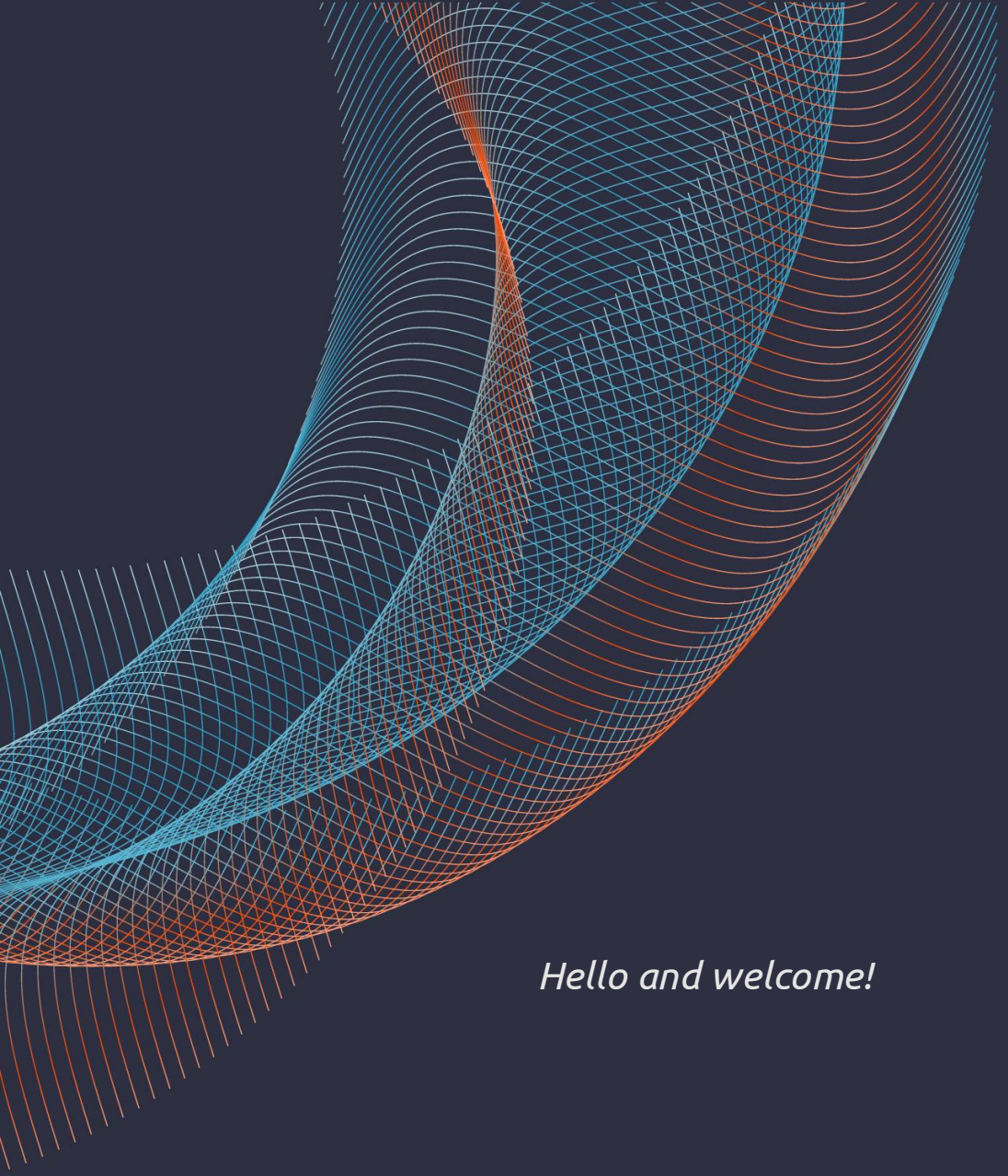

A Taste of
New Learning Programs



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Cloud Native Machine Learning Overview

Hello and welcome!

