**Speaker:**
**Caroline HENEKA (University of Heidelberg, Germany)**

**Lecture description:**
Right now we are entering a data-driven era in astrophysics due to current and upcoming large astronomical surveys. Modern machine learning (ML) methods are up for the challenge to optimally learn about galaxy evolution and cosmology across a wide range of data products and redshifts. In this lecture, we will highlight the astronomical data life cycle, from observations, over simulations and modelling, to inference of astrophysical properties, focusing on data-driven machine learning methods specifically developed for large surveys. We will see some examples of how these methods offer advantages for observational tasks such as on-the-fly classification and source characterisation. For inference and generative tasks we focus on intensity mapping, i.e. the large-scale mapping of line fluctuations, which due to large data volumes and non-Gaussian signatures offers an interesting use-case for DL methods. The lecture will be wrapped up by mapping out how ML and AI can help to look for new discoveries, using novel developments for example related to network interpretability and multi-purpose foundational network models for astrophysics.

**Tutorial description:**
In the tutorial on ML analysis of astronomical data you will be challenged to build and train a fast on-the-fly (online) classifier for astronomical spectra that outperforms a simple benchmark model. A second route will be to focus on a regression task of astrophysical parameters and the interpretation of a trained network model built with domain-specific knowledge on data expected for the Square Kilometre Array (SKA)