

Classification of Fermi-LAT sources with deep learning

S.Manconi (RWTH) , with A.Butter, T.Finke, F.Keil, M.Krämer

What is this contribution about?

We predict the class of gamma-ray sources of uncertain type in Fermi-LAT catalogs by using a novel type of deep learning classifiers.

Why is it relevant / interesting?

About $\sim 30\%$ of detected sources in last Fermi-LAT catalog (4FGL-DR2) are not classified. Deep learning-based classification can complement population studies and stimulate multi-wavelength follow ups to identify their nature.

What have we done?

We optimize dense and recurrent neural networks able to classify Fermi-LAT sources with high accuracy, by using as input data the full information from the measured energy and time spectra, instead of derived features. We use Bayesian networks to provide robust uncertainties on predicted source classes. We analyze the characteristics of the newly identified sources, and release the full list of candidates.

What is the result?

We obtain powerful and robust classifiers which extract the relevant source features from the Fermi-LAT measured energy and time spectra. For the first time in this context, we provide deep learning class predictions with uncertainty estimates using Bayesian networks. Candidate sources from the various classes follow the expected distribution for their relevant characteristics.