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AGENDA

INTRODUCTIONS

COURSE OVERVIEW

A FLAVOUR OF THE COURSE

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Introductions

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INSTRUCTOR – FRANK CALLALY

frank.callaly@neueda.com

Senior Technical Instructor

- Agile Software Development
- Python for Data Science
- Data Engineering Systems
- Machine Learning Applications

Qualifications

- BSc Electronic & Computer Engineering
  - National University of Ireland, Galway (NUIG)
- Senior Researcher NUIG
  - A/V Compression Techniques
  - Neural Network Applications
  - Si-Elegans AI Project
- Development Tech Lead

Key Technical Competencies

- Python, Java, C, JavaScript
- Web Applications
- Visualisation for Data Science
- Big Data Technologies
- Cloud Architectures
- Applied Machine Learning

Business Domains

- Web Applications
- Mobile Telecoms
- Consumer Electronics Applications

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Course Outline:

Cloud Native Machine Learning

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COURSE MODULES & HIGHLIGHTS

Module 1 Docker, K8S & Helm Essentials 3 x ½ days	Module 2 ML with Python & Keras/Tensorflow 3 x ½ days	Module 3 Cloud Native ML Deployment 2x ½ days
• Creating and managing containers • Multi-stage builds • K8S Architecture • K8S Networking • Using Helm	• Key Machine Learning Techniques • Artificial Neural Network Architecture • Effective Use of Keras/Tensorflow • Convolutional Neural Networks for Image Processing • Reinforcement Learning & Generative Adversarial Networks in Python	• Distributed Model Training with Tensorflow • Using Tensorflow Serving for production deployment of ML models • Automating complex ML workflows on K8s with KubeFlow

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KEY LEARNING OUTCOMES

- Understand the key concepts, tools & technologies involved in building Cloud Native Machine Learning applications.
- Create and manage containerised workloads with Docker, Kubernetes and helm
- Build complex ML solutions with Python & Tensorflow
- Automate and run ML training and deployment workloads on Kubernetes with Tensorflow Serving and KubeFlow

A Flavour of Course Content

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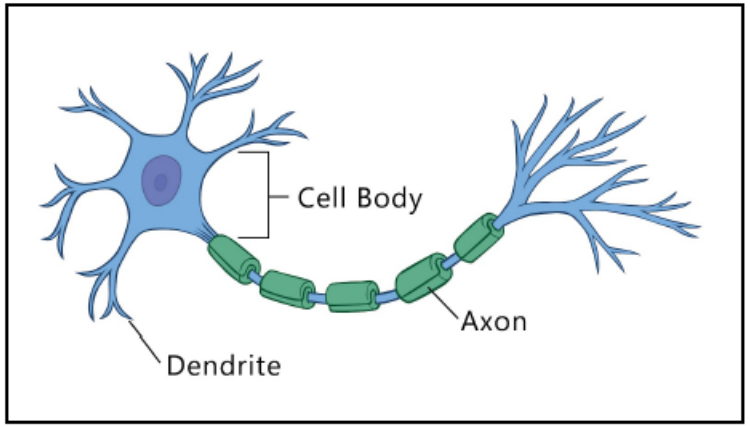
NEURAL NETWORKS INTRODUCTION

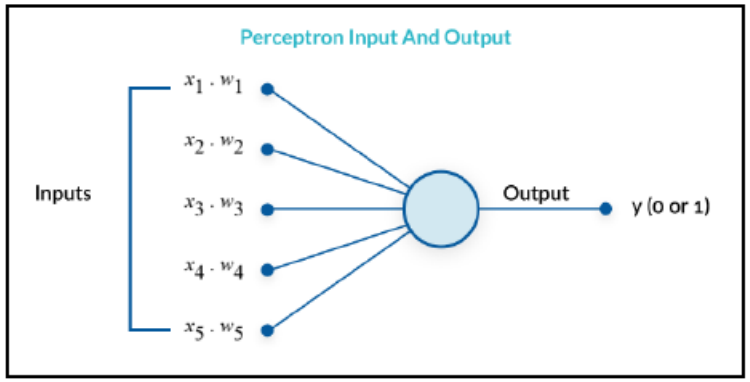
Biological Neurons

- Receive information from other neurons
- Aggregate this information via changes in cell voltage at the cell body
- Transmit a signal if the cell voltage crosses a threshold
- This can be received by many other neurons in the network



