Posters - Iberian Strings 2025

1. Xiancong LUO, University of Edinburgh,
   Finite complexity of the ER=EPR state in de Sitter
   The ER=EPR conjecture states that quantum entanglement between boundary degrees of freedom leads to the emergence of bulk spacetime itself. Although this has been tested extensively in String Theory for asymptotically anti-de Sitter spacetimes, its implications for an accelerating universe, such as our own, remain less explored. Assuming a cosmic version of ER=EPR for de Sitter space, we explored the computational complexity corresponding to long-range entanglement responsible for bulk states on spacelike hypersurfaces. Rather remarkably, I will show that the complexity of the Euclidean vacuum, as an entangled state over two boundary CFT vacua, is finite both in the UV and the IR, which provides additional evidence for cosmic ER=EPR. If time permits, I will show that this result is a universal feature of spacetimes with horizons and points to a third law of complexity.

2. Camilo las Heras Guverneur, IFT UAM/CSIC,
   Quantum M2-branes, torsion, and parabolic (p,q)-strings
   In this talk, we show that M2-branes with fluxes and monodromy can reproduce type IIB gauged supergravities in 9D. The worldvolume description of these M2-branes with nonvanishing winding on a torus is known. They have a discrete supersymmetric spectrum. Their global description is given by twisted torus bundles with monodromy in SL(2,Z). This monodromy implies the existence of torsion cycles in the bundle description. We found a relation between the equivalence classes of M2-brane bundles with the gauge symmetry and the U-duality group at low energies. We also identify the role of the torsion in the global and local description and analyze its consequences. The double-dimensional reduction of these quantum M2-branes with torsion and parabolic monodromy will be discussed.

3. Clara Roldán Domínguez, Federal University of Espirito Santo (UFES)
   Supersymmetric Axionic model in $N = 1$ Wess-Zumino gauge from CFJ approach
   Axions offer a compelling solution to the strong CP problem in quantum chromodynamics (QCD) and are excellent dark matter candidates. Recently it has been studied that axions-like particles arise naturally in a CFJ electrodynamics scenario (with Lorentz symmetry violation). With the desire to study the axion in a supersymmetric context, we take advantage of an already studied supersymmetric extension of the CFJ electrodynamics and analyze the natural appearance of the axion in this scenario.

4. Pau García, IFT UAM/CSIC
   Harris-relevant disordered charged horizons
   We present a bottom-up model for the holographic dual of 2D and 3D strongly interacting systems with a disordered chemical potential along one spatial direction.

On the gravity side, we introduce disorder through a space-dependent source for a U(1) gauge field sampled from a Gaussian white noise distribution; we ensure the disorder is Harris-relevant. At high temperatures, we observe disordered charged horizons. We find distinct behaviours for the two cases after lowering the temperature while remaining within the disordered regime. In the AdS_3 scenario, contrary to the expectation from the Harris criterion, inhomogeneities at the horizon die off as the temperature decreases, leading to the clean IR fixed point. Conversely, in the AdS_4 case, we propose that the dual theory flows to an inhomogeneous IR fixed point with finite conductivity. The average geometry of the inhomogeneous IR coincides with the clean fixed point.

5. Ram Narayan Deb, Chandernagore College
   A Measure of Quantum Entanglement in Multi-Particle Systems of Two-Level Atoms
   We propose a method for the detection and quantification of quantum entanglement in multi-particle systems of two-level atoms in pure states. We show that the quantum fluctuations of the pseudo-spin operators of the composite quantum state of multi-particle systems can be expressed as an algebraic sum of the quantum fluctuations of the individual atoms and quantum correlation terms among them. This helps to separate out solely the quantum correlation terms among the atoms and construct a measure of multi-particle quantum entanglement.

6. Guhesh Kumaran, Imperial College London
   Quiver Polymerisation
   The gauging of flavour symmetries of 3d N=4 gauge theories is a classical problem and well understood. However, 3d N=4 gauge theories enjoy a topological symmetry in the UV which may get enhanced in the IR to some non-Abelian symmetry. The gauging of subgroups of this Coulomb branch global symmetry is difficult to realise through a Lagrangian description. For 3d N=4 quiver theories the gauging of these symmetries has been realised through combinatorial operations which bypass the need for a Lagrangian description. In this talk, two such combinatorial operations are introduced; chain and cyclic polymerisation which are inspired from class S theories. These techniques are applied to a variety of physical contexts, through magnetic quivers, such as the moduli space of SU(n) instantons on Klein A-type singularities and also to the 6d N=(1,0) theory arising from two 1/2 M5 branes on Klein E6 singularity.

