

ALS User Meeting 2023

Hands-On Machine Learning in Python

Monday, September 11

Location: 91-310

This tutorial offers an overview of scientific machine learning using Python and includes practical exercises for hands-on experience. The guide encompasses numerous methods and resources employed in data-driven research, starting with a brief introduction to reading and processing scientific data in Python—a programming language widely used in scientific computing. The tutorial investigates popular machine learning packages, such as scikit-learn, PyTorch, and TensorFlow, while discussing their potential in addressing a variety of scientific challenges.

Our tutorial provides a step-by-step guide on essential techniques, including linear regression, clustering, principal component analysis (PCA), and Uniform Manifold Approximation and Projection (UMAP) for dimensionality reduction. We then delve into advanced machine learning approaches, such as neural networks and convolutional neural networks (CNNs), showcasing their potential in handling complex scientific data. The tutorial elucidates the concepts of regression, clustering, classification, and dimension reduction techniques with emphasis on their applicability across diverse scientific data sets.

By providing a thorough overview of scientific machine learning techniques and tools, this tutorial aims to equip researchers with the necessary skills to tackle data-driven challenges in their respective fields. The tutorial emphasizes the importance of understanding and selecting appropriate techniques, ensuring that researchers can make informed decisions when applying machine learning to scientific problems.

START	TITLE
8:30	Welcome
8:35	Intro to Machine Learning (talk)
9:00	Getting started with Colab (hands-on)
9:20	Data pre-processing (hands-on)
9:50	Dimension reduction (hands-on)
10:20	BREAK
10:50	Fitting and Tensors (hands-on)
11:30	Dataloaders (hands-on)
12:00	LUNCH
13:00	Autoencoders (talk)
13:20	Autoencoders (hands-on)
14:00	Convolutional NN (talk)
14:15	Convolutional NN (hands-on)
14:55	BREAK
15:25	chatGPT for ML (hands-on)
15:55	Online resources and discussions