South American Workshop on Cosmology in the LSST Era
ICTP-SAIFR, Sao Paulo, Brazil
December 17-21, 2018

List of Abstracts

PLENARY TALKS

Strong lensing by substructures in galaxy clusters

David Alonso

(School of Physics and Astronomy, Cardiff University)

Wide-area imaging surveys such as LSST have a huge potential to massively improve our understanding of the nature of the late-time accelerated expansion. They will however face important challenges in terms of data analysis, in the form of optimal estimation of summary statistics, accurate description of the LSS likelihood, systematics modelling and marginalization and theoretical uncertainties. In this talk I will describe some of the new tools and methods (some developed collaboratively within LSST) that are being designed to rise up to the occasion.

The Gravitational Landscape for the LSST Era

Tessa Baker

(University of Oxford)

I'll talk about how we plan to use LSST to test of the landscape of extended gravity theories. I'll outline the gravity models that have been selected as our top priorities, and explain why parameterised methods are the smart way to probe these. I'll discuss some exciting recent theoretical developments — many of them sparked by the gravitational wave detections of the past few years — that offer new insights on the remaining space of gravity theories.

First Cosmology Results Using Tupe IA Supernova from the Dark Energy Survey

Dillon Brout

(University of Pennsylvania)

We present cosmological parameter constraints from 251 spectroscopically confirmed Type Ia Supernovae (0.02 $<$ z $<$ 0.85) discovered during the first 3 years of the Dark Energy Survey Supernova Program. Type Ia supernovae, used as standardizable candles, probe the acceleration of the universe and are sensitive to the equation of state parameter for dark energy. Our results, uncertainty budget, and nuisance parameters describing the standardization of Type Ia SNe are discussed within the context of the LSST SN Science and Cosmology program.

A Unified Analysis of Four Cosmic Shear Surveys

Chihway Chang

(University of Chicago)

In the past few years, several independent collaborations have presented cosmological constraints from tomographic cosmic shear analyses. These analyses differ in many aspects: the datasets, the shear and photometric redshift estimation algorithms, the theory model assumptions, and the inference pipelines. To assess the robustness of the existing cosmic shear results, we present in this paper a unified analysis of four of the recent cosmic shear surveys: the Deep Lens Survey (DLS), the Canada-France-Hawaii Telescope Lensing Survey (CFHTLenS), the Science Verification data from the Dark Energy Survey (DES-SV), and the 450 deg2 release of the Kilo-Degree Survey (KiDS-450). By using a unified pipeline, we show how the cosmological constraints are sensitive to the various details of the pipeline. We identify several analysis choices that can shift the cosmological constraints by a significant fraction of the uncertainties.

Deciphering the Dark Side of Structure Formation with Cosmological Data: Current Status and Future Prospects

Cora Dvorkin

(Harvard University)

Challenges for Galaxy Morphological Classification from Large Surveys

Katrin Heitmann

(Argonne National Laboratory)

Next-generation cosmological observatories will open new routes to understand the true nature of the ``Dark Universe''. These observations will pose tremendous challenges on many fronts -- from the sheer size of the data that will be collected to its modeling and interpretation. The interpretation of the data requires sophisticated simulations on the world's largest supercomputers. The cost of these simulations, the uncertainties in our modeling abilities, and the fact that we have only one Universe that we can observe opposed to carrying out controlled experiments, all come together to create a major test for our future data analysis capabilities. In this talk I will discuss an ambitious end-to-end simulation project that attempts to provide a faithful view of the Universe as seen through the Large Synoptic Survey Telescope (LSST). This simulation project is the foundation for the second data challenge (DC2) carried out by the LSST Dark Energy Science Collaboration (LSST DESC). I will briefly describe how these complex, large-scale simulations will be used in order to prepare the collaboration for the arrival of LSST data.

