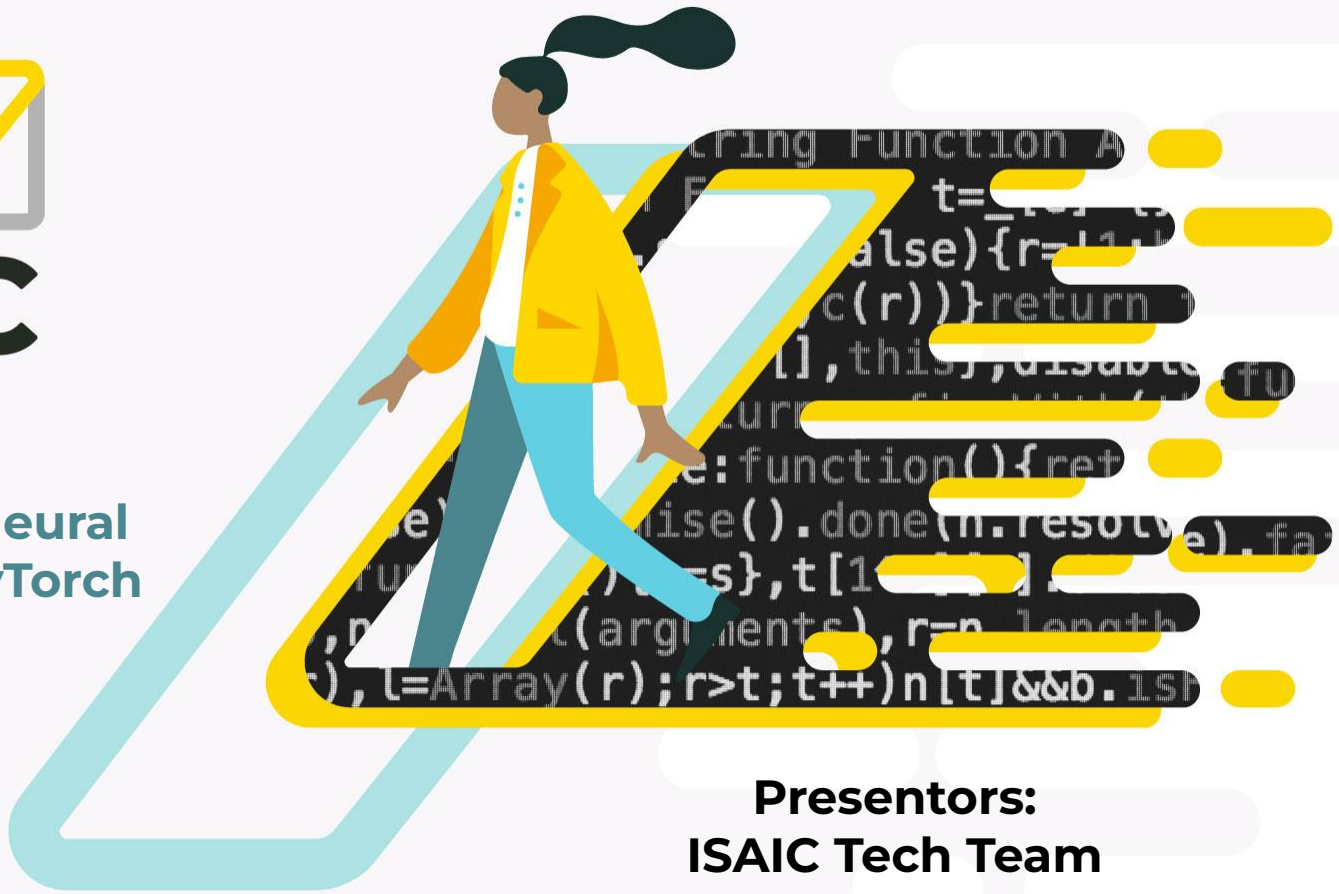
ISAIC

Industry Sandbox
& AI Computing

Introduction to Neural Network using PyTorch



DATE:

Presentors:
ISAIC Tech Team

Today’s Discussion

- **Who we are and more about ISAIC?**
- **What is Artificial Neural Network?**
- **Introduction to PyTorch**
- **Tutorial**

ISAIC is powering the A.I.mbition in Western Canada

- **Small to medium size start ups**
- **Accelerate AI adoption and commercialization**
- **By abstracting away hardware management**

We offer High-performance Computing Virtual Machines

- **At ISAIC, we offer different flavours of high-performance VMs that come preconfigured and specifically tailored to their needs**
- **Our services come with 1 to 8 GPUs and up to 64 CPU cores with 512GB RAM**
- **Our offerings come ready with AI tools including newest libraries from TensorFlow, Torch, & Keras**
- **We offer in-person expert consultation to our clients and help them through their AI journey**

