Press Release ICRA - ICRANet

Classifying Seyfert galaxies with deep learning

Scientist uses deep learning to identify low luminous Seyfert 1.9 galaxies that are usually missed by human inspection among ten thousands of spectra. These results are published in the Astrophysical Journal Supplement Series on 28 September 2021 by a PhD student, Yen Chen Chen, in the department of physics at Sapienza University of Rome and the International Center for Relativistic Astrophysics Network (ICRANet).

Seyfert 1 and Seyfert 2 galaxies have distinct features on their spectra and the difference is explained by different viewing angles in the unification model of active galactic nuclei. However, a few Seyfert galaxies called intermediate Seyfert (Seyfert 1.2, 1.5, 1.8, 1.9) share spectral features from Seyfert 1 and Seyfert 2 and these two-component sources are hard to be explained by the unification model. At early time, these sources were picked out by vision inspection and hard to be picked out from amount observation data. Recently, astronomers usually fit candidate spectra to find these two-component sources. However, the fitting process usually spends a lot of time and the classification results are dependent on fitting results. Now, this classification process can be done by deep learning. Scientist builds a convolution neural network (CNN) model and feeds the model with a known sample of Seyfert 1.9 galaxies. The result shows that the trained CNN model has a high ability to recognize Seyfert 1.9 galaxies and the trained model finds new Seyfert 1.9 sources. The novel point is that this method only needs a few known sources for training model and the training process is fast. Besides, the trained model can obtain more new sources in a faster way ever. This work shows a practical method in identifying sources and can be applied in the future. These new Seyfert 1.9 sources have obscure characteristic on its spectra and are usually missed in classification process by visual inspection. Scientist finds this machine-selected Seyfert 1.9 sample is fainter than the human-selected one. This work provides astronomers more Seyfert 1.9 sources to low luminous end and will help astronomers understand the origin of the two components on its emission lines with multiple wavelength follow-up observation.

NGC 2992 (right) and NGC 2993 (left). Credit Line and Copyright Adam Block/ Mount Lemmon SkyCenter/University of Arizona.

Contact:

Yen Chen Chen

[1] ICRA and Dipartimento di Fisica, Sapienza Università di Roma, Rome, Italy

[2] ICRANet, Pescara, Italy

Email: yen-chen.chen@icranet.org