

AKjDPG 2: jDPG/AKPIK Programmierworkshop (joint session AKjDPG/AKPIK)

Time: Sunday 17:30–19:00

Location: AM 00.014

Tutorial

AKjDPG 2.1 Sun 17:30 AM 00.014

Resource-Aware Deep Learning: Tracking Energy Consumption in Scientific AI Applications — •KEVIN SCHMITZ¹, ANNO KNIERIM¹, and RAPHAEL FISCHER² — ¹TU Dortmund University, Dortmund, Germany — ²Lamarr Institute for ML & AI, Dortmund, Germany

Deep learning has become an indispensable tool across physics and astronomy, yet its growing computational demands increasingly raise questions about energy efficiency and sustainability. This tutorial introduces physicists to the principles of resource-aware deep learning, focusing on practically quantifying, understanding, and optimizing the energy consumption of deep learning models. We begin by outlining different approaches for tracking model power usage, ranging

from static estimation methods to dynamic profiling tools validated against ground-truth measurements, and demonstrate how these concepts are implemented in practice using the Lamarr Energy Tracker, developed at the Lamarr Institute for Machine Learning and Artificial Intelligence, for straightforward monitoring of GPU and CPU utilization during training or inference. Finally, we show how resource metrics can be visualized together with reconstruction accuracy using an example from radio interferometric imaging, where super-resolution neural networks reconstruct astrophysical sources from sparse visibility data. The session provides conceptual foundations and practical guidance for integrating sustainability into scientific machine learning workflows, empowering researchers to balance predictive performance with environmental responsibility.