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Rutgers-Princeton Center aims to improve diagnosis of psychiatric diseases using computational models

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A new center is bringing together researchers from Princeton and Rutgers universities to apply computational modeling to the understanding of psychiatric diseases. The Rutgers-Princeton Center for Computational Cognitive Neuro-Psychiatry, which will open its doors this month, aims to improve the diagnosis of mental disorders, better predict their progression and eventually aid in developing treatments.

The center fosters collaboration between computational neuroscientists, who develop models of brain activity and cognitive processes, and clinical researchers who work directly with patients. The studies conducted at the center will address disorders ranging from depression, anxiety and schizophrenia to obsessive-compulsive disorder and substance abuse.

The center, located at Rutgers University Behavioral Health Care in Piscataway, features a 1,400-square foot facility with rooms for conducting patient intake and testing. It is supported by matching funds from Rutgers and Princeton.

"We can learn a lot about how the brain controls behaviors when we create computational models of how life events affect brain circuits, and how these circuits change over time. This center will allow us to bring this knowledge into the patient setting," said Yael Niv, who co-directs the new center and is an associate professor of psychology and the Princeton Neuroscience Institute.

"We still lack an understanding of the biological basis of many of the symptoms of psychiatric disorders, and computational approaches can help us start to close that gap," said Steven Silverstein, co-director of the center with Niv. Silverstein is the director of the Division of Schizophrenia Research at Rutgers University Behavioral Health Care, and a professor of psychiatry at the Rutgers-Robert Wood Johnson Medical School.

Over the last decade or so, neuroscientists have turned to computational modeling to help them understand how brain activity gives rise to behaviors. For example, researchers can build a computer model that represents how two areas of the brain communicate to generate behavior, and then block that communication to see what happens to the behavior.

The researchers can then test the model's predictions by comparing them to the real-life behavior of human volunteers. At present, most of these tests are done with community members or students. The new center will enable researchers to test models of disorders like depression and bipolar disorder in individuals living with those conditions.

One goal of the research is to better understand the brain's circuitry and what goes awry in mental disorders — how brain regions are connected, what is the role of each brain area, and how disruptions in brain circuitry can give rise to symptoms.

"With computational models, you can quickly find out which of your hypotheses about how the brain works are likely to be true, and which are unlikely to be true," said Silverstein. "This can accelerate scientific progress by maximizing the chances that follow-up experiments with people will lead to useful results, and avoiding long and expensive studies that are unlikely to succeed."

Models can also help improve diagnosis, Niv said. "Models allow us to describe behaviors in a precise, quantitative way," Niv said. "For example, we can quantify the extent to which getting an unexpected reward affects your mood, and how this differs between patients and healthy control. This allows us to start to think about diagnosing psychiatric disorders in a more definitive way, with tools that are more like a blood test rather than a self-report of symptoms."

As the models improve, and researchers gain confidence that computational models accurately represent human conditions, it should be possible to use the models to develop new treatments, Silverstein said. "You can ask, what happens to behavior if I add a treatment effect to the model, and this can help us understand what might happen in patients."

Source:

<https://www.princeton.edu/main/news/archive/S48/63/99I44/index.xml?section=topstories>