The Perceptron

- The words first artificial neural network, developed in 1950's by Frank Rosenbutt
- Receives inputs from other neurons
- Aggregates those inputs (weighted sum)
- Generates an output if the weighted sum crosses a threshold which is sent to other neurons in the network



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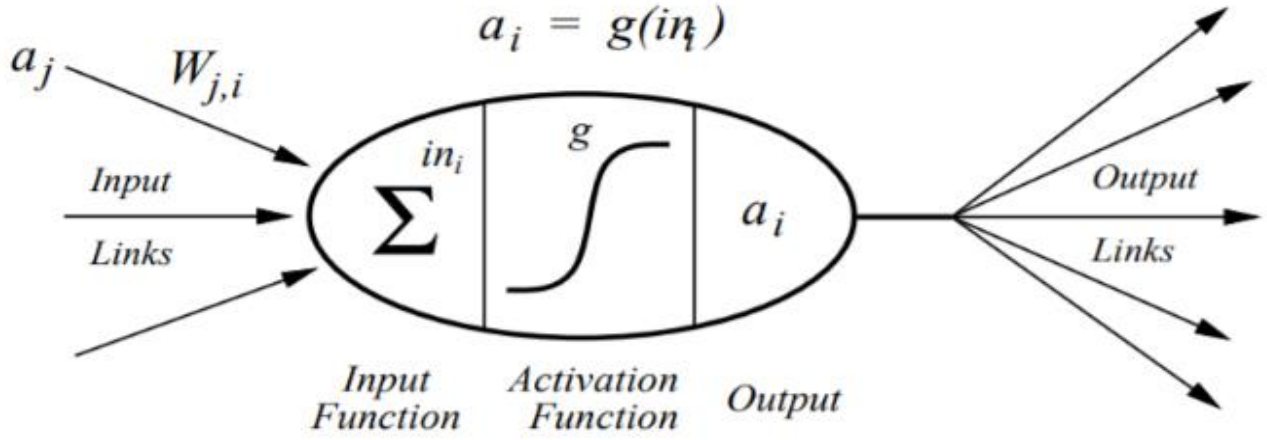
NEURAL NETWORKS INTRODUCTION

Artificial Neural Networks

- A perceptron is used as a single processing unit of a neural network
- In many ways a perceptron can be thought of as a "binary classifier" - it can identify the "class" of input
- Networks of these artificial neurons can perform complex classification and regression problems