Joint Probes Cosmology in the Systematics-Limited Regime

Elisabeth Krause

(University of Arizona - Steward Observatory)

This talk will outline the cosmology analysis of the first year of the Dark Energy Survey (DES Y1), which combines galaxy clustering, galaxy-galaxy lensing, and cosmic shear. In combination these three measurementsthey provide some of the most stringent constraints on cosmological parameters. I will describe the validation of measurements and systematics modeling, and I will give an outlook on cosmology analysis plans and challenges for future, much larger experiments such as LSST.

Galaxy Cluster Cosmology in the LSST Era

Thomas McClintock

(Brookhaven National Laboratory)

Galaxy clusters can be the most constraining probe of large scale structure, assuming the numerous systematics associated with clusters can be controlled. Here, I will discuss efforts made by current experiments to measure galaxy cluster masses, paying close attention to limiting systematics. Next, I will outline the path forward to successfully performing cluster cosmology in the LSST era.

Photometric Redshifts for LSST

Jeff Newman

(University of Pittsburgh)

In this talk I will review the idea of photometric redshifts and discuss some of the challenges we will face in optimally applying them for LSST. If time allows, I will also discuss concepts for complementary telescopes and instruments that can provide spectroscopic training and calibration data for LSST photometric redshifts.

Galaxy cluster mass estimate from weak lensing signal

Mariana Penna-Lima

(Universidade de Brasília)

Galaxy clusters are important cosmological probes as their spatial distribution, abundance and their correlations with other observables trace the matter distribution and the growth rate of the universe. These observables depend on the position and mass estimates of the clusters. The latter is the largest source of uncertainty on cosmological constraints since the cluster masses are not directly observed. These are estimated from different observables such as the X-ray flux, richness (both through the so-called mass-observable relations) and the weak lensing signal . In this work we discuss a methodology to estimate the masses of individual clusters from the weak lensing signal (reduced shear) of galaxies. In particular we apply the approach previously used by the 'Weighing the Giants' team, based on the use of the full photometric redshift (photo-z) distributions of these lensed galaxies, in order to better calibrate the mass-observable relations. As a practical example, we apply the cluster pipeline developed by our team to the MACSJ2243.3-0935 cluster. The full photo-z method is implemented in the Numerical Cosmology (NumCosmo) library. We also extended this approach including astrophysical/cosmological effects, such as miscentering and the 2-halo term, as well as generalizing it to use any matter density profile. This work has been developed with the Cluster WG of the DESC collaboration, being part of the CLMassMod project.

Galaxy Clusters Hunters

Ricardo Ogando

(Observatório Nacional & LINEA)

Clusters of galaxies: who are they? Where do they live? To find these giants we need to track them by identifying their signs. For optical cluster finders, we need to understand how galaxies group themselves throughout the universe. However, true clustering can be mistaken by several observational effects, such as projection on the line of sight and depth variation across a survey. We review the steps to setup a galaxy catalog, find clusters of galaxies, and study their properties with Dark Energy Survey data and what to expect from LSST.

Testing gravity with LSST

Nelson David Padilla

(Universidad Catolica de Chile)

Large future surveys such as LSST offer the possibility to test gravity by combining large-scale structure and weak lensing measurements. I will show efforts from different groups to design ways to do this, some centered on weak lensing around voids, others on mark correlations. The former could in principle be used to determine the type of screening of the modified gravity theory, as was recently shown by Paillas et al. Comparisons between LSST and Euclid like surveys will also be presented.

Velocity and density power spectrum measurements with LSST supernovae

Miguel Quartin

(Universidade Federal do Rio de Janeiro)

Type Ia supernovae distance measurements revolutionized cosmology and are still one of the main probes of the cosmological expansion. Nevertheless there is much more information on what is often considered the noise in the supernova data. There are two ways of recycling this noise into signal by making use of weak-lensing and velocity flows signatures. Lensing makes the Hubble residuals non-Gaussian while peculiar velocities make the residuals correlated. Both effects can be well-modeled, and together they allow the use of supernovae to measure both the present large-scale matter distribution and its evolution at late times. I will discuss in detail how both effects can be measured using different survey strategies and will forecast the achievable precision with LSST data.