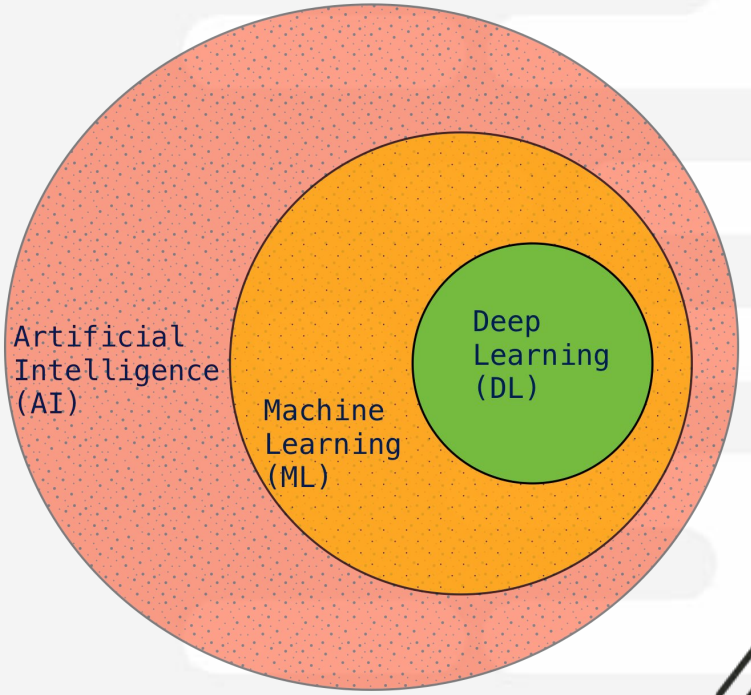
Today, we will see how ISAIC creates and uses VMs for our clients

- **What is a Virtual Machine?**
  - **Through virtualization we can divide existing hardware resources into multiple machines and create virtual hardware that our Operating Systems run on .....**

- **Let’s set aside the technical terminology and definition and take a look at virtualization from an operational point of view**

What is Artificial Neural Network?

- **Artificial Neural Network (NN) is a part of Deep Learning algorithms**
- **Inspired by working principle of biological neurons in animal brains**
- **Data driven statistical inference**
- **Requires large volume data**
- **Transforms input data to very high dimensional abstract space through complex model architecture**



‘Vanilla’ Neural Network

- **Simplest form of ANN structure**
- **Consists of input, hidden and output layer**
- **Philosophy of “Neurons that fire together, wire together”**
- **Relies on Stochastic Gradient Descent**
- **Advancement of auto differentiation and computing power enables us to build such models**

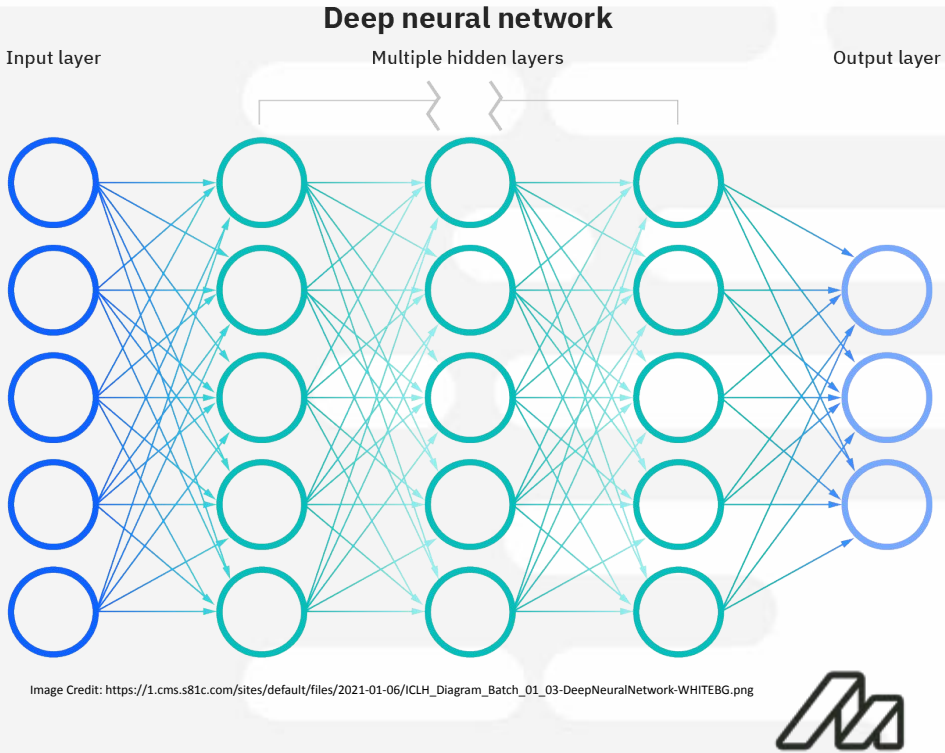


Image Credit: https://1.cms.s81c.com/sites/default/files/2021-01-06/ICLH_Diagram_Batch_01_03-DeepNeuralNetwork-WHITEBG.png

Introduction to PyTorch

- **Open source ML framework**
- **Developed by Facebook and built upon Torch library**
- **torch.tensor stores and processes multi-dimensional data in very efficient way**
- **torch.autograd provides auto differentiation engine to perform stochastic gradient descent**
- **APIs are intuitive, easy-to-use for ML project development**

Introduction to `torch.tensor`

```
In [18]:  1 torch.linspace(0,10,10)

Out[18]: tensor([ 0.0000,  1.1111,  2.2222,  3.3333,  4.4444,  5.5556,  6.6667,  7.7778,
                  8.8889, 10.0000])

In [19]:  1 np.linspace(0,10,10)

Out[19]: array([ 0.        ,  1.11111111,  2.22222222,  3.33333333,  4.44444444,
                 5.55555556,  6.66666667,  7.77777778,  8.88888889, 10.        ])
```

Advantages over NumPy Arrays

- **torch.tensor handles data very similarly as NumPy arrays, and can be converted to back and forth**
- **Unlike NumPy arrays, torch Tensors can be computed on other devices such as GPUs, TPUs**
- **Torch Tensors hold additional placeholder for gradients calculation**
- **PyTorch neural network modules are designed to work efficiently on torch Tensors**