$$a_i = g(\sum_j W_{j,i} a_j)$$

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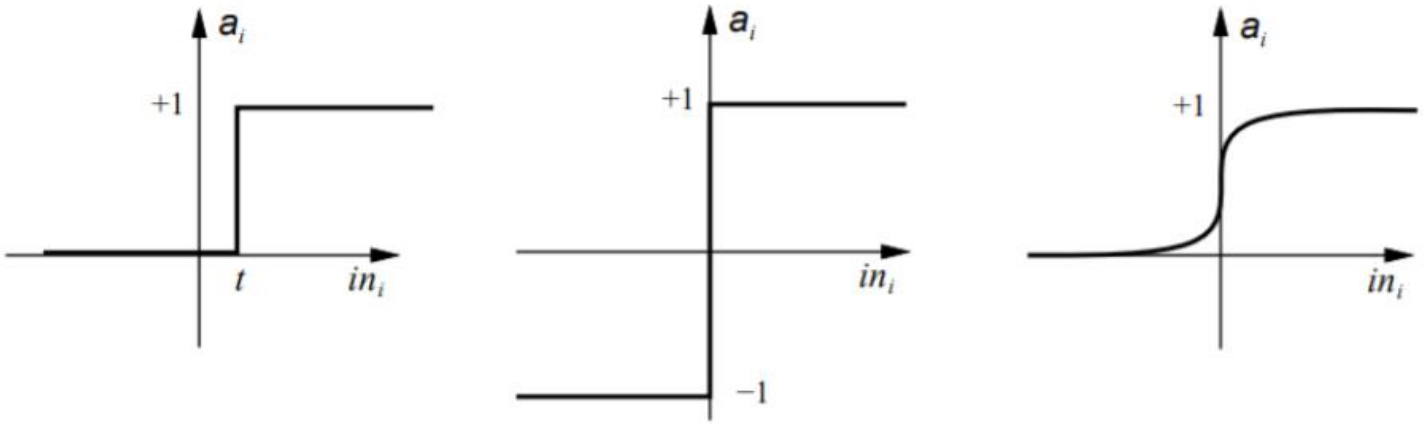
NEURAL NETWORKS INTRODUCTION

Artificial Neural Networks

- The "activation" function determines when the neuron will give an output



(a) Step function (b) Sign function (c) Sigmoid function

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NETWORKS OF ARTIFICIAL NEURONS

- These are coded as algorithms that will "train" or "learn" on data
- For example, with supervised learning the model can iterate over data and know the correct output for each data point.
- So, the model selects the most suitable weights and bias values.

