Gain in pain: Stanford researchers use brain scans, algorithms to ID chronic pain patients

San Francisco Business Times by Ron Leuty, Reporter

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A picture -- and an algorithm -- may be worth a thousand words describing chronic pain.

In a paper published Monday in the journal Cerebral Cortex, Stanford University researchers said computer algorithms read brain scans and predicted with 76 percent accuracy which patients have chronic lower back pain.

The findings are important as pain drug developers and the Food and Drug Administration struggle to find objective ways of measuring pain and how drugs alter all sorts of chronic pain. What's more, the research shows how medicine and algorithms like those used to generate Google search results are intersecting in the Bay Area.

"We're using a lot of this technology developed for other fields and applying it in this
neuroscience area," said Dr. Sean Mackey, chief of the Division of Pain Medicine at the Stanford School of Medicine. "That's one of the things that just makes this area so magical."

Researchers have long known that neuroimaging can show how chronic pain sufferers' brains change over time, but Mackey said no one has classified patterns of change to create algorithms that identify actual chronic pain sufferers.

Researchers conducted MRI scans of 47 people who had lower back pain and 47 healthy subjects, according to Stanford. They then trained a linear support vector machine to create a model to accurately read brains scans in a completely new set of individuals and classify their pain. It did so in roughly three of four chronic back pain subjects.

Mackey's lab last year published research in the journal PLoS ONE that 81 percent of the time accurately read acute thermal pain. But measuring chronic pain could prove especially useful for drug researchers and companies, and the FDA as it tries to assess whether a drug actually is effective.

Yet even Mackey was doubtful going into the study.

"I was convinced we couldn't capture a subjective experience of something like pain," he said. "It's like trying to capture whether someone's in love and using a 'love meter.'"

Hoameng Ung, Mackey's former research assistant and now an M.D./Ph.D. student at the University of Pennsylvania School of Medicine, was the first author on the Cerebral Cortex paper.

Even now, Mackey has concerns about lawyers, insurers and others potentially misusing the technology to enhance or reduce legal pain and suffering awards or denying insurance coverage.

"This technology is not ready in any way to be used in that way," Mackey said.

Also, Mackey said, the goal of the research is not to discard patients' own experiences when trying to determine pain levels. "I see it as potentially augmenting it," Mackey said.

Mackey, who also has a Ph.D. in electrical engineering, said his lab continues to investigate the accuracy of neuroimaging and the algorithm, especially when accounting for things like remembered pain or empathy for pain. Studies have shown, he said, that if one thinks about being in pain, it engages brain systems similar to when experiencing physical pain.

The lab also is looking at telomeres, which are like the plastic caps on the ends of shoelaces, except that they protect chromosomes as they divide.

Telomeres, which have been the focus of the Nobel Prize-winning research of Elizabeth Blackburn at the University of California, San Francisco, appear to shorten...
when people are in long-term stressful situations, like chronic pain -- and if telomeres shorten, cells age.

"Could you combine that information to make your classifier more accurate? That's where this field is going," Mackey said. "Can you use genetic information? Can you use other biomarkers and combine these models? Machines don't care what kind of data you feed it. They're interested in features."

Ron Leuty covers biotech, higher education and China for the San Francisco Business Times.

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