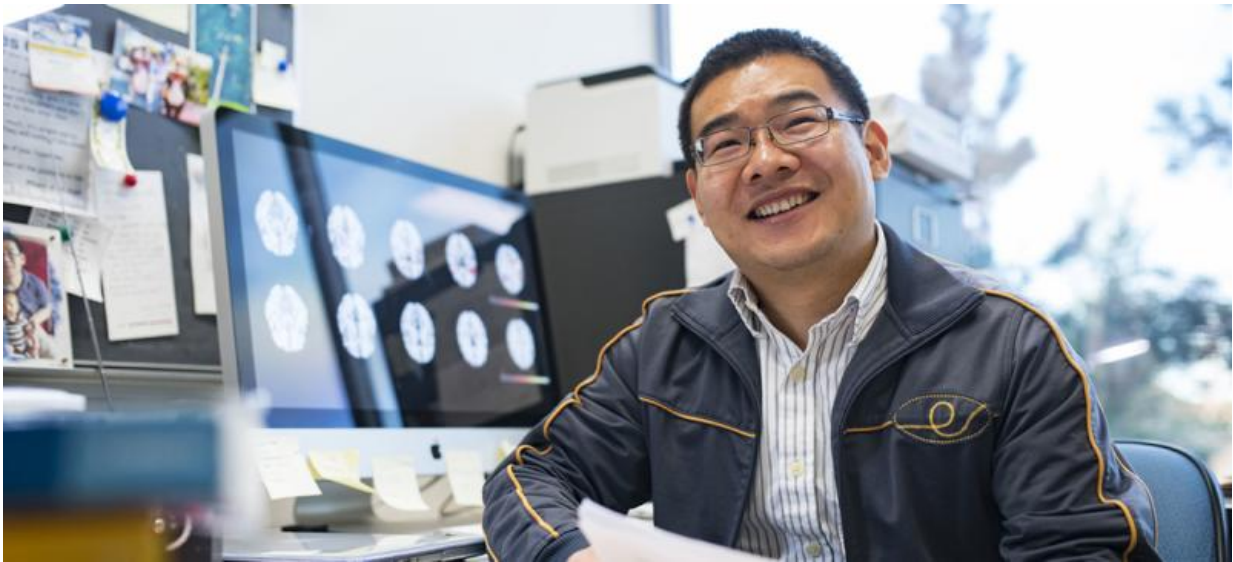


Statisticians step up to aid neurological health research

April 5 2016



Linglong Kong (mathematical and statistical sciences) is the co-lead of a new collaboration of 18 researchers across North America working together to improve the way neuroimaging data is analyzed.

Numbers can tell a story. In the hands of the right reader, it may prove to be a very important one—such as the likelihood of a particular patient developing a neurological disorder like dementia or responding positively to a new treatment for depression or ADHD.

Recent rapid innovations in technology have enabled the unprecedented

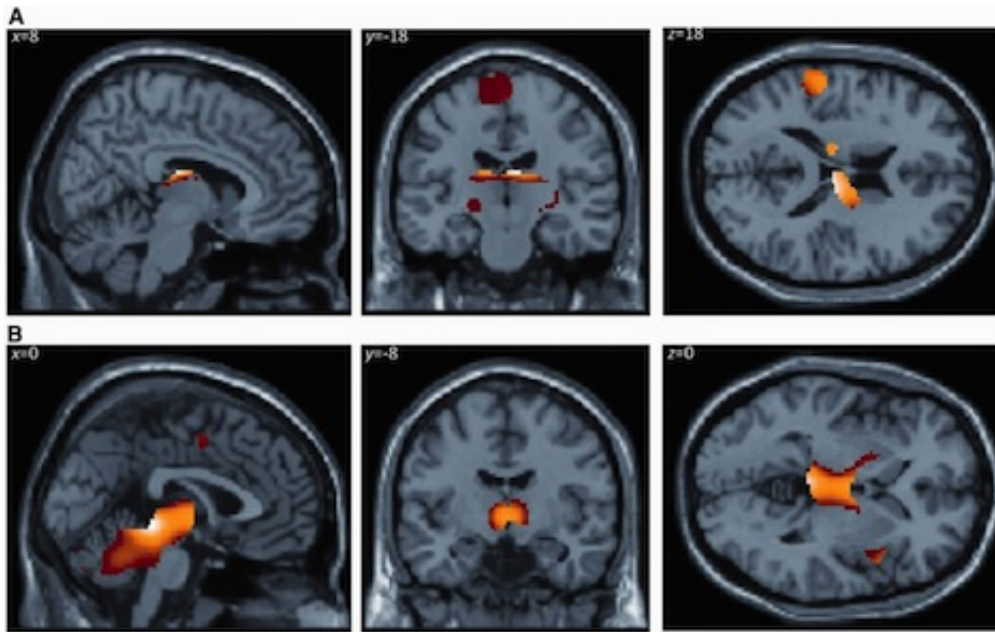
collection of complex neuroimaging data to measure different perspectives on brain structures and functions. This information-rich data offers incredible potential to investigate neurological and psychiatric diseases, trace neural network changes of various disorders and understand the inner workings of the human brain—helping lay the foundation for a future with more precise, patient-specific medical treatment options.

Some of the more complicated problems involve integrating complementary sources of information—such as those that arise from studies that collect data using multiple neuroimaging modalities simultaneously, or studies that aim to combine brain imaging with genomics.

In fact, the data is so dense and so abundant that the challenge now is finding enough experts to make sense of it all.

Building a statistics super-team

Enter University of Alberta statistician Linglong Kong and his new collaboration of 18 researchers across North America. Co-led by Kong and the University of Victoria's Farouk Nathoo, the team comprises statisticians, computing scientists, neuroscientists and biomedical engineers, all working together to improve the way neuroimaging data is analyzed.



"The amount and the complexity of the data have increased the need for new methods and new statistical tools to analyze it," explains Kong, an assistant professor in the Department of Mathematical and Statistical Sciences.

Each member of the team brings a different skill set to the table; Kong is specifically focusing on the joint analysis of imaging and genetic data—for example, looking at possible connections between diseases and particular genes, or how a given area of the brain may be related to mental disorders such as Alzheimer's disease or ADHD.

Another collaborator, computing science professor Russ Greiner, is using computers to find patterns in a process known as statistical machine learning.

"It's a very exciting time to be a researcher. Even if we'd had these really

good ideas 50 years ago, you couldn't do it with a hand calculator." says Greiner. "We've got the algorithms now, and we've got the computer power. I'm very excited by this machine learning approach and finding patient-specific treatments."

The emerging need for qualified experts to disseminate the overabundance of data is reflected in the recent swell of researchers in this area. Just a few years ago, Kong was a pioneer in statistical neuroimaging analysis—one of about a hundred working in that field of statistics. Now he estimates there are more than a thousand.

The project, Joint Analysis of Neuroimaging Data: High-Dimensional Problems, Spatio-Temporal Models and Computation, is funded through 2019 through \$180,000 in Collaborative Research Team (CRT) Project funding from the Canadian Statistical Sciences Institute (CANSSI).

"This area is quite new," says Kong. "One of the goals of our project through this collaborative research is to promote statistical neuroimaging analysis in Canada. Not many people in Canada are doing this work, so by training graduate students and hosting workshops, we can train the next generation of researchers and bring them into this area to boost its development."

Provided by University of Alberta

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