7. Gonzalo Fernández Casas, IFT UAM/CSIC
   Modular Invariant Starobinsky Inflation and the Species Scale
   In cosmological inflation, scalars with trans-Planckian ranges lead to massless towers of states, shifting the fundamental scale to the species scale, Λ. This scale transforms as an automorphic form of the theory's duality symmetries. We propose that the inflaton potential should be an automorphic invariant form, non-singular over all moduli space, depend only on Λ and its field derivatives, and approach constant values

in large moduli for prolonged inflation. This leads to the potential ($V \sim \lambda(\phi, \phi^*)$), with ($\lambda = G^{i\bar{j}}(\partial_i \Lambda)(\partial_{\bar{j}} \Lambda)/\Lambda^2$). For a single elliptic complex modulus with (SL(2, Z)) symmetry, the inflaton potential resembles the Starobinsky model at large modulus. Inflation parameters are computed, showing results similar to Starobinsky's but with modular invariant expressions. The number of e-folds is proportional to the number of species in the tower, suggesting the tower's significant role in the inflation process.

8. Pablo Saura Bastida, Universidad Politécnica de Cartagena and IFT UAM/CSIC
   Generalized Symmetry Resolution of Entanglement in CFT for Anyonic Sectors
   In this talk, I will discuss our recent work where we present a comprehensive symmetry resolution of entanglement entropy (EE) in (1+1)-d rational conformal field theories (RCFTs) with non-invertible symmetries. This amounts to symmetry resolving entanglement with respect to the generalized twisted and anyonic charge sectors of the theory. The anyonic sectors label the irreducible representations of a modular fusion category defining the symmetry and can be understood through the (2+1)-d symmetry topological field theory (SymTFT) that encodes the symmetry features of the CFT. Using this, we define the corresponding generalized boundary dependent charged moments necessary for the symmetry resolution of the entanglement entropy. Furthermore, contrary to the case of invertible symmetries we observe the breakdown of entanglement equipartition between different charged sectors at next-to-leading order in the ultraviolet cutoff.

9. Aitor Vicente Cano, University of Barcelona
   Buchdahl's theorem in gravitational theories of regular black holes
   Recently, it has been shown that the Schwarzschild black hole singularity gets generically resolved in $D \geq 5$ spacetime dimensions by the introduction of certain string theory-inspired infinite towers of higher-curvature corrections to the Einstein-Hilbert action. In such theories, a Birkhoff theorem holds and the collapse of matter has been show to lead to the formation of regular black holes. In my talk I will explain how the Tolman-Oppenheimer-Volkov equations for the hidrostatic equilibrium of perfect-fluid spherical bodies get modified by the presence of such infinite towers of corrections. In particular, I will describe how Buchdahl's theorem for the maximal sustainable density of matter predicted by general relativity is affected within this context, for which the physics of gravitational collapse is drastically altered.

10. Andrea Conti, Universidad de Oviedo
    AdS3/CFT2 and defects
    In recent years defects in CFT have been the subjects of many works. In this talk I will focus on 2d defects. I will present two classes of AdS3 x S3 x S2 x Σ solutions in Massive Type IIA supergravity that preserve small and large N=(0,4) supersymmetry. They are related to the AdS7 x S2 x I solutions that are dual to 6d N=(1,0) CFTs. I will show how the first class is dual to deconstructed 6d (1,0), while for the second I suggest an interpretation of defects in the same 6d theories.

11. David Garcia Fariña, IFT UAM/CSIC
Holographic Non-Hermitian Lattices and Junctions with PT-Restoring RG Flows
We construct and study inhomogenoeus non-Hermitian strongly coupled holographic field theories. We consider two models: a lattice where in each site there is some inflow/outflow of matter and a Hermitian/non-Hermitian/Hermitian junction. Depending on whether we turn on a complex external gauge field, we find solutions that spontaneously break PT (thus hinting at a lack of unitary evolution) and solutions that do not. The former present an imaginary current responsible for the spontaneous breaking of PT. We also study the IR geometry of these solutions finding that they flow to a PT-unbroken fixed point. This leads us to claim that there is a PT-symmetry restoration in the IR, similar to the one observed in the perturbative setup of arXiv:2110.05289.

