A clash of two cultures

A lack of formal training is hampering Japan's efforts in computational neuroscience, says Robert Triendl.


ATR

Researchers working with Mitsuo Kawato (below) build and run humanoid robots (left) to test their theories on cognitive neuroscience.

In Japan, much like the rest of the world, uniting physics and biology in an effort to understand the brain has been a long process. But there are now signs of a strengthened resolve to combine experimental and theoretical approaches. Masao Ito, head of the RIKEN Brain Science Institute (BSI) in Saitama, sees an advantage in such a combination.

Cellular and molecular approaches can lead to new drugs, Ito says, but they do not help us to understand the brain as a complex system. But a purely computational route could miss potential applications. "I believe the merger of these two directions is what we should pursue in the coming years," Ito says.

Such links are now forming, says Mitsuo Kawato, a computational neuroscientist at the Advanced Telecommunications Research Institute International (ATR) in Kyoto. Research activities within Kawato's group combine experimental research in cognitive neuroscience with computer modelling and the development of robotic model systems. "Humanoid robots help us to verify our theories or to develop new hypotheses while building such devices," he says.

At the BSI, interactions between bench neuroscientists and computer scientists or mathematicians are also developing — albeit slowly. Differences in publication practices and research evaluation remain an important impediment to collaborations between the two camps, says Shun-ichi Amari, a mathematician who specializes in algorithms related to learning and cognition.

A COMMON APPROACH

Yoko Yamaguchi, director of the BSI's Laboratory for Dynamics of Emergent Intelligence, says that successful collaboration between experimentalists and theoreticians requires a shared set of concepts and research tools, such as an experimental model system that provides opportunities for both experimental research and theoretical analysis. But few experimental neuroscientists in Japan have been exposed to computational neuroscience during their training.

Cultural differences also provide an impediment. In Japan, most neuroscientists are educated in medical schools, whereas researchers specializing in such areas as neural networks or machine learning typically have backgrounds in electrical engineering or physics. Apart from a widely acclaimed summer school set up by the BSI, and a similarly successful event run by the Japanese Neural Network Society, there are no dedicated graduate-education programmes in computational neuroscience in Japan.

Employment opportunities for young researchers in computational neuroscience remain limited — there are few university positions, and research tends to be restricted to institutions such as the BSI, ATR or Sony Computer Sciences Laboratories in Tokyo.

WIRED UP FOR THE FUTURE

There are some promising developments at a few of the smaller private universities, such as the Kyushu Institute of Technology in Fukuoka, which established a department of brain sciences and engineering in 2000. But the overall job situation for young scientists in computational neuroscience is hardly encouraging.

There is some hope that the upcoming reform of national universities could provide opportunities to establish new, multidisciplinary graduate schools. But Kawato, who chairs a special committee at the education ministry on multidisciplinary research, says that it won't be easy for computational neuroscientists to find an institutional home in the universities. "In the present funding climate, the first question that government officials ask is always about the economic impact," he says. ■

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RIKEN Brain Science Institute
www.brain.riken.go.jp
Japanese Neural Network Society
www.jnns.org/English
Advanced Telecommunications Research Institute International
www.atr.co.jp/index-e2.html


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Shun-ichi Amari (above) and Yoko Yamaguchi (below) want to link experiment and theory.


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