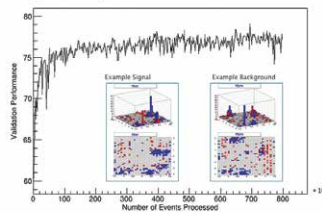Signal Image Classification Performance

Processing Power

Hughes leverages HPC in research, classroom, business

Richard Hughes, Ph.D., has an impressive resume in the world of physics: He was a leading member of the team that discovered top quark, contributed to the search for dark matter in the Milky Way halo, was an integral part of the discovery and study of the Higgs Boson at the Large Hadron Collider—oh, and has founded his own company and is also a professor of physics at The Ohio State University. Typically, Ohio Supercomputer Center (OSC) users fall into one of three categories: academic research, classroom use or industrial. It should come as no surprise that Hughes has leveraged OSC for all three purposes.

Hughes first started using OSC a decade ago when his high-energy physics research required more resources than the local department resources could provide. Several years later, Hughes took an interest in machine learning and, again, needed more resources than he had locally.

"A student and I started to look at various tools that were available at OSC and whether they would work for us, and it seemed like they would," Hughes said. "That was incredibly successful. That's where I really learned how to attack machine learning problems at a really large scale. I got a lot of experience with using GPUs which I had never used before."

OSC also provided a license for the MATLAB software that Hughes could use, as well as Python. As he gained more experience with machine learning through his own research at OSC, Hughes was tapped for an outside consulting project by his sister Stephanie Hughes, an expert in strategy and competitive intelligence and professor and chair of the management department within the Haile US Bank College of Business at Northern Kentucky University.

Together, the two founded Chapel Hill North (CHN) Analytics, a company that does text-based analytics. Hughes' machine-learning expertise translated well, from looking at millions of records containing numbers to millions of documents with text. Again, Hughes began running low on processing power on his local computing system and started wondering what he could do to manage the data—now from an industry standpoint.

"I knew that I could do a lot of the things I wanted to do at OSC, but I couldn't do them because it wasn't research work," Hughes said. "I just started searching the (OSC) website wondering if they had some sort of industry program—and they did!"

Hughes worked closely with OSC's Chase Eyster, business development manager, and Alan Chalker, Ph.D., director of strategic programs, to ensure he was using the right resources for his company so he could focus on the business rather than the computational side.

FIGURE // Richard Hughes and a student leveraged OSC resources to do image classification.

"It seemed too good to be true. I found out that not only is it something they encourage, they're incredibly helpful," Hughes said. "It really is an advantage for Ohio companies to have access to this kind of computing power."

Hughes is also introducing the future of Ohio's companies to this computing power in his classroom. The head of the physics department at Ohio State approached Hughes about creating an introduction to machine learning course with practical applications in mind. His original plan was to have students install a Python environment on their laptops, but he realized that could create a headache with all the different platforms students use.

"As I got closer to the startup of the class, I began to panic," Hughes said. "It's usually a complete disaster trying to install software on all these different platforms. I thought, you know, maybe I could do it at OSC, but then the problem is I have to teach students how to operate within the OSC environment."

Hughes started the class using a Google service, which was not ideal. Then a colleague told him about OSC's OnDemand platform. Hughes immediately switched the class over, with help from OSC's education and training support team. Hughes could focus on the material and not have to worry about installing programs or the environment.

"I have to admit I was a little worried because you know I'm thinking this could be a complete train wreck, but once again I had so much support from OSC," Hughes said. "I'm going to teach this class again in the fall, and I'm going to start out from day one with the OnDemand setup. I'm really looking forward to it, because it made my life as an instructor incredibly easy." •

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> — *Richard Hughes, Ph.D.*
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FIGURE // Richard Hughes and sister Stephanie Hughes, co-founders of Chapel Hill North Analytics, have a team there conducting text classification work exemplified by the illustration above, Technology Mapping using Graph Analytics.