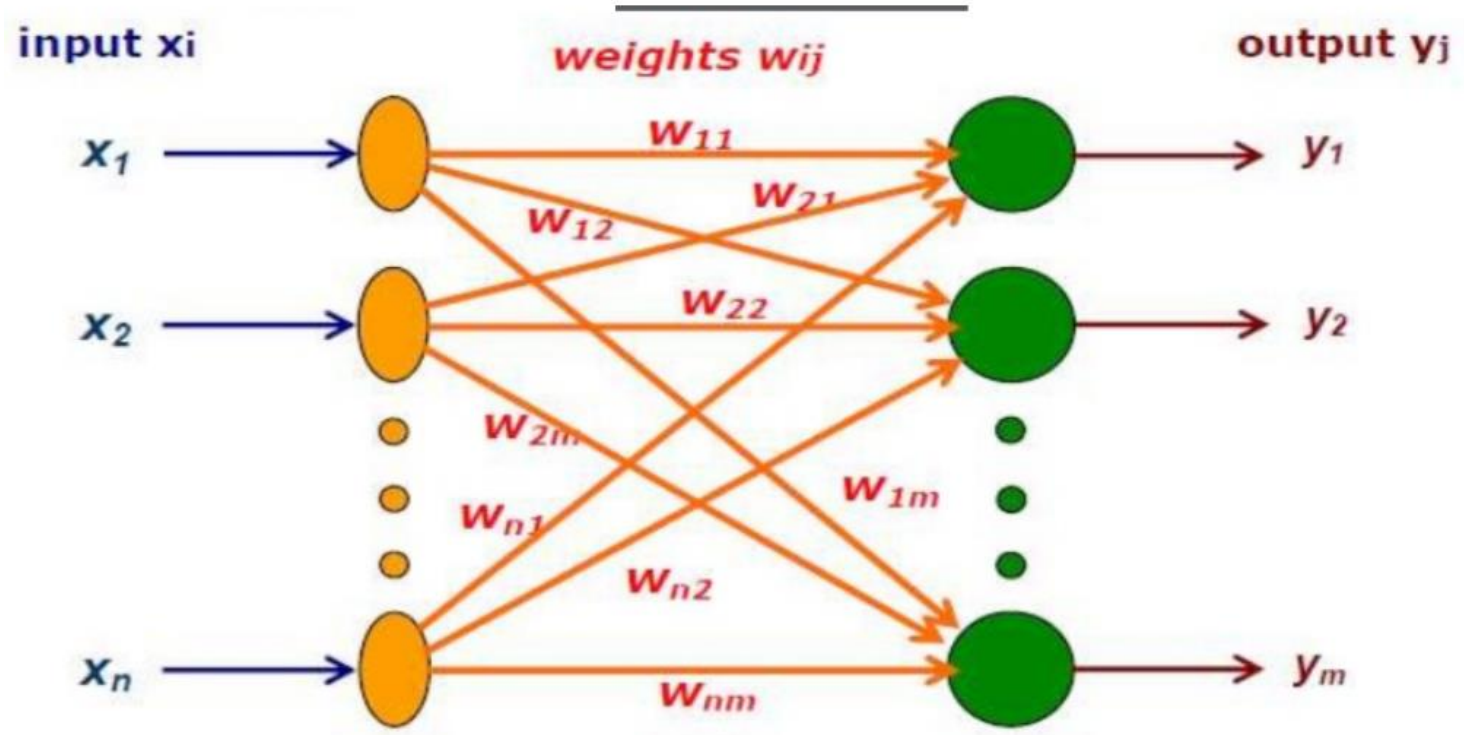

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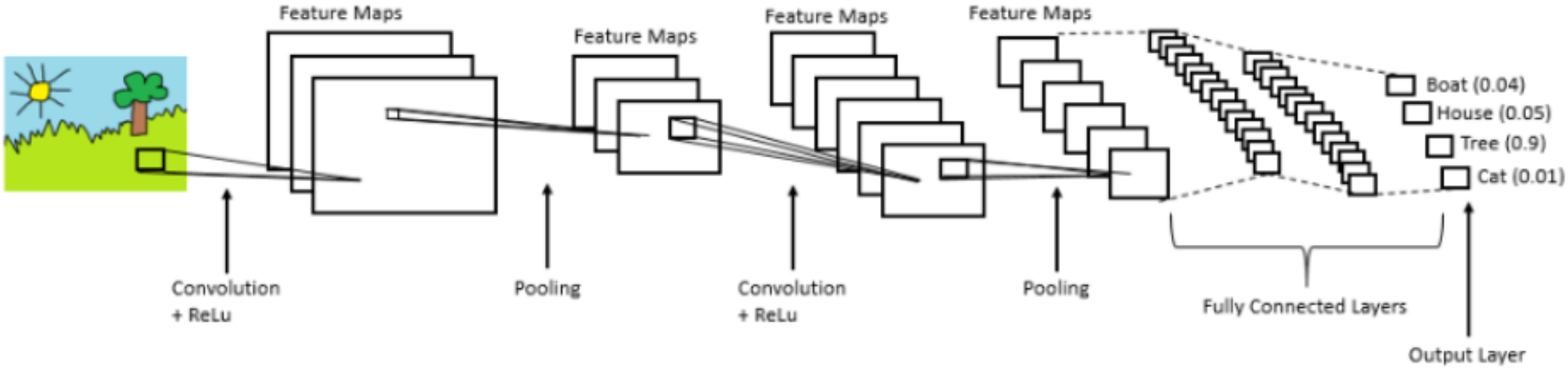
IMAGE PROCESSING – CONVOLUTIONAL NEURAL NETWORKS

- These networks are well suited to image processing problems
- Some extra layers are added to the network which process the images prior to the "traditional" fully connected layers



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KEY TOOLS & TECHNOLOGIES

- Training Models: Python, Jupyter, Scikit-learn, Keras/Tensorflow
- Training in the Cloud: Keras/Tensorflow distributed training
- Cloud Deployment: Tensorflow Serving & KubeFlow
- Kubeflow tries to make it easy to deploy the best Machine Learning open-source systems to K8s