12. Giacomo Giorgi, Universidad de Murcia
Non invertible operators in Type IIB supergravity
In Type IIB supergravity, we obtained a collection of (non)invertible topological operators corresponding to broken p-form symmetries of the theory, especially for SL(2, Z) 0-form symmetry. These non-invertible operators are obtained by imposing fractional charges within a BF theory framework while ensuring gauge invariance. We further analyze how these operators act on charged objects. The obtained non invertible operators present similarities to those in the fractional quantum Hall effect but with a more extensive field content.

13. Davide Rovere, University of Padova
How to uplift D=3 maximal supergravities
We investigate the necessary and sufficient conditions for finding of a higher dimensional uplift for three-dimensional maximally supersymmetric (gauged) supergravity theories. The inverse problem of Scherk-Schwarz compactification of M-theory consists in distinguishing which lower dimensional maximal (gauged) supergravities, with duality group $E_n(n)$, admits a higher dimensional uplift, assuming the Scherk-Schwarz compactification to be the unique way to get back the initial theory. A general procedure is known in solving the uplift problem, up to four dimensions, based on the generalised geometry formalism. The main problem in the three-dimensional case, that is, when the duality group is $E_8(8)$, is that its fundamental representation is larger than the number of M-theory degrees of freedom, even including the dual graviton. To overcome the problem, one has to modify the generalised geometry, by "doubling" the generalised Lie derivative. We extend the known procedure of find-ing an uplift in this modified generalised geometry. We also study the global patching of the gauge parameters in this setup. [Based on 2410.14520 w/ G. Inverso]

14. Jani Kastikainen, University of Würzburg
Holographic confinement on positively curved spacetime
Confinement is the phenomenon where quarks at low energies cannot propagate freely,

but are confined into bound states of hadrons. At large temperatures hadrons break apart in a transition to a deconfined phase. Such transitions can also be induced by the curvature of the background spacetime, even at zero temperature. In this talk, I investigate curvature induced confinement transitions in QFTs living on positively curved spacetimes (de Sitter space) using holography. The holographic model consists of Einstein-scalar gravity where the bulk scalar field is assigned a potential that diverges exponentially at large field values. Acceptable interior boundary conditions are defined by requiring the existence of an uplift to a regular solution of higher-dimensional Einstein gravity. We find a competition of two types of saddles and a phase transition between them. We argue that when the leading exponent of the potential is above a certain bound, the transition is first-order, while below the bound, it is higher-order. The talk is based on upcoming work with Elias Kiritsis and Francesco Nitti.

15. Gabriele Barbagallo, IFT UAM/CSIC
Symmetries, Noether Charges, and Black Hole Thermodynamics in 5D and 4D Supergravity
We examine the symmetries and Noether charges for the bosonic sector of N=1, D=5 supergravity and their connection to the corresponding D=4 theory compactified on a circle. A key focus will be on the first law of black hole thermodynamics in both 5D and 4D.

16. Ricardo Stuardo, University of Oviedo
Twisted circle compactification of N = 4 SYM and its holographic dual
We consider a compactification of 4D N = 4 SYM, with SU(N) gauge group, on a circle with anti-periodic boundary conditions for the fermions. We couple the theory to a constant background gauge field along the circle for an abelian subgroup of the R-symmetry which allows to preserve four supersymmetries. The 3D effective theory exhibits gapped and ungapped phases, which we argue are holographically dual, respectively, to a supersymmetric soliton in AdS5xS5 and a particular quotient of AdS5xS5. The gapped phase corresponds to an IR 3D N = 2 supersymmetric Yang-Mills-Chern-Simons theory at level N, while the ungapped phase is naturally identified with the root of a Higgs branch in the 3D theory. We discuss the extension of the twisting procedure to maximally SUSY Yang-Mills theories in different dimensions, obtaining the relevant duals for 2D and 6D, and comment on the odd dimensional cases.

17. Noelia Sánchez González, University of Oxford
Percolating Cosmic String Networks from Kination
A new mechanism will be presented for the formation of cosmic (super)string networks, whose ingredients are realised in string compactifications. Oscillating string loops grow when their tension μ decreases with time. If $2H+\dot{\mu}/\mu < 0$, where H is the Hubble parameter, loops grow faster than the scale factor and an initial population of isolated small loops (for example, produced by nucleation) can grow, percolate and

form a network. This condition is satisfied for fundamental strings in the background of a kinating volume modulus rolling towards the asymptotic large volume region of moduli space. Such long kination epochs are motivated in string cosmology by both the electroweak hierarchy problem and the need to solve the overshoot problem. The tension of such a network today is set by the final vacuum; for phenomenologically appealing Large Volume Scenario (LVS) vacua, this would lead to a fundamental string network with $G_\mu \sim 10^{-10}$.

