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Characterizing the High Energy Gamma-ray Sources using Deep Learning

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The Cherenkov Telescope Array (CTA) is entering its production phase and the upcoming data will drastically improve the point source sensitivity compared to previous imaging atmospheric Cherenkov telescopes. The Galactic Plane Survey (GPS), proposed as one of the Key Science Projects for CTA observation will focus on the observation of the inner galactic region ($|b| < 6$).
Here we discuss our recent results from extending our Deep Learning (DL)-based pipeline, AutoSource-ID, (see the talk by F. Stoppa et.al, at this conference) for classifying gamma-ray sources with different extensions and predicting the fluxes with uncertainties. This pipeline was initially developed for detecting point sources at optical and gamma-ray wavelengths and tested using MeerLicht (optical) and Fermi-LAT (gamma-ray) data. For the CTA data, we are using Gammapy for simulation which already includes the updated instrument response functions. We test the classification and flux prediction capability for simulated gamma-ray sources lying in the inner galactic region (specifically $0 < l < 20$, $|b| < 4$) for energies ranging from 30 GeV to 100 TeV. Similar DL pipeline, for regression-based tasks for Optical sources were also shown to be effective and precise, highlighting once again possibility of multi-wavelength analysis under the same hood.

Primary author: BHATTACHARYYA, Saptashwa (University of Nova Gorica)

Co-authors: STOPPA, Fiorenzo (Radboud University); Ms ZAHARIJAS, Gabrijela (University of Nova Gorica); Mr PRINCIPE, Giacomo (Universita di Trieste); Mr DE AUSTRI, Roberto Ruiz (University of Valencia); CARON, Sascha

Presenter: BHATTACHARYYA, Saptashwa (University of Nova Gorica)

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