Training Sandbox Environment

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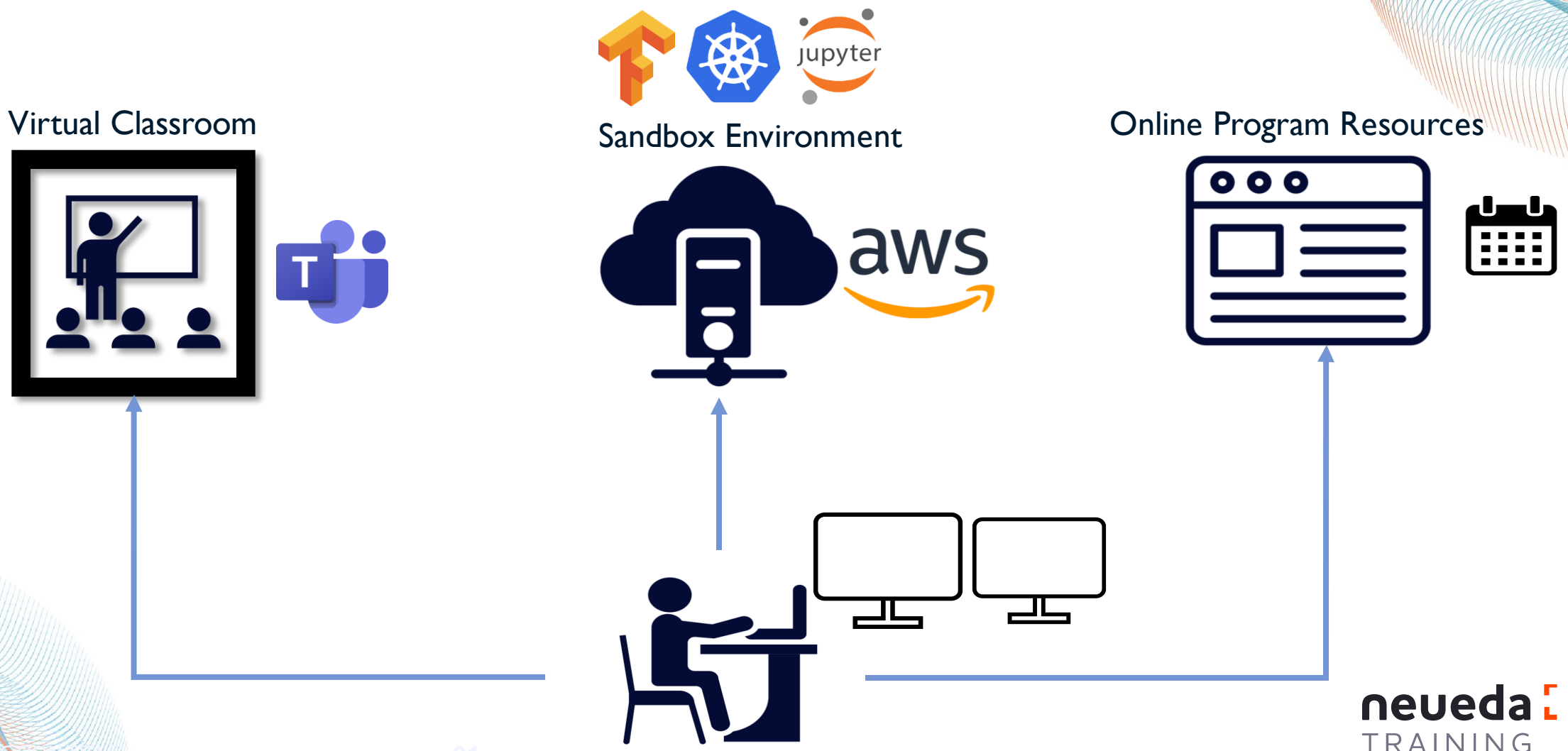
ARCHITECTURE



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MATERIALS SITE

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VIRTUAL SANDBOX ENVIRONMENT

- A set of Virtual Machines for each participant with all required tools pre-installed
- Virtual machines can be used at any time after course hours
- All machines are configured identically with all necessary tools pre-installed. You don’t need to prepare anything

Thank you

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