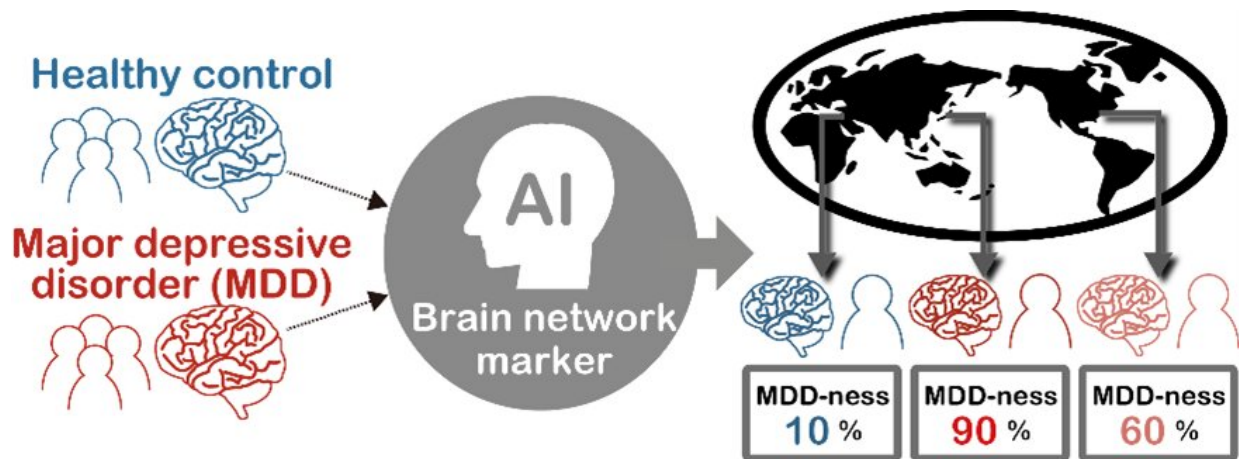# Machine learning identifies new brain network signature of major depression

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Visual representation of new brain network signature. Credit: Ayumu Yamashita

Using machine learning, researchers have identified novel, distinct patterns of coordinated activity between different parts of the brain in people with major depressive disorder—even when different protocols are used to detect these brain networks. Ayumu Yamashita of Advanced Telecommunications Research Institutes International in Kyoto, Japan, and colleagues present these findings in the open-access journal *PLOS Biology*.

While [major depression](#) is usually straightforward to diagnose, a better understanding of the [brain networks](#) associated with depression could

improve treatment strategies. Machine-learning algorithms can be applied to data on brain activity in people with depression in order to find such associations. However, most studies have focused only on specific subtypes of depression, or they have not accounted for the differences in brain imaging protocols between healthcare institutions.

To address these challenges, Yamashita and colleagues used machine learning to analyze brain network data from 713 people, 149 of whom had major depression. These data had been collected using a technique called resting-state functional MRI (rs-fMRI), which detects brain activity and produces images that reveal coordinated activity, or "functional connections," between different parts of the brain. The imaging had been performed at different institutions using different protocols.

The machine-learning method identified key functional connections in the imaging data that could serve as a brain network signature for major depression. Indeed, when the researchers applied that new signature to rs-fMRI data collected at different institutions from 521 other people, they achieved 70 percent accuracy in identifying which of those new people had major depressive disorder.

The researchers hope that their new brain network signature, which can be applied across different imaging protocols, could serve as a foundation for discovering brain network patterns associated with subtypes of depression, and to reveal relationships between depression and other disorders. A better understanding of brain network connections in major depression could help match patients to effective treatments and inform development of new treatments.

  More information: Yamashita A, Sakai Y, Yamada T, Yahata N, Kunimatsu A, Okada N, et al. (2020) Generalizable brain network markers of major depressive disorder across multiple imaging sites.

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