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AI-Powered Pathology via HPC Helps Improve Patient Outcomes

How PathAI Leverages Advanced Technology to Support Pathology and Help Enhance Treatments and Outcomes.

Customer profile

PathAI

HPC | United States

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"With technology, pathology's important job in research and the future of clinical medicines being completely transformed. That's why we needed a Dell Technologies solution that supports scalability and enables pathology's next frontier."

Andy Beck
CEO, and co-founder at PathAI

Business needs

PathAI is bettering patient outcomes by transforming pathology. Via HPC technology in a new hybrid cloud platform, PathAI provides AI powered tools to support pathology. This transforms more subjective, heterogeneous analysis to a data-driven approach, helping generate objective patient diagnoses, effective treatments and creating a healthier future for all.

Business results

- Increased processing speed by 3-4X on HPC on-premises versus public cloud
- Significantly lowered operating costs
- Gained 24/7 GPU access and operability
- Achieved scalability for future expansion

Solutions at a glance

- PowerEdge R750xa, R750xs, DSS8440, R740xd, R640 servers
- ArcaStream PixStor software
- PowerVault ME4084 storage

PathAI is on a mission to improve patient outcomes with AI-powered pathology. Its focus is on pathology, known as the "ground truth of medicine." Through HPC technology, PathAI is revolutionizing pathology from a subjective approach to a deeper, objective and more precise one that helps patients receive accurate diagnoses and effective treatments. This AI-powered pathology, enabled by cutting-edge Dell HPC systems, delivers a breakthrough competency that strives to create a healthier future for all.

PathAI is using AI-powered pathology to help solve big healthcare challenges, such as tackling cancer and other serious diseases, with improved diagnostic accuracy, treatment efficacy and new drug development. Recently, PathAI upgraded its technology – designed and delivered by Dell Technologies – from public cloud to a hybrid cloud HPC environment to cost-effectively scale its AI-powered pathology capabilities. The HPC system is delivering significant operational improvements such as 3-4 times faster processing speed, 24/7 immediate access and decreased operational costs. In turn, these performance upticks deliver more accurate results, faster, to patients and life science companies, a crucial need when managing time-sensitive health concerns.

Based in Boston, Massachusetts, PathAI is delivering AI-powered research tools and services to support next-level pathology – for patient diagnoses and new drug developments. Dell Technologies is a key enabler of PathAI's toolkit, while PathAI works with leading life sciences companies and researchers to elevate healthcare precision and results.

Pathology's next frontier

As a patient, dealing with a serious disease is difficult. Increasing curability can help and pathology is the linchpin. Pathology is used when a doctor needs to go beyond typical science and symptoms and look at a patient tissue sample to make a final diagnosis. A pathologist's analysis is the most important diagnostic information in determining the next set of patient treatments, thus it's critically important to get right. Via AI-powered pathology, each patient can gain access to a better diagnosis and a recommended therapy with the best chance of curing the disease.

At the same time, pathology is ripe with opportunities for improvement and untapped potential. Traditionally, manual pathology is used to analyze tissue samples. It is fraught with subjectivity and inconsistencies that can negatively impact diagnoses and drug developments. In addition, a tissue sample is information-dense, containing hundreds of thousands of cells and dozens of different cell types organized in different tissue regions. A pathologist can only process a very small fraction of these cells and doing so takes time.

AI and deep learning systems can classify every component of the tissue sample accurately and quickly, based on a broad range of global knowledge. AI-powered pathology then delivers data in a structured format to pathologists or researchers to help them make more precise diagnoses or better understand the biology of a disease. "Every sample contains far more information than any human can process," says Andy Beck, CEO, and co-founder at PathAI. "Pathology plays an important role in research and the future of clinical medicines. Technology completely transforms pathology and what's possible. That's why we needed a Dell Technologies solution that supports scalability and enables pathology's next frontier."

Technology's role in transforming pathology

Technology plays a vital role in pathology's future. Many of the big challenges in preparing for pathology's larger-scale transformation are based on large data sets; storing them, moving them and learning from them in a reliable, predictable way. That's because within each information-dense tissue sample, technology images every single cell for analysis, with hundreds of thousands of cells per sample. The result? Huge data sets for training very large models, or algorithms, reliably and quickly.

Training the algorithm. PathAI works with hundreds of pathologists around the world, using their expertise to train the algorithms. Those pathologists provide examples and, in aggregate, millions of those examples help train the system. Training at scale creates big opportunities along with big computational challenges.

Deploying the algorithm. Once the algorithm is trained, it's ready for deployment. Within deployment, each location in an image is analyzed for patterns and identification. As deployment scales, hundreds of thousands of objects need to be analyzed per sample and hundreds of thousands of samples need to be processed per day. Deployment at scale also creates big opportunities and big computational challenges.

Designing the right system to manage these computational demands is a must-have. PathAI needed to upgrade for two primary reasons. First, it was cost-prohibitive to have cloud-native technology, especially in the face of scaling

larger. Second, GPUs were not always available to run big jobs in the cloud, limiting PathAI's ability to generate customer insights on demand. Thus, PathAI decided to build its own HPC cluster. "The Dell Technologies HPC solution got our jobs running 3-4 times faster versus the cloud. And, GPU capacity is available on demand 24/7. Our costs are now controlled and we are ready for future expansion at scale," shares Don O'Neill. VP of Engineering and Security at PathAI.

From public to hybrid cloud

Since its launch six years ago, PathAI has been working in the public cloud. So, it was a big deal to consider going from public cloud to a hybrid cloud environment. Today, with the new HPC system allows PathAI to run jobs on both the data center cluster and in the cloud, with dedicated links between them.

"When we move to hybrid cloud, we had a lot to learn. Dell helped us immensely and their HPC expertise was invaluable. Then, we started running our workloads in our new environment and were absolutely blown away by the performance," states O'Neill. "For our core business, hybrid cloud just makes more financial sense. And as we discovered, it makes more business sense to have your own dedicated resources that are available for you 24/7/365 that are significantly cheaper and significantly faster. It gives us a distinct advantage."

Working with Dell Technologies, PathAI was able to find a solution to store data on a very high-speed storage tier, so that data can be moved from storage onto PowerEdge servers with Intel® Xeon® Scalable processors and GPUs quickly and train and run inferences much faster. PathAI deploys a hundred-gigabit network for moving large amounts of data around to the GPU. "We had tried all sorts of techniques to speed things up on the cloud, but it really wasn't designed for what we are doing," says O'Neill.

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It's about better treatments and outcomes

The PathAI platform, powered by Dell Technologies, is an ideal example of advanced technology working to improve humankind. When it comes to healthier patient outcomes, the speed and performance of the technology also matters. In one example, upon completion of a clinical trial, PathAI was asked to generate insights on whether or not the therapies were going to generate a favorable outcome. PathAI provided those insights in record time. "I'm pretty sure we wouldn't have been able to rapidly provide those insights if it hadn't been for the availability of the HPC cluster in our data center. It was ready to roll, available to run 24/7 and it was significantly faster than what we did before. When you're impacting lives, that's a really important outcome," says O'Neill.

What's next for PathAI? Plans are to continue to grow the PathAI cluster. "We are deploying additional GPUs at the moment and we hope to have that capacity coming online soon. In addition to the performance boost, we also got about two years runway without having to add any additional capacity," shares Beck. "And, operating much more efficiently and faster versus being on a public cloud has been great. It cost us less than we had anticipated, so it was an even better return on investment. Dell's expertise and collaboration were and are of huge value to us."

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