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We introduce a novel method for reconstructing the projected matter distributions of galaxy clusters with weak-lensing (WL) data based on convolutional neural network (CNN). We control the noise level of the galaxy shear catalog such that it mimics the typical properties of the existing Subaru/Suprime-Cam WL observations of galaxy clusters. We find that our mass reconstruction based on multi-layered CNN with architectures of alternating convolution and trans-convolution filters significantly outperforms the traditional mass reconstruction methods.

[구 ML-03] Reconstructing the cosmic density field based on the generative adversarial network.

Feng Shi
Korea Astronomy and Space Science Institute

In this topic, I will introduce a recent work on reconstructing the cosmic density field based on the GAN. I will show the performance of the GAN compared to the traditional Unet architecture.I'd also like to discuss a 3-channels-based 2D datasets for the training to recover the 3D density field. Finally, I will present some performance tests based on the test datasets.

[구 ML-04] From dark matter to baryons in a simulated universe via machine learning

Yongseok Jo
Seoul National University

The dark matter (DM) only simulations have been exploited to study e.g. the large scale structures and properties of a halo. In a baryon side, the high-resolution hydrodynamic simulation such as IllustrisTNG has helped extend the physics of gas along with stars and DM. However, the expansive computational cost of hydrodynamic simulations limits the size of a simulated universe whereas DM-only simulations can generate the universe of the cosmological horizon size approximately.
I will introduce a pipeline to estimate baryonic properties of a galaxy inside a dark matter (DM) halo in DM-only simulations using a machine trained on high-resolution hydrodynamic simulations. An extremely randomized tree (ERT) algorithm is used together with multiple novel improvements such as a refined error function in machine training and two-stage learning. By applying our machine to the DM-only simulation of a large volume, I then validate the pipeline that rapidly generates a galaxy catalog from a DM halo catalog using the correlations the machine found in hydrodynamic simulations. I will discuss the benefits that machine-based approaches like this entail, as well as suggestions to raise the scientific potential of such approaches.

항성 및 항성계

[구 SA-01] Sejong Open cluster Survey (SOS). VII. A Photometric Study of the Young Open Cluster IC 1590

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We present deep $UBVI_c$ and Hα photometry for the young open cluster IC 1590 which is at the center of the HII region NGC 281. From Hα index, 39 Hα emission stars and 15 Hα emission candidates are selected. The reddening law toward IC 1590 is slightly abnormal ($R_{V,cl}$ = 3.6 ± 0.2). The distance modulus of IC 1590 obtained from the reddening-free (Q', $Q_{V\lambda}$) diagrams is 12.4 ± 0.1 mag (d = 3.02 ± 0.14 kpc), which is consistent with distance d = 2.91 ± 0.42 kpc from the parallax of Gaia DR2 catalogue within the error range. We also determined the age and mass function of IC 1590 using the stellar evolution models and PMS evolutionary tracks. The median age of PMS stars is 2.4 ± 2.2 Myr. The initial mass function (IMF) of IC 1590 is the Salpeter-type IMF with a slope of Γ = -1.26 ± 0.14 for m > 1 $M_\odot$ stars.

[구 SA-02] Discovery of Raman-scattered He II Features at 6545 Å in Planetary Nebulae NGC 6886 & NGC 6881 from BOES Spectroscopy

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We report our discovery of Raman-scattered He II λ6545 feature in young planetary nebulae NGC