# Brain Researchers Speed Up Science with Thecus Storage

In their research at the University of California, Berkeley, Jack Gallant's team processes a lot of data. By adding an Intel® Atom™ processor-powered Thecus network-attached storage device to their lab, the researchers are getting more science done every day.

Jack Gallant wants to know exactly what's going on in that pretty little head of yours. The professor of psychology and neuroscience at the University of California, Berkeley, is working with a cutting-edge blend of brain imaging and computer simulation to decode the pictures in people's minds.

Using functional Magnetic Resonance Imaging and computational models, Gallant and his team have succeeded in decoding and reconstructing people's dynamic visual experiences. As yet, the technology can only reconstruct movie clips that research subjects have viewed. But, the research could lead to reproducing dreams and memories and even understanding what goes on in the minds of people who cannot communicate verbally, such as stroke victims, coma patients, and people with neurodegenerative diseases.

## Slow Data Access Speeds Caused Headaches

Gallant's research generates gigabytes and gigabytes (GB) of data. Plus, rather than using commercial software to analyze that data, Gallant's team writes its own, so researchers are not only analyzing data but constantly writing and testing code.

The team uses giant server farms in the university's data center to perform this processing and store most of its research data. But researchers are constantly moving chunks of this data onto a server in their lab for local processing and analysis. That's where their research hit molasses.

The team stored the data in the lab on standard magnetic disk drives. However, these drives were frustratingly slow when processing reams of data for up to 20 researchers at a time.

"Our drives had about a 4-millisecond lag time, which sounds spectacular," says James Gao, graduate student and research assistant for Gallant. "But when you have 15 people running code constantly, you see latencies of up to 15 or 100 milliseconds. Researchers often had to wait for 15 minutes just to load a program or two hours to process data. Every day, people were screaming at me that they couldn't get any work done because the data access times were so slow."

## High-Speed Storage Solution

In early 2012, Gallant's lab received a Thecus N5200XXX network attached storage (NAS) device based on the Intel® Atom™ D525 processor. The Thecus unit that Gallant's team uses contains five bays with 1.2 terabytes of storage capacity using modern solid-state drives.

## Faster Data, More Science

Gao set up the Thecus unit himself in a couple of hours and moved all the team's data onto it. The performance improvement: phenomenal.

The Intel Atom processor combined with 1 GB of DDR3 RAM delivered incredible transfer speeds. Whereas before, the team was experiencing latencies of up to 100 milliseconds per read/write access, the Thecus unit served up data within 150 microseconds. "The Thecus NAS is out-of-the-ballpark better than magnetic media," Gao says. "It has greatly improved our random read/write access times."

What does this speed up mean for brain research? Programs load instantaneously rather than taking 15 minutes. Large processing jobs take 30 minutes rather than two hours. "Faster data access increases research throughput, plain and simple," Gallant says. "With science, you don't have a bright idea that works immediately. You go through a painstaking iterative process whereby you test and retest your model. The faster you can run this loop, the more science you can do."

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>
> – James Gao, graduate student and research assistant, The Gallant Lab, University of California, Berkeley
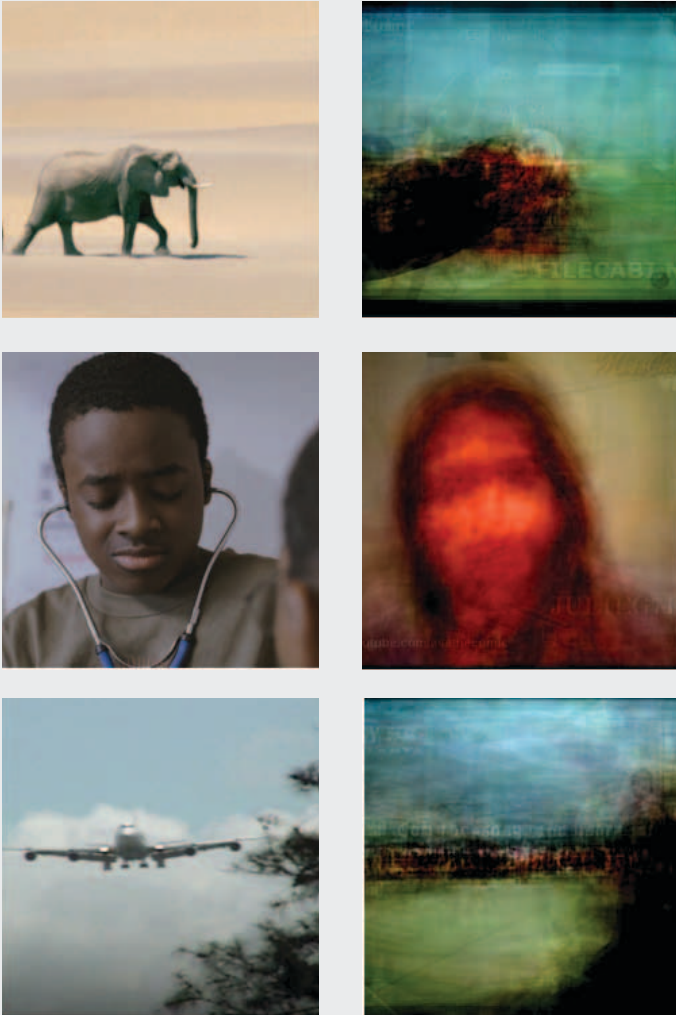
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## Easy to Expand, Access Remotely

Gallant's team is adding data at a rapid rate, and the researchers will be able to easily add another Thecus unit or swap in higher capacity drives to accommodate their needs without the expense of constantly adding servers. "A ten-minute MRI session generates up to 50 GB of raw data," Gallant says. "The more storage space we have, the more science we can do."

The team can also access their data and code from home, from a conference, or from any remote location. They use the Thecus NAS for nightly backups, backing up data to magnetic media.

"The Thecus device has made everything so much faster and made my life so much easier," Gao says. "Everyone on our team gets more work done. And no one yells at me about technology anymore."

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– Jack Gallant, Professor of Psychology and Neuroscience, University of California, Berkeley

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