

CANONICAL



Kubeflow

Modelling and Operations

Training Curriculum

Version:

1.0

Introduction & Scope

This course is intended to enable its attendees to effectively utilize their Kubeflow platform. The target audience is data scientists, MLOps engineers, and data processing infrastructure engineers. The main focus of the curriculum is understanding Kubeflow and all of its components, installing and configuring them, troubleshooting for each of the components, optimising the workflow across multiple components from data ingestion, to training and model serving.

There are three thematic chapters and each one of them contains a theory session (presented by the instructor.) At the end, there are a series of practical labs. The purpose of the labs is to reinforce the main points described during the slide presentation and provide full hands-on experience in working with Kubeflow. By combining the theoretical background with hands-on exercises, the course encourages better assimilation of the material and deeper understanding. Finally, the students will be provided with complete step-by-step documentation, ensuring that the material is readily available for future review.

The duration of the course is four days.

Agenda

1. Machine Learning & Deep Learning Architecture

- AI/ML architecture
 - Hardware and architectural considerations
 - GPU and FPGA support - nVidia, IBM, Intel and others.
 - Bare metal, VMs, OpenStack and public cloud considerations
 - Storage for persistent volumes
- Introduction to Charmed Kubernetes
 - Modules and services
 - Packaging and tooling
 - Services walk-through
- AI/ML Frameworks in Charmed Kubernetes
 - Overview of Machine Learning pipeline
 - Data ingestion, training, testing, tuning, deploying, etc.
 - Overview of Kubeflow components and features
 - Jupyterhub Notebooks, Frameworks for training, Hyperparameter tuning, Pipelines, Serving

- Example application walk-through (Tensorflow based)

2. Kubeflow Pipelines and components

- Kubeflow Pipelines
 - Building a TensorFlow pipeline
 - Building a PyTorch pipeline
 - Deploying Pipelines & Examining Output
 - Running Experiments
 - Scheduling Pipelines
 - Automation of Pipeline Creation with KALE
 - Pipeline Component Versioning
- Working with Jupyter notebooks
 - Visualizing results
 - Exporting and visualizing pipeline metrics
 - Construct A Pipeline using KALE (walk-through)
- Model Serving Tools in Kubeflow
 - KFServing
 - TensorFlow Serving

3. MLOps and Advanced Topics

- Introduction to MLOps
- Building a continuous model delivery pipeline for training and serving model
 - Overview of a simple use-case with Kubeflow
 - Building a continuous delivery pipeline for model training, validation, and versioning
 - Model training and deployment through MLOps Pipeline
 - Model Serving and deployment for inferencing through MLOps Pipeline
- Advanced Topics:
 - Fairing for Using Kubeflow in Hybrid Environments
 - Fairing walk-through
 - Hyper Parameter Tuning in Kubeflow Using Katib
 - Model Tuning walk-through
- Troubleshooting Tips & Techniques

4. Labs

- How To Create Pipeline Components
- Working with Jupyter Notebooks
- Managing Pipelines (scheduling, running experiments, viewing output)
- Serving Models