dust continuum, including asymmetries and one or multiple rings, caused by dust

Deep learning algorithms for morphological classification of galaxies

Friday, 30 October @12:30 pm **note unusual time**

Dr. Helena Domínguez Sánchez (Institute of Space Sciences, Barcelona**)**

Galaxies exhibit a wide variety of morphologies that are strongly related to their star formation histories. Having large samples of morphologically classified galaxies is fundamental to understand their formation and evolution. I will present recent results on morphological classifications for SDSS and DES surveys obtained with Deep Learning (DL) algorithms using convolutional neural networks (CNN). Supervised DL algorithms are fast, accurate and efficient but they rely on large training sets (~5000) of pre-labelled galaxies. I will show how transfer learning (i.e., the ability of CNNs to export knowledge acquired from an existing survey to a new dataset), helps reducing by almost one order of magnitude the necessary training sample for morphological classification. Another important caveat is that visually classified galaxies are usually very bright. We model fainter objects by simulating what the brighter objects with well determined classifications would look like if they were at higher redshifts. The CNNs reach 97% accuracy to mr ~ 21.5, suggesting that they are able to recover features hidden to the human eye. Where a comparison is possible, our classifications correlate very well with Sérsic index, ellipticity and spectral type, even for the fainter galaxies. We provide classifications for ~27 million galaxies, the largest multi-band catalog of automated galaxy morphologies to date.

A new detailed visual morphological classification for galaxies in the MaNGA survey and a general characterisation.

Friday, 6 November @ 3pm

Dr. J Antonio Vazquez (UNAM, Mexico)

Within the current theoretical scenario of galaxy formation and evolution, the interplay between cosmic cool gas accretion onto galaxies and galaxy mergers, and other internal processes, give rise to the observed morphological diversity of galaxies (e.g., Dubois et al. 2016). In this context, a reliable morphological classification becomes crucial for understanding the properties and formation mechanisms of galaxies, and constraining models and simulations of galaxy evolution.

In the last years surveys like MaNGA (an IFU survey), offer the possibility to connect physical and morphological properties of galaxies with their spatially-resolved properties at the kpc scales (e.g., Cano-Diaz et al. 2019). This positions the study of the origin of the Hubble sequence to a new level.

telescope in Hawaii. The results have implications for massive star evolution. the

demonstrate that the observed size-mass relation of galaxies can be derived from the halo mass - stellar mass relation. This suggests a straightforward relation between the size scale of dark matter halos and that of galaxies, with the effects of dust and young stars being the main remaining uncertainty. I will then present results from state-of-the-art cosmological hydrodynamical simulation SIMBA with dust radiative transfer package Powderday, used to disentangle the effect of dust attenuation on the sizes of galaxies, which remarkably changes the picture of the size-mass relation as painted by HST. Resolved stellar population synthesis modelling augmented by upcoming JWST observation will be needed to verify our revised view of the size-mass relation of galaxies.

High-contrast imaging of exoplanets and disks.

Friday, 22 January 2021: **1-2pm AST (note unusual time)**

Dr. Trisha Bhowmik (Universidad Diego Portales, Chile)

Planets are formed in the circumstellar environment when dust grains start accreting material from an optically thick circumstellar disk leaving behind young planets and occasionally a debris disk. Several techniques such as radial velocity, transit, and direct imaging techniques have become popular to discover and confirm such exoplanets. The advantage of direct imaging is in observing wide orbit planets and doing spectral characterization of an exoplanet atmosphere. Yet, an Earth-like exoplanet would be 10e8 to 10e9 times fainter than its Sun-like star, in near-infrared wavelengths. This requires extremely high contrast techniques. The backbone of high-contrast imaging is the use of adaptive optics, advanced coronagraphy, and post-processing techniques. Throughout the years this technique has been very successful in imaging circumstellar disks and recently has also started discovering circumplanetary disks. In this talk, I will present the basic working principle of high-contrast imaging and the scientific advancements that have been done with this technique.

From the Eddington limit into quiescence with tidal disruption events

Friday, 29 January 2021 @3pm AST, via Zoom

Dr. Thomas Wevers (European Southern Observatory, Santiago)

Tidal disruption events have been heralded as probes of extreme accretion regimes, in particular as super-Eddington accretors, since the seminal papers over 30 years ago. However, observationally this field has only started to blossom in the last 5-10 years, with the advent of wide-field optical surveys and coordinated multi-wavelength follow-up

facilities, particularly at X-ray and UV wavelengths. These efforts are now producing a steady stream of exquisite observational constraints for the formation and evolution of the accretion flows, including the disk, soft excess and the corona, in the aftermath of disruption. I will discuss TDE observations in the framework of accretion states as developed for X-ray binaries and show that they are in excellent agreement with predicted properties. I will also present new results that probe, for the first time, accretion state transitions in an individual supermassive black hole, from the Eddington limit into quiescence. These results open up a new avenue to study accretion physics and its scale (in)variance across the mass scale in the near future.

A journey into the Perseus cluster of galaxies: radio lobes, mini-halo and bent-jet radio galaxies

Friday, 5 February 2021 @3pm AST, via Zoom

Dr. Marie-Lou Gendron-Marsolais (ESO/ALMA)

Jets created from accretion onto supermassive black holes release relativistic particles on large distances. These strongly affect the intracluster medium when located in the center of a

from the combination of UltraVISTA DR3 photometry and *Herschel* PACS-SPIRE data using MAGPHYS. I evaluate the ability of the rest-frame UVJ color-color diagram to determine the star formation and dust obscuration properties for our sample. I construct median SEDs of massive, dusty galaxies as a function of redshift and star-formation activity (quiescent vs star-forming). Simultaneous modelling of the panchromatic SED allows us to quantify the contribution to the IR emission from dust heated by star formation rather than evolved stellar populations, which we find to be a crucial element in characterizing these galaxies correctly. I also investigate in more detail the properties of a subset of the most heavily dust-obscured sources in the UltraVISTA DR3 to determine their relationship to IR-selected and sub-millimeter galaxies (SMGs). Finally, I will propose how this line of research can be extended through my current involvement with the CANUCS program using the *James Webb Space Telescope.*

Ionized winds driven away from supermassive black holes

Flows of gas around z~1