the [Human Connectome Project](#). For each region they then calculate the average synergy between that region and all of the others.

In the same way, Luppi et al. also examined “redundancy,” which is, loosely speaking, the opposite of synergy.

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The implication is that synergy has something to do with higher brain function:

Synergistic interactions are ideally poised to act as a global workspace, allowing the integration of complementary information from across the brain in the service of higher cognitive functions.

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