Biological Psychiatry: CNNI

Computational Psychiatry Series

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Illnesses will naturally be shaped by the core functions of the organs from which they arise. Conceived broadly, computation and adaptive changes or "learning" are the core and most distinguishing features of the brain. Computational, adaptive change and learning principles are therefore likely to play a mechanistic role in shaping and forming illnesses arising from the brain. Computation and learning interact: the computations our brains can perform today are a function of the learning they have undergone and of the computations they have performed in the past, whereas the adaptive change a brain can undergo depends on its computational abilities. These core features of the brain hence suggest that illnesses can arise when the demands for learning and computation outstrip what the brain can deliver, just like symptoms of heart failure arise when the pumping requirements outstrip what the heart can deliver. Properly comprehending and treating such illnesses in a mechanistic and precise manner will likely require that mental health researchers and clinicians pay due respect to their as-yet all too poorly understood learning and computational nature (1).

The motivation for computational approaches has also arisen from the linked explosions in data availability and complexity and the ever-advancing availability of processing power. Vast amounts of data can now be stored cheaply, ubiquitous handheld devices can acquire data quickly, and powerful neuroimaging methods are becoming omnipresent. These developments have led to a veritable flood of data of ever-increasing complexity, raising fundamental issues about the identifiability of a true underlying mechanism given that dimensionality can unhinge statistical procedures. They have rendered necessary the development of novel analytic approaches from machine learning and artificial intelligence that jointly promise an ever more fine-grained view of the functioning of the human mind.

These twin theory-driven and data-driven aspects have hence rightfully propelled computational approaches to the center of our attention. They have gained traction in neuroscience, in psychology, and recently—in the form of computational psychiatry—in mental illness research (2). The rapid increase in the research work using computational methods and the computational questions being asked has given rise to dedicated journals and has been witnessed in the pages of the two journals of the Society for Biological Psychiatry. This increased prominence has motivated the editors of the journals to focus on how to best support his young and promising field.

So, what is missing? First, there is a need for a joint and shared platform for theoreticians, clinicians, psychologists, and neuroscientists. The annual meeting of the Society of Biological Psychiatry has already adapted an annual symposium on computational methods and has given increased prominence to computational work in its plenary lectures, symposia, and contributed work. This journal, *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, is ideally placed to complement that. As an offspring of *Biological Psychiatry*, it is closely associated with mechanistic research into mental illness, but with its focus on cognitive neuroscience and neuroimaging also aims to reach and represent a broad audience of scientists in related fields. The increasing amount of computational work it publishes also puts the *Journal* in an ideal position to further link with the theoretical community.

Second, computational work is often highly technical, giving rise to complex issues [witness the recent discussion around canonical correlation analyses (3,4)]. While many computational analysis packages have greatly reduced the barrier to access the methods, there is also a need to provide a methodological exchange and education platform so that these often-powerful tools can be used well and be improved as needed. Indeed, several courses have sprung up across the globe to satisfy this demand. Third, computational psychiatry is a young field and should learn from the experience of other, more established fields. More importantly, its methods are constantly being reinvented and its best practice is constantly changing, requiring that there be a shared platform to discuss and establish such best practices to ensure the fastest progress.

To address these 3 issues, we have started a new Computational Psychiatry Series consisting of 3 components: regular commentaries on topical issues; in-depth tutorials on novel or important methodological aspects; and articles discussing current or potential best practices. At times, the *Journal* will feature special issues to explore computational topics in mental illness in greater depth. The commentaries, tutorials, and best practice contributions will primarily be solicited, though we will also accept direct submissions and are always grateful for suggestions.

The commentaries will take the form and length of the established commentary series in the *Journal*. The best practice contributions will likely be of the archival report type because we will encourage any recommendations to be supported by theoretical or simulation results. The tutorials will be in the format of reviews, though the inclusion of examples using both simulated and real data in the supplement will be a required feature.

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Article Information

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