Internal Robustness of Growth Rate data

Domenico Sapone

(University of Chile)

In this talk we discuss the Internal Robustness analysis (iR) performed using a compilation of the most recent fsigma_8(z) data. The method analyzes combinations of subsets in the data set in a Bayesian model comparison way, potentially finding outliers, subsets of data affected by systematics or new physics. In order to validate our analysis and assess its sensitivity we show several cross-checks, for example by removing some of the data or by adding artificially contaminated points, while we also generate mock data sets in order to estimate confidence regions of the iR. Applying this methodology, we found no anomalous behavior in the $f\sigma 8(z)$ data set, thus validating its internal robustness.

Modeling Biased Tracers at the Field Level

Marko Simonovic

(CERN)

In this talk I will show how well the perturbative halo bias model works at the field level. The advantage of this approach is that all measurements can be done without sample variance if the same initial conditions are used in simulations and perturbation theory calculations. For this purpose, modified bias operators in Eulerian space are defined, designed such that the large bulk flows are automatically resummed and not treated perturbatively. Using these operators, the bias model accurately matches the Eulerian density of halos in N-body simulations. The mean-square model error is close to the Poisson shot noise for a wide range of halo masses, and it is rather scale-independent. In contrast, for linear bias the mean-square model error can be higher than the Poisson prediction by factors of up to a few on large scales, and it becomes scale dependent already in the linear regime. These results may be of particular relevance for cosmological inference methods that use a likelihood of the biased tracer at the field level, or for initial condition and BAO reconstructions that require precise estimates of the large-scale potential from the biased tracer density.

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TALKS

Dark Clusters on Megaparsec Scales

Luis Campusano

(Departamento de Astronomia, Universidad de Chile)

An optical study from Campusano et al. (2018) on the nearby universe finds that the massive structures (clusters) may have widely different M/L ratios and galaxy content. These results that contribute to our understanding of selection effects of massive systems (clusters) were possible thanks to the development of a new class of cluster finder by Pereira et al. (2017), not model-dependent, focussed on the identification of massive systems and which abandons the usual priors on the system's galaxy richness or galaxy content. The consistence of our results with the searches of large mass clumps through weak-lensing (galaxy shear) maps that have been conducted at intermediate redshifts (z:0.2-0.6), notably by Shan et al. (2012) and Miyasaki et al. (2018), is discussed. We discuss the incidence of these new results on the understanding of selection effects in catalogs of clusters of galaxies, critical for using cluster counts as a cosmological tool, and in particular the impact for LSST searches of mass clumps based on weak-shear is considered.

A generalized non-Gaussian consistency relation for single field inflation.

Rafael Bravo Guerraty

(Departamento de Física, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile)

In this talk, I will show that a perturbed inflationary spacetime, driven by a canonical single scalar field, is invariant under a special class of coordinate transformations together with a field reparametrization of the curvature perturbation in co-moving gauge. This transformation may be used to derive the squeezed limit of the 3-point correlation function of the co-moving curvature perturbations valid in the case that these do not freeze after horizon crossing. This leads to a generalized version of Maldacena's non-Gaussian consistency relation in the sense that the bispectrum squeezed limit is completely determined by spacetime diffeomorphisms. Just as in the case of the standard consistency relation, this result may be understood as the consequence of how long-wavelength modes modulate those of shorter wavelengths. This relation allows one to derive the well-known violation to the consistency relation encountered in ultra slow-roll, where curvature perturbations grow exponentially after horizon crossing. I will also comment that independently of whether inflation is attractor or non-attractor, the size of the observable primordial local non-Gaussianity is predicted to be cero at leading order.

