Rubin LSST-France, APC Paris, 27-29/11/2024

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APC

Recueil des résumés

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Science talks / **1**

High-redshift LBG selection from broadband and wide photometric surveys using a Random Forest algorithm

Auteur: Constantin Payerne[1]

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Lyman-Break Galaxies (LBGs) are promising tracers for exploring the properties of dark energy in the high-redshift Universe. In light of DESI-II, the extension of the current Dark Energy Spectroscopic Instrument (DESI) that will start in 2029, the role of broadband-wide photometric surveys such as UNIONS or the Vera C. Rubin LSST is essential to design the optimal selection of these $z \geq 2$ tracers. In this work, we explore the feasibility of selecting LBGs using a Random Forest approach in the redshift range $2.5 < z < 3.5$, using existing deep imaging data from HSC and CLAUDS (u, g, r, i, and z bands) degraded to the UNIONS depth. For a target density budget of $1,100$ deg^{-2}, we expect from this work a density of spectroscopically confirmed LBGs of 490 deg^{-2}. Our UNIONS-like target selection was tested during a dedicated DESI observation campaign on the COSMOS field, providing a safe spectroscopic sample of 460 targets with a mean redshift of 3. This sample is then used to derive forecasts for DESI-II. This talk is based on the paper arXiv:2410.08062, recently submitted to JCAP.

Science talks / **2**

Probabilistic characterization of blending: application to cluster lensing cosmology

Auteur: Manon Ramel[1]

[1] *LPSC / IN2P3*

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The upcoming deep optical surveys, such as the Vera C. Rubin Observatory Legacy Survey of Space and Time (LSST), are set to explore the Universe to unprecedented depths, uncovering billions of galaxies. This amount of detection from the ground will lead to the apparent superposition of galaxies in the images, a phenomenon known as blending. This poses a significant challenge for the precise measurement of individual galaxy properties, especially shapes and redshifts, which are crucial for estimating the masses of large-scale structures, such as galaxy clusters, through weak gravitational lensing.

This talk will introduce an innovative matching approach to properly detect and characterize blended systems in simulated catalogs, in preparation for the future LSST data. The technique employs new metrics —probability of matching and blending entropy —to distinguish recognized and unrecognized blends. It is implemented in the friendly algorithm, developed for the major and international Dark Energy Science Collaboration (DESC) of LSST.

We use it to address the issue of blending in galaxy cluster mass estimates, demonstrating its efficiency. We find that cutting on blending entropy excludes the third of detected galaxies that are strongly impacted by blending from the dataset. We thus demonstrate that blending can cause a low bias in the amplitude of cluster weak lensing profiles, affecting the mass estimates of galaxy clusters. Furthermore, the broader impact of blending on the cosmological parameters Omega_m and sigma_8 from cluster lensing, and how the friendly procedure can mitigate these effects will be discussed.

Science talks / 3

Growth rate measurement using LSST type Ia supernovae

Auteur: Damiano Rosselli[1]

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Type Ia supernovae (SNe Ia) are well-known distance indicators. Through the distance recovered from SNe, it is possible to recover their host galaxy's peculiar velocities (PVs). The PV field measured by SNe Ia enables us to constrain the growth rate of cosmic structure. Using a realistic simulation of SNe light curves, as expected from LSST, we have analyzed the sample bias due to selections and contamination. We have used the Maximum Likelihood method to recover the growth rate constraints from LSST SNe Ia PVs. We have produced a forecast for the 10 years of LSST surveys under various scenarios and assumptions.

Science talks / 4

Human-Labelling-Free Transient and Bogus Classifier using Gen3 LSST Pipelines

Auteur: Raphael BONNET GUERRINI[None]

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In the upcoming LSST survey, transient detection—including events like Type Ia supernovae (SNe Ia)—will be conducted through Difference Image Analysis (DIA). A major challenge in this method is that many detections are actually "bogus", arising from noise, artifacts, imperfect image subtraction, cosmic rays, bad pixels, or atmospheric effects. Currently, distinguishing real transients from bogus detections involves a combination of physical flags generated by algorithms and manual human inspection.
In this talk, we introduce a machine learning-based approach for classifying bogus and transient events using unlabelled datasets. By injecting synthetic transients into the data, we eliminate the need for human labelling. Additionally, we present an improved injection process leveraging the Gen3 LSST pipelines.

Science talks / 5

Transient Classifiers for Fink: Benchmarks for LSST

Auteurs: Anais Moller[1]; Andre Santos[2]; Bernardo Fraga[2]; Clecio Roque De Bom[3]; Emille Ishida[4]; Etienne Russeil[None]; Julien Peloton[5]; Marco Leoni[6]; Stéphane Blondin[7]

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I will present the infrastructure tests and classification methods developed within the Fink broker in preparation for LSST. This work aims to provide detailed information regarding the underlying assumptions, and methods, behind each classifier. Using simulated data from the Extended LSST Astronomical Time-series Classification Challenge (ELAsTiCC), we showcase the performance of binary and multi-class ML classifiers available in Fink. These include tree-based classifiers coupled with tailored feature extraction strategies, as well as deep learning algorithms. We introduce the CBPF Alert Transient Search (CATS), a deep learning architecture specifically designed for this task. ELAsTiCC was an important milestone in preparing Fink infrastructure to deal with LSST-like data. Our results demonstrate that Fink classifiers are well prepared for the arrival of the new stream; this experience also highlights that transitioning from current infrastructures to Rubin will require significant adaptation of currently available tools.

