HPC for Early Cancer Detection

The Department of Psychology and the Research Computing team at the University of York leverage High Performance Computing (HPC) and Machine Learning (ML) to seek out 'nonlocalizable global markers of cancer' through the rigorous testing and refinement of neural network models on public cloud.

"Our Research Computing team at the University of York strives to make HPC available to all research subjects. Thanks to our work with the Alces Flight team we are continuing to expand these services into public cloud, utilising the Flight Control toolset to allow researchers to seamlessly engage with supercomputing resources at the right time, scale, and cost that suits their project needs."

Dr. Emma Barnes,
University of York

Business Need

The Research Computing team at the University of York collaborated with the Department of Psychology to develop and refine neural network models in cancer screening and diagnosis. With a requirement for interactive processing capabilities the project team looked to add on-demand public cloud resources to their robust existing on-premises HPC service. To succeed, the team needed a solution that would integrate on-demand and persistent compute platforms, deliver rapid-deployment services to help build out their desired plan, and provide consistency in managing cloud resource availability and spend.

Solution

The University of York turned to Alces Flight to build and manage a public cloud component as part of their existing managed services agreement. Additional scaling, cost forecasting and budget control in the cloud was provided through the Alces Flight Cloud Cost Visualiser (Flight Control) software tool. The interactive Flight Control web-interface allowed the research team to easily engage with public cloud based compute and GPU resources to rapidly progress work on their models.

Benefits

- Centralized management of the complete HPC solution portfolio
- Ability to control and forecast public cloud resource availability and scalability
- Quickly establish spending limits to prevent budget overrun
- Simple, secure connectivity between on-premises and cloud-based research environment

Solution at a glance

- Managed HPC Services
- Machine Learning / Deep Learning
- Scalable, on-demand job automation
- HPC on public cloud

The Department of Psychology and the Research Computing team at the University of York have taken on the challenge to understand how clinician's minds often notice the "nonlocalizable global markers" of cancer in in x-ray imaging or mammography and if, through the use of neural networking models, they can replicate this ability in order to increase capability for early cancer detection. To achieve this goal the team leverages HPC and machine learning via extensive testing and refinement of neural networking models in cancer diagnosis.

> "Our project required a lot of interaction with the models we were testing and refining. Thanks to Alces Flight and Flight Control being able to forecast and control our resources and budget meant we were able to focus on research that may benefit early cancer detection."
>
> Dr. Karla Evans,
> University of York

"The human mind is a wonderful thing," says Karla Evans, Associate Professor, at the University of York. "Our minds have this uncanny ability to see patterns in every input, be it speech or images. However, through years of seeing and comparing thousands of images and tuning the visual system to the natural occurring patterns we have this ability also to pick up important differences, including signals that something might be wrong. The question is, can we train machines to help us find those signals faster and at scale so we can do something about it? This is the premise behind our cancer research project - utilising HPC and ML to locate markers that trained clinicians notice at scale so we have the potential to treat people much sooner."

Building this early cancer detection project meant the University of York's HPC services needed to undergo a public cloud expansion. "We want our researchers to have access to the right resources at the right time," explains Dr Emma Barnes, "In order to achieve their goals the team at the Department of Psychology needed to work interactively with their models at scale. We turned to Microsoft Azure to add this functionality and the team at Alces Flight to bring this capability into our already existing HPC service portfolio."

Leveraging on-demand technologies
"We needed to be really thorough with the design and testing of the neural network models," said Karla, "This meant that my lead researchers needed to create an environment that not only investigated the models, but the imaging data also needed to be organised so that every run could be seamless. Thanks to working with Alces Flight we were able to log cases to rapidly build out our work, explore options with what Azure resources were on offer, and then - once we had decided on what instances to utilise - we were able to control when and how much we spent towards each training run. Creating this type of process was invaluable to us and has allowed us to really stretch out our budget to get the most from public cloud."

Ready for flight
The team at Alces provides a managed HPC cluster service for the University of York which encompasses both their on-premises and public cloud resources. This service reduces day-to-day management burdens and enables the research teams to focus on rapidly progressing projects through key milestones, laying the foundations for future work.

"We wanted the Research Computing team to be able easily integrate projects such as these within their already existing services," said Cristin Merritt, Program Manager for Alces Flight, "We also didn't want them to have to take on the pressure of having to manage cloud resources or budgets. This is why Flight Control is an integral part of their public cloud management strategy. With Flight Control it is easy to allocate the what, when, and how much a project utilises; providing this level of control and safety allows the team at York to get the most from public cloud."

"The ability to rapidly spin up additional HPC capacity is essential if we are to meet our sustainability goals and our research objectives. However, that needs to be coupled with ease of use and effective cost management if it is to challenge traditional ways of working, and Alces have delivered both here, with great results." said Richard Fuller, Assistant Director of IT-Infrastructure at the University of York.

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