Interdisciplinary for astronomical data challenges: the case for PLAsTiCC

EMILLE ISHIDA

(CNRS/LPC - Clermont)

Among the many challenges imposed by the next generation of large scale astronomical surveys, the classification of transient sources is arguably one of the biggest obstacles to be overcomed before we can exploit the full potential of these new instruments. Although most of the standard astrophysical transient studies rely on high resolution spectroscopic observations, the new surveys will mostly deliver low resolution photometric measurements. Machine learning methods are then expected to overcome this sample selection bias providing reliable photometric classifications. In order to have an up to date picture of how different methods behave in this scenario, a new simulated data set is being developed - which will allow machine learning methods to be tested in a controlled environment. Moreover, PLAsTiCC (Photometric LSST Astronomical Time-series Classification Challenge) also aims to be a fertile ground for the development of new approaches based on LSST requirements. In this talk I will discuss the motivations and goals behind this data challenge and give details on how the language of data challenges can help bridge the gap between academia and industry to help overcome bottle-necks in the cosmological pipeline.

Sharpening cosmological constraints with EFT methods

Nickolas Kokron

(Stanford University)

The incoming era of Stage-4 survey cosmology has the potential to revolutionize our understanding of the Universe. For the first time, constraints on the late Universe better than early Universe constraints obtained by the Planck mission. However, fully unlocking the power of these surveys is a task fraught with difficulties at every stage. One of the main theoretical challenges will be modelling the non-linear regime of structure formation, in order to optimally use survey data. One promising approach to tackling this issue is the use of Effective Field Theory methods, which push modelling into the quasilinear regime in a controlled fashion. In this talk we will discuss efforts to re-analyze BOSS DR12 clustering measurements using the EFT of Large Scale Structures, implications of these results, and what lies ahead for LSST and other surveys.

Strong lensing by substructures in galaxy clusters

Massimo Meneghetti

(INAF - OASBO)

Thanks to the very recent CLASH and Frontier Fields programs of the Hubble Space Telescope, it has been possible to identify an unprecedented number of strong lensing features (multiple images and gravitational arcs) in the fields of several galaxy clusters. These features have been used to build detailed mass models and to map the distribution of matter in the cluster lenses. Among the strong lensing features, several examples of galaxy-galaxy strong lensing events have been found. In these events, the lenses are cluster members, whose ability to lens background sources is enhanced by the host cluster. The cluster mass models indeed predict that the cross section for this kind of events should be relatively large. With the aid of numerical simulations and analytical models, I will discuss how do these observations compare to theoretical expectations. In particular, I will show that clusters obtained from state-of-the-art N-body and hydrodynamical simulations have much lower cross sections for galaxy-galaxy strong lensing than measured in the Frontier Fields or in other CLASH clusters. This puzzling result casts doubts on our current understanding of the processes that shape the internal structure of galaxy clusters.

Tomographic local 2D analyses of the WISExSuperCOSMOS all-sky galaxy catalogue

Camila Paiva Novaes

(Observatório Nacional)

The recent progress in obtaining larger and deeper galaxy catalogues is of fundamental importance for cosmological studies, especially to robustly measure the large-scale density fluctuations in the Universe. The present work uses the Minkowski Functionals (MF) to probe the galaxy density field from the WISExSuperCOSMOS (WSC) all-sky catalogue by performing tomographic local analyses in five redshift shells (of thickness $\delta z=0.05$) in the total range of $0.10 < z < 0.35$. Here, for the first time, the MF are applied to 2D projections of the galaxy number count (GNC) fields with the purpose of looking for regions in the WSC catalogue with unexpected features compared to LCDM mock realizations. Our methodology reveals one to three regions of the GNC maps in each redshift shell with an uncommon behaviour (extreme regions), i.e. p-value < 1.4 per cent. Indeed, the resulting MF curves show signatures that suggest the uncommon behaviour to be associated with the presence of over- or underdensities there, but contamination due to residual foregrounds is not discarded. Additionally, even though our analyses indicate a good agreement among data and simulations, we identify one highly extreme region, seemingly associated with a large clustered distribution of galaxies. Our results confirm the usefulness of the MF to analyse GNC maps from photometric galaxy data sets.