18. Lavish, Jagiellonian University
Holographic approach to scale without conformal invariance
In this work, we investigate the conditions under which scale invariance arises without conformal invariance in a holographic setting across any number of spacetime dimensions. To this end, we analyze a warped product metric ansatz and show that the presence of a non-vanishing Weyl curvature tensor prevents the existence of the Killing vector field associated with special conformal transformations. Furthermore, we study various non-trivial constraints imposed on the metric ansatz, revealing conditions that might lead to a holographic no-go theorem.

19. Alessandro Pini, Humboldt-Universität zu Berlin,
Integrated correlators at strong coupling in an orbifold of N = 4 SYM
We consider the four-dimensional N=2 quiver gauge theory arising from a Z_2 orbifold of N=4 super Yang-Mills with gauge group SU(2N). By exploiting supersymmetric localization, we study the integrated correlator of two Coulomb branch and two moment map operators, the integrated correlator of four moment map operators and the integrated correlator between a half-BPS Wilson line and two moment map operators, determining exact expressions valid for any value of the 't Hooft coupling in the planar limit. Finally, through a combination of analytical and numerical methods, we determine the leading terms of the corresponding strong-coupling expansions.

20. Rafael Carrasco Carmona, IFT UAM-CSIC
Lorentzian threads and generalized complexity
Recently, an infinite class of holographic generalized complexities was proposed. These gravitational observables display the behavior required to be duals of complexity, in particular, linear growth at late times and switchback effect. In this work, we aim to understand generalized complexities in the framework of Lorentzian threads. We reformulate the problem in terms of thread distributions and measures and present a program to calculate the infinite family of codimension-one observables. We also outline a path to understand, using threads, the more subtle case of codimension-zero observables.

21. Álvaro Arboleya Megido, Universidad de Oviedo
A systematic study of 3D orientifold flux vacua
I will present a systematic study of type II orientifold flux vacua in three dimensions including gauge and metric fluxes, O-planes and D-branes. After introduc-

ing the embedding tensor formalism for half maximal 3D supergravity, I will construct a dictionary between string-theoretic and 3D supergravity quantities, such as fluxes/embedding tensor components. This is done based on group theoretical arguments. As an application, I will explicitly consider the type IIA with O2 duality frame and classify all vacua for its $Z2^2$ invariant sector. I will also comment on the properties of the corresponding mass spectra.

22. Jose David Tempo, Universidad Arturo Prat
    BMS_3 (Carrollian) field theories from a bound in the coupling of current-current deformations of CFT_2
    Two types of Carrollian field theories are shown to emerge from finite current current deformations of toroidal CFT2's when the deformation coupling is precisely fixed, up to a sign. In both cases the energy and momentum densities fulfill the BMS3 algebra. Applying these results to the bosonic string, one finds that the electric-like deformation (positive coupling) reduces to the standard tensionless string. The magnetic-like deformation (negative coupling) yields to a new theory, still being relativistic, devoid of tension and endowed with an "inner Carrollian structure". Classical solutions describe a sort of "self-interacting null particle" moving along generic null curves of the original background metric, not necessarily geodesics. This magnetic-like theory is also shown to be recovered from inequivalent limits in the tension of the bosonic string. Electric- and magnetic-like deformations of toroidal CFT2's can be seen to correspond to limiting cases of continuous exactly marginal (trivial) deformations spanned by an SO(1,1) automorphism of the current algebra. Thus, the absolute value of the current-current deformation coupling is shown to be bounded. When the bound saturates, the deformation ceases to be exactly marginal, but still retains the full conformal symmetry in two alternative ultrarelativistic regimes.

23. Matteo Morittu, Universidad de Oviedo and ICTEA
    On type II half-maximal RSTU models and scale separation
    Relying on the systematic correspondence between string-thepretic and 3D gauged supergravity quantities established in 2408.01403, I will present some simple flux models - called RSTU models - that are derived upon truncation of the full 3D half-maximal gauged supergravity theory to its SO(3) invariant sector. I will mainly focus on the type IIB with O5 RSTU model and provide examples of non-supersymmetric and parametrically scale separated AdS_3 vacua.

24. Jesus Huertas, IFT UAM/CSIC
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    TBA