**Washington University – Oct. 1**

**Schedule:**

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| **WashU Research Compute Services Seminars****EPNEC Conference Center****Level 2 Seminar Room B** | Start Time | Duration Minutes |
| **Morning Technical Seminars** |  |  |
| Introduction to new Research Infrastructure Services by WashU | 8:30am | 10 |
| •         **Introduction to Machine Learning - NVidia** | 8:40am | 45 |
| •           **Introduction to Deep Learning - NVidia** | 9:25am | 45 |
| * Break – beverages provided
 | 10:10am | 10 |
| •            **Enabling AI/ML Outcomes - Dell Technologies** | 10:20am | 55 |
| •         **Clara – AI for Medical Imaging and Genomics - NVidia** | 11:15am | 55 |
| * Lunch – light lunch provided
 | 12:10pm | 50 |
| **Afternoon Developer Seminars** |  |  |
| Introduction to new Research Infrastructure Services by WashU | 1:00pm | 10 |
| •            **Software Programming for GPUs - Three Approaches - NVidia** | 1:10pm | 120 |
| * Break – beverages provided
 | 3:10pm | 10 |
| •            **Python Programming for GPUs - NVidia** | 3:20pm | 60 |
| *Post Event Networking on Level 2* | 4:20pm | 5pm |

**Seminar descriptions:**

**Introduction to Machine Learning**

Data Science has a wide range of tools for examining data, solving problems, and developing learning models using patterns and inference. Deep learning (DL) is really focused on using Neural Networks for accomplishing these goals. On the other hand, machine learning uses other types of algorithms to achieve the similar results. Tools include supervised and unsupervised learning, regressions, classification, feature learning, and dimensionality reduction. Even Descriptive Statistics such as minimum, maximum, various averages, media, mode, and so on, are used in machine learning for better understanding the data.

Historically, machine learning algorithms ran on CPUs, but scientist and engineers were looking for higher performance to allow them to make more than a few training runs per day, and with even larger data sets. Let’s face it, data sets never get smaller, so they needed a technology that would accelerate the computations. Running these algorithms on GPUs is a game changer. It can change the way scientist think and function when analyzing data.

**Introduction to Deep Learning**

Scientists in both industry and academia have been using GPUs for AI and machine learning to make groundbreaking improvements across a variety of applications including; image classification, video analytics, speech recognition, and natural language processing. Deep Learning is an area that has been seeing significant investment and research. Deep Learning uses sophisticated, multi-level “deep” neural networks to create systems that can perform feature detection from massive amounts of unlabeled training data. –.

Although AI has been around for decades, two relatively recent trends have sparked widespread use of Deep Learning within AI: the availability of massive amounts of training data, and powerful and efficient parallel computing provided by GPU computing. Early adopters of GPU accelerators for deep learning have come from across all fields including healthcare, automotive, financial service, manufacturing, web and social media. They are driven by the work of top tier research institutions in data science and deep learning. With thousands of GPU computational cores and 10x to 100x application throughput compared to CPUs alone, GPUs have become the processor of choice for processing big data for data scientists.

**Enabling AI/ML outcomes with Dell Technologies**

[Dell](https://www.dellemc.com/en-us/solutions/artificial-intelligence/index.htm) customers are expecting guidance from us on building the framework for their AI journey. What does this entail? In this session we will highlight the questions customers should be asking before approaching Machine Learning strategies for their organization, the importance of quality data in fueling AI engines and how you are storing it, and the Infrastructure decisions around AI/ML based on the problems you are trying to solve.

**NVIDIA Clara**
[NVIDIA Clara™](https://news.developer.nvidia.com/nvidia-clara-platform-augmenting-radiology-with-ai/) is a collection of healthcare specific developer tools built on NVIDIA’s compute platform aimed at accelerating data acquisition, analysis, and data integration. Healthcare industry has been generating massive amounts of digital data, and Artificial Intelligence has allowed for this data to be integrated and analyzed in new ways, generating deeper insights. NVIDIA Clara™ aims to provide access to technological advancements in hardware and software for developers across medical imaging and genomics to accelerate the future of medicine.

**Software Programming to use GPUs - Three Approaches**

Writing applications that take advantage of GPUs to improve performance can be done in many ways. This workshop presents three approaches to GPU application development that begin with the easiest approach to the most flexible, but most challenging approach.

**The first approach**, which is the easiest approach, can be as simple as replacing CPU based libraries with the equivalent [NVIDIA GPU libraries](https://developer.nvidia.com/gpu-accelerated-libraries). This can be done for many languages such as Python, Julia, C/C++, FORTRAN, and others.

**The second approach** uses OpenACC to port applications to use the GPU. [OpenACC](https://developer.nvidia.com/search/site/OpenACC) is a "descriptive" approach to GPU applications because you describe to the compiler what you want done on the GPU, and the compiler creates the code for you. You can also use OpenACC for targeting code to run on the CPU using all the cores.

**The third approach**, using [C/C++ or FORTRAN](https://developer.nvidia.com/pgi-accelerator-fortran-and-c-compilers), gives you the most control over your application but requires the most work. Using [CUDA](https://developer.nvidia.com/cuda-zone) you can write your application to take advantage of the huge parallelization potential of GPUs.

This workshop is a great way to learn how to start programming for GPUs. You only need some knowledge of programming in a language.

**Python Programming for GPUs**

Python is quickly becoming one of the most popular language in technical computing. For Deep Learning and Machine Learning it is arguable the “lingua franca” of that world. Creating [Jupyter Python](https://developer.nvidia.com/how-to-cuda-python) notebooks both in teaching and research is fast becoming the way of delivering information. It’s also a way of creating reproducible data which is a very important topic in the scientific computing world.

There are some tools for running Python code on GPUs or porting Python code to GPUs, but the landscape has been scattered for years. Many of the tools are no longer supported or developed and some require the purchase of commercial packages that no longer exist! But the good news is that in the last year or so, the GPU-Python world is changing and there are some excellent tools for utilizing GPUs.

The workshop only requires a basic working knowledge of Python or similar language, but the discussion will be focused on Python.