



**High-Performance Data-Intensive  
Computing Systems Laboratory**

# Kubernetes Workshop: Utilizing the NRP Nautilus Super Cluster

MORENet Technical Summit

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University of Missouri



# Presenters

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# Topic Introduction

- ▶ **Kubernetes** is a powerful tool to enable the efficient scaling and orchestration of **containers**
- ▶ **Containers** are virtualized environments that be reproduced on any machine with the **container runtime**
- ▶ The National Research Platform has a compute cluster called **Nautilus** that is managed with **Kubernetes**



# What to Expect

- ▶ In this workshop, you will learn:
  - ▶ How this technology can be leveraged for hands-on STEM education
  - ▶ What Jupyter is, how to use it, and what it offers STEM educators
  - ▶ What the Nautilus Hyper Cluster is, and what kinds of resources it offers
  - ▶ How scientific computing can be scaled on the Nautilus cluster
- ▶ The technical topics covered in this workshop are:
  - ▶ What a container is and how to build one
  - ▶ How to share containers with others using a container image registry
  - ▶ What Kubernetes is and its key concepts
  - ▶ How to deploy a container on a Kubernetes cluster
  - ▶ How to deploy a Jupyter Hub application using Helm to a Kubernetes cluster



# Agenda

- ▶ Introduction to Nautilus
  - ▶ Nautilus for Statistics Education with Jupyter
  - ▶ Background on the Nautilus Cluster
  - ▶ Use Case: University of Missouri - Columbia
- ▶ Questions & Break
- ▶ Kubernetes Technical Breakdown
  - ▶ Docker & Kubernetes
  - ▶ Jupyter UI Walkthrough
  - ▶ Creating JupyterHub Environment in Kubernetes
- ▶ Questions & Break
- ▶ Kubernetes for Scientific Computation
  - ▶ Case Study: Object Detection and Localization in Remote Sensing Imagery
  - ▶ Case Study: Wildfire Burn Area Mapping

