東北大学 宇宙創成物理学国際共同大学院プログラム



**GPPU** Seminar

## 1) "From Form to Function: How to Harness the Information Contained in Galaxy Morphology"

## by Juan Pablo Alfonzo (Tohoku University) Time and Date: 15:00-17:00, April 18, 2025 Place: Room 745, Science Complex B (H-03) (hybrid)

**Registration:** "https://us02web.zoom.us/meeting/register/77KIFvPIRBS2cvp4EswOqw"

The main tool astronomers have to understand distant galaxies is the light they have emitted. A galaxy's spectral energy distribution (SED) is a measure of its flux density across the electromagnetic spectrum. This SED contains unique signatures which tell us how the galaxy formed and how it has evolved over cosmic time. From these SEDs we are able to recover key physical properties, which include but are not limited to: the stellar mass of the galaxy, the star formation rate of the galaxy, and the age of the galaxy. This is done by building theoretical models of how SEDs of various stellar populations would look like, and then finding the combination that best matches observed galaxy SEDs. Nevertheless, SEDs are not the only observable we have of galaxies. We also have high resolution images of them taken with telescopes, from which we can observe their morphologies (i.e their physical structure). Traditionally, unlike with SEDs, the information contained in the morphology of a galaxy has not been used to help derive its physical properties. However, we know there is a clear connection between physical properties and galaxy morphology. With the upcoming waves of unprecedented amounts of high quality imaging from space based telescopes like Euclid and Roman it is of utmost importance to make meaningful use of all this data. In this seminar I will present my work which uses state of the art machine learning to (i) show we can derive physical properties of galaxies just from imaging and (ii) create a new methodology for incorporating galaxy morphology information into existing SED fitting pipelines to get better constraints on the physical properties of galaxies.

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