Challenges for Galaxy Morphological Classification from Large Surveys

Reinaldo Roberto Rosa

(Instituto Nacional de Pesquisas Espaciais)

Morphology is a key ingredient in the process of selecting a sample of galaxies for studying the physical mechanisms responsible for shaping the galaxies as we observe today. In the context of Big Data, the morphological classification of galaxies requires high performance for fast processing of images made available from large surveys (e.g. SDSS7, KiDS and upcoming instruments as LSST and Euclid.). A high performance in this scientific context requires expertise in the three computational segments: software, hardware and people ware. In this talk we will situate the galaxy morphology within the context of Big data (volume, velocity, variety, value and virtuosity), emphasizing the software performance that is currently available (with emphasis on Morfometryka and Scymorph [2]). We will also discuss which bottlenecks exist in the hardware segment and what are some strategies to optimize automatic classification considering new parallelism architectures (e.g. GPGPU, XP-KNL and FPGA) and their adequacy to machine and deep learning techniques. We will show preliminary results using Morfometryka and Cymorph in addition to a projected performance, for an optimized prototype, to analyze and classify one billion galaxies. [1] Rosa, R.R. et al., MNRAS, 477(1), L101-L105, 2018. https://doi.org/10.1093/mnrasl/sly054

Non-Gaussian Likelihood in Harmonic space. Why we don't need covariance to estimate parameters

Antonino Troja

(ICTP-SAIFR/IFT-UNESP)

We are used to consider Cl distributed like a Gaussian. But this is not true, especially at the lowest multipole, where the distribution is highly non-Gaussian. In this talk I will show you how it is possible to build a new likelihood for the Cl's using them actual distribution and what are the results of the analysis performed with NG likelihood with respect to G likelihood.

NumCosmo: Numerical Cosmology Library

Sandro Dias Pinto Vitenti

(CP3 - Universitè Catholique de Louvain)

The Numerical Cosmology Library (NumCosmo) project aims to build a complete and public numerical library dedicated to solve cosmological and astrophysical numerical problems. The language of choice is C and the toolkit GLib that provides data structure handling for C, portability wrappers, and interfaces for such runtime functionality as threads, dynamic loading, and an object system. GLib also provides automatic bindings through the GObject-Introspection module, making NumCosmo available in other languages (Python, Perl, Java, Javascript, etc) without any additional code. The library deals with two distinct class of problems, the numerical computation of theoretical predictions of cosmological and astrophysical observables and their comparison with data. The general infrastructure is built on top of a multi-purpose mathematical library NumCosmoMath and external tools (fast Fourier transform, ordinary differential equation solver, numerical integration, special functions, etc). The library currently implements several observables, ranging from cosmological distances to recombination and galaxy cluster mass estimation. Currently, there are three main projects involved in the Library, Xcor as the basis of implementation of cross correlation likelihoods, the large scale structure module that includes different tools as non-linear matter power spectrum, halo mass function, lensing, and the module to compute the Cosmic Microwave Background (CMB) anisotropies. In this presentation we will discuss briefly these modules and examples of their usage highlighting the library philosophy. Then we move to a simple example of NumCosmo usage where we implement a model and a data object in Python and perform different statistical analyses. The library can be found at github https://github.com/NumCosmo/NumCosmo and its documentation, tutorials and examples at https://numcosmo.github.io/ . The library is available for different package managers such as the conda at conda-forge https://anaconda.org/conda-forge/numcosmo.