Science talks / **6**

Advancements in the DESC Cluster Pipeline: Current State and Cosmological Analysis with Firecrown

Auteur: eduardo barroso[1]

[1] *LAPP*

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In this talk, we will see the state-of-art of the DESC Cluster pipeline and some recent improvements that have been done in Firecrown regarding the cluster shear profile analysis.

Science talks / **7**

DC2 Cluster Detections with WaZP

Auteur: Rance Solomon[1]

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This talk focuses on the cluster detection performance in the DC2 image catalog with the WaZP cluster finder.

Science talks / **8**

Rubin Cluster and protocluster detection and cosmology

Auteur: Simona Mei[None]

Co-auteurs: Dominique Boutigny [1]; James Bartlett [2]; Kirill Grishin [3]; Mai Nicolas ; Stéphane ILIC [4]; Vinh-Phat Tran

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We deleveloped ML algorithms for cluster detection within DESC, and will present future projects to extend this research and the developement of algorithms for the estimation of detection selection function for cosmology. We also focus on the study of galaxy evolution in galaxy clusters and protoclusters.

Science talks / **10**

The Rubin Galaxies science collaboration

Auteur: Simona Mei[None]

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We will present the Rubin Galaxies science collaboration, and recent updates to our publication policy.

Science talks / **11**

Fink

Auteurs: Anais Moller[1]; Emille Ishida[2]; Julien Peloton[3]

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Status & perspectives of the Fink project 6 months before the start!

Science talks / **12**

The Effect of the Environment on Galaxy Scaling Relations as a Function of Redshift in Euclid and LSST

Auteur: Cressida Cleland[None]

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We present predictions on the effect of the local environment on the quenched fraction and early-type fraction of galaxies, as a function of redshift. With a focus on z=2-3, we probe how the 'protocluster' environment affects galaxy evolution. We compare between various semi-empirical and semi-analytic models. We combine simulated Euclid and LSST data to select for quenched galaxies from z=0.5 to 3. Our results show a strong passive-density relation, particularly at high stellar mass, in the GAEA model. We find that this trend is present at least up to z=3. We find a similar trend in the

morphology-density relation. These results show how important the synergy between Euclid and Rubin will be for obtaining a large statistical sample of galaxies in a range of environments.

Science talks / **13**

LSST impact on dark matter analysis with stellar stream

Auteur: Matthieu Pelissier[1]

Co-auteur: Marine Kuna [2]

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Dark matter subhalos with masses from 10^6 to 10^9 solar masses are mostly invisible, but could impact the structure of stellar streams observed by LSST. Presentation on how LSST systematics could impact establishing constraints on alternative dark matter models thanks to stellar streams analysis.

Plenary / **14**

Tomographic study of the anomalous cosmic dipole with LSST

Auteur: Roya Mohayaee[1]

[1] *Institut d'Astrophysique de Paris/Sorbonne université*

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The recent data from high redshift Universe demonstrates that our velocity with respect to distant sources, for example quasars and radio galaxies at redshifts of more than one,
is at least twice as large as our velocity with respect to the rest frame of cosmic microwave background (CMB). If the Universe is homogeneous and isotropic on large scales then the restframe of CMB is expected to coincide with the restframe of distant matter. A tomographic study of the evolution of the dipole starting from nearby to larger and larger scales is essential in order to understand the origin of this anomaly. I report on recent results from Wise satellite and outline how a tomographic map of the dipole can be achieved with the forthcoming LSST.

Plenary / **15**

Welcome

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Plenary / **16**

News from Rubin and DESC

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Plenary / **17**

EDIM

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Plenary / **18**

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Plenary / **19**

Computing

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Plenary / **20**

180s flash talks!

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Plenary / **21**

Commissioning plan focal

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Plenary / **22**

AuxTel

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Plenary / **23**

Camera filter exchange system

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Parallel / **24**

Clusters

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Parallel / **25**

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Parallel / **26**

ComCam

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Parallel / **27**

Photo-z

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Parallel / **28**

Fink

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Parallel / **29**

Shear/blending

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Plenary / **30**

Simons Observatory: status update and synergies with LSST

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The Simons Observatory (SO) is a new cosmic microwave background (CMB) experiment, located on Cerro Toco in Chile, that began observing in 2024. SO plans to measure the temperature and polarization variations in the CMB across six frequency bands, spanning 27 to 280 GHz. The initial setup includes three small-aperture (0.5-meter) telescopes (SATs) and one large-aperture (6-meter) telescope (LAT), using a total of 60,000 cryogenic bolometers. The detector count in both the SATs and LAT is planned to double by 2028.
The key scientific goals for SO include investigating primordial perturbations, determining the number and mass of relativistic species like neutrinos, testing the cosmological constant, improving insights into galaxy formation, and constraining the period of reionization. The SATs will observe the largest angular scales, covering about 10% of the sky with a white noise level of 2 μK-arcmin in the combined 93 and 145 GHz bands, targeting the primordial tensor-to-scalar ratio, r, with a sensitivity goal of $\sigma(r) = 0.003$ (in the nominal configuration). Meanwhile, the LAT will map roughly 40% of the sky at arcminute-scale resolution with an expected white noise level of 6 μK-arcmin in the same bands, overlapping significantly with LSST's sky region and partially with DESI.
In this talk, we will outline the scientific objectives of SO, the current progress of the initial phase of data taking, and plans for future upgrades (SO:UK, SO:JP, and Advanced SO). We will also describe our work, which concerns some aspects of the data analysis pipeline such as map-making and instrumental modelization.

Science talks / **31**

StarDICE update

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Plenary / **32**

Lightning talks

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Science talks / **33**

Alert pipeline

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