The BINGO Telescope: an instrument to explore the Universe in the 21cm wavelength

Carlos Alexandre Wuensche

(Instituto Nacional de Pesquisas Espaciais)

BINGO (BAO Integrated Neutral Gas Observation) is a unique radio telescope designed to make the first detection of Baryon Acoustic Oscillations (BAO) at radio frequencies through measurements of neutral hydrogen at cosmological distances using a technique called Intensity Mapping (IM). Along with the Cosmic Microwave Background anisotropies, the scale of BAO is one of the most powerful probes of cosmological parameters, including dark energy. The telescope will be built in a low RFI site at Vale do Piancó, in the northeastern state of Paraíba, Brazil. It consists of a two- mirror compact range design with ~ 40 m diameter primary and have no moving parts. With a feedhorn array of 50 receivers, it will operate in the frequency range going from 0.96 GHz to 1.26 GHz ($0.13 < z < 0.48$) and will map a 15o declination strip as the sky drifts past the telescope. This presentation will cover the science goals proposed for BINGO and its current construction status.

Galaxy Surveys in Harmonic Space

Felipe Andrade Oliveira

(Instituto de Física Teórica- Unesp)

In this talk, we will discuss some features of galaxy surveys in harmonic space. Using a sample of 1.3 million galaxies in the redshift $0.6 < z < 1.0$ from the Dark Energy Survey Y1 'Gold' catalog, we detected the Baryon Acoustic Oscillation feature using the Angular Power Spectrum (APS). The methods presented here will be extended for the Y3 DES data and other surveys.

Dealing with stellar contamination and anisotropic selection effects on large photometric surveys

Henrique Xavier

(Instituto de Astronomia, Geofísica e Ciências Atmosféricas da USP)

Past photometric surveys have demonstrated that certain observational systematic effects are very likely to be present in future surveys as well. Stellar contamination, stellar obfuscation (decrease in the number of observed galaxies as a function of stellar density), Galactic extinction and anisotropic selection functions due to combining data from disjoint sky regions or different telescopes appear to have come to stay. I will present a few recent progresses made on techniques to minimize these effects that will likely affect LSST and other upcoming projects.

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POSTERS

Matter growth in imperfect fluid cosmology

William Celestino Algoner Jorge

(UNIVERSIDADE FEDERAL DO PARANÁ)

We model the total cosmic medium as an imperfect fluid in Einstein's GR. The corresponding total energy-momentum tensor is split into two components, one of them being a pressureless perfect fluid, the second one another imperfect fluid. The pressureless fluid is supposed to account for some form of (dark) matter, the imperfect component is intended to provide an effective description of dark energy. The imperfect fluid structure allows us to include anisotropic stresses and energy fluxes which are considered as potential signatures for deviations from the cosmological standard model. As an example, we consider the dynamics of a scalar-tensor extension of the ΛCDM model, the eΦΛCDM model. We quantify the possible impact of (effective) dark-energy perturbations and constrain the magnitudes of anisotropic pressure and energy flux with the help of redshift-space distortion (RSD) data for the matter growth function fσ8.

The relation between the physical properties of the intracluster plasma and the large scale structure of the Universe

Natália Crepaldi Del Coco

(Institute of Astronomy, Geophysics and Atmospheric Sciences)

The main goal of this project is the study of the possible relation between the physical properties of the intracluster plasma, determined through X-ray observations, and the large scale environment where clusters are found. Based on the clusters X-ray analysis we will measure the density, temperature, and metallicity radial profiles, while the large scale structure in the neighborhood of clusters will be analyzed based on the galaxy spatial distribution (in the optical) as well as based on the spatial distribution of nearby groups and clusters (in X-ray, based on the ROSAT All-Sky Survey). We will identify the possible correlations between the intracluster plasma physical properties with the environment and evaluate what this information brings to our understanding of large structure formation in the Universe.

Thermodynamics of decaying vacuum

David Montenegro Coelho

(Instituto de Fisica Teorica (IFT))

We will show the influence of dissipative thermodynamics process in decaying vacuum over Israel-Stewart formulation and perform an expansions at second order in entropy's law. We clarify hos dissipative process interfere at data analyzes.

Field theory models of interacting dark energy: observational constraints and model selection

Sandro Marcio Rodrigues Micheletti

(Universidade Federal do Rio de Janeiro - Campus Macaé)

We derive two field theory models of interacting dark energy, in which dark energy is associated with the quintessence and the tachyon scalar field. In both, instead of choosing arbitrarily the potential of scalar fields, these are specified implicitly by imposing that the dark energy fields must behave as the new agegraphic dark energy. The resulting models are compared with the Pantheon supernovae sample, CMB distance information from Planck 2015 data, baryonic acoustic oscillations (BAO) and Hubble parameter data. For comparison, we also consider the noninteracting case and the LambdaCDM model. By use of information criteria, we obtain strong evidence in favor of an interaction in the dark sector of the universe, and for the two models the coupling constants are non vanishing with more than 3 standard deviations of confidence.

Lensed Quasars on Large Surveys

Cristobal Moya

(Instituto de astrofisica PUC)

Statistical analysis of lensed sources such as quasars can yield valuable cosmological data. Such analysis requiere a larger number of known systems. Future surveys such as LSST will be a key source of lens candidates. I'll present our approach at finding this objects in current surveys.

Machine and Deep Learning applied to galaxy morphological classification

Rubens Andreas Sautter

(Instituto Nacional de Pesquisas Espaciais)

The morphological classification of galaxies is crucial for understanding the large- scale structure of the universe. The galaxy classification is a challenge due to the large amount of data and the data quality variation. We examine ~670.000 visually consistent images from Sloan Digital Sky Survey, which were classified by the citizen science project Galaxy Zoo. We investigate two approaches to galaxy morphology: one based on non-parametric morphology known as CyMorph, and a second approach based on Deep Learning (DL). In order to speedup CyMorph, we distributed the galaxy images and tested at a machine with 40 CPU units, and 64 GB of RAM. CyMorph took ~3 days and 6 hours to classify the dataset, and the overall accuracy was ~95%. For the second approach, we used the GoogLeNet Inception architecture to build the Convolutional Neural Network (CNN), which were tested at a machine with 20 CPU units, 512GB of RAM, and 8 Tesla P100 GPU. It took ~3 hours to train the CNN and classify the dataset. The overall accuracy of CNN is ~98%.

Using quasars to probe the large-scale structure of the Universe

Carolina Queiroz de Abreu Silva

(Instituto de Física/USP)

The next generation of large telescopes points to an exciting future with quasar research. In this work, I present some results on how to obtain a complete and accurate catalog of quasars in the context of narrow-band filter surveys. First, we use a machine learning approach, based on a random forest algorithm, to separate quasars from stars and galaxies. Then, we implement a technique to estimate the photo-z's in a 6-dimension space, that models the quasar fluxes through a linear combination of the amplitudes of the principal components of quasar spectra plus an extinction law. Finally, we apply these methods to exploit the potential of quasar catalogs to map the large-scale structure of the Universe.

Inferring Cosmological Parameters in a Non-Gaussian Likelihood Framework

Vinícius Santos Terra

(Instituto de Física Teórica (IFT-UNESP))

In the data analysis of the first year of observation of the Dark Energy Survey (DES), an assumption for the angular power spectrum, denoted by C_{ℓ}, is that they are Gaussian random variables. But in a more rigorous analysis, is it possible to prove that C_{ℓ} it follows a Non-Gaussian Likelihood, the Gamma probability distribution function. So, to study these properties, we produced 150 and 1200 FLASK Mocks for complete and fractional observation of the sky with a DES satellite like, respectively. After doing this, we calculate C_{ℓ} with the NaMaster code, convert the analysis to the configuration space, and explore what's the impact on the Cosmological Parameters when we assuming a Non-Gaussian Likelihood framework.