Iberian Strings 2019

Report of Contributions

https://indico.icc.ub.edu/e/iberianstrings2019

Contribution ID: **5** Type: **not specified**

The Generalized Supergravity Equations

Wednesday 23 January 2019 09:15 (1 hour)

I will review how requiring kappa symmetry for the Green-Schwarz string in a general background leads to a generalization of the usual equations of supergravity. These generalized supergravity equations can also be interpreted as scale invariance, as opposed to Weyl invariance, conditions for the string sigma model. Non-trivial solutions to these equations can be generated by anomalous non-abelian T-duality transformations.

Author: WULFF, Linus

Presenter: WULFF, Linus

Contribution ID: **6** Type: **not specified**

Supersymmetric Action for Multiple D0-brane System

Wednesday 23 January 2019 10:15 (30 minutes)

We present a complete action for the system of N D0-branes in flat 10D type IIA superspace. It is invariant under the rigid spacetime supersymmetry and local worldline supersymmetry (kappa–symmetry). This latter can be considered as supersymmetry of maximal 1d SU(N) SYM model which is made local by coupling to supergravity induced by embedding of the center of energy worldline into the target superspace. We discuss the differences with Panda-Sorokin multiple 0-brane action and with the dimensionally reduced 11D multiple M-wave action.

Author: BANDOS, Igor

Presenter: BANDOS, Igor

Contribution ID: **7** Type: **not specified**

(Super) Maxwell Symmetries and Infinite Dimensional Algebras

Wednesday 23 January 2019 11:15 (30 minutes)

The Poincaré algebra can be extended (non- centrally) to the Maxwell algebra and beyond. These extensions are relevant for describing particle dynamics in electro-magnetic backgrounds. They also appear in gravity theories. We establish the relation of this construction to Free Lie algebras. We will also consider the supersymmetric extension and the role of Free super Lie algebras and Borcherds super algebras as possible symmetries of M theory. Title: (Super) Maxwell Symmetries and Infinite Dimensional algebras Abstract The Poincaré algebra can be extended (non- centrally) to the Maxwell algebra and beyond. These extensions are relevant for describing particle dynamics in electro-magnetic backgrounds. They also appear in gravity theories. We establish the relation of this construction to Free Lie algebras. We will also consider the supersymmetric extension and the role of Free super Lie algebras and Borcherds super algebras as possible symmetries of M theory. Title: (Super) Maxwell Symmetries and Infinite Dimensional algebras Abstract The Poincaré algebra can be extended (non- centrally) to the Maxwell algebra and beyond. These extensions are relevant for describing particle dynamics in electro-magnetic backgrounds. They also appear in gravity theories. We establish the relation of this construction to Free Lie algebras. We will also consider the supersymmetric extension and the role of Free super Lie algebras and Borcherds super algebras as possible symmetries of M theory.

Presenter: GOMIS, Joaquim

Contribution ID: **8** Type: **not specified**

Quantum Gravity from Timelike Liouville

Wednesday 23 January 2019 11:45 (30 minutes)

The Euclidean path integral of quantum gravity has long resisted a proper definition because the kinetic term for the conformal factor of the metric comes with an additional minus sign. We propose a definition of two-dimensional quantum gravity with a cosmological constant based on the conformal bootstrap results of timelike Liouville theory coupled to matter. For the spectrum, we prove a no-ghost theorem for the states in the BRST cohomology. We then show that the crossing symmetric four-point function constructed by gluing the timelike DOZZ three-point function with the Ribault-Santachiara contour for internal momenta, is well-defined when the external momenta are continued to correspond to the physical states in the BRST cohomology.

Author: BAUTISTA SOLANS, Teresa

Presenter: BAUTISTA SOLANS, Teresa

Contribution ID: **9** Type: **not specified**

CYBE/Gravity Correspondence: Vision & Reality

Wednesday 23 January 2019 12:15 (30 minutes)

Building on integrable deformations of sigma-models, we outline a map between deformations of generic supergravity solutions and solutions to the Classical Yang-Baxter Equation. Time permitting, we will touch upon TTbar deformations.

Author: Ó COLGÁIN, Eoin

Presenter: Ó COLGÁIN, Eoin

Contribution ID: **10** Type: **not specified**

How to Build the Thermofield Double State

Wednesday 23 January 2019 14:30 (1 hour)

Given two copies of any quantum mechanical system, one may want to prepare them in the thermofield double state for the purpose of studying thermal physics or black holes. However, the thermofield double is a unique entangled pure state and may be difficult to prepare. We propose a local interacting Hamiltonian for the combined system whose ground state is approximately the thermofield double. The energy gap for this Hamiltonian is of order the temperature. Our construction works for any quantum system satisfying the Eigenvalue Thermalization Hypothesis.

Author: HOFMAN, Diego

Presenter: HOFMAN, Diego

Contribution ID: **11** Type: **not specified**

The Fate of Pseudo-Weyl Invariance

Wednesday 23 January 2019 15:30 (30 minutes)

In the context of studying Unimodular Gravity (UG), it is useful to consider a more general scalar-tensor theory obtained from the General Relativity (GR) lagrangian by the process of group averaging. Such theory inherits the diffeomorphism invariance of GR but has a tautological Weyl invariance. This theory can reduce both to GR and UG depending on the gauge fixing choice for the conformal symmetry. We use a toy model to study whether this "fake" symmetry is anomalous at the quantum level.

Author: SANTOS, Raquel

Presenter: SANTOS, Raquel

Contribution ID: **12** Type: **not specified**

Recent Results on Alpha Prime Corrections of Stringy Black Holes

Wednesday 23 January 2019 16:30 (30 minutes)

I will review some recent results on the explicit computation of the first-order alpha prime corrections of static, supersymmetric 4- and 5-dimensional stringy black holes. We will use the framework of the Heterotic Superstring effective action and we will study the corrections to entropy of those black holes and we will compare it to the microscopic computations in the literature. We will also show, if we have time for it, how some singular solutions are regularized by the alpha prime corrections in d=4 giving rise to globally-regular black-hole spacetimes.

Author: ORTÍN, Tomás

Presenter: ORTÍN, Tomás

Contribution ID: **13** Type: **not specified**

The Small Black Hole Illusion

Wednesday 23 January 2019 17:00 (30 minutes)

Small black holes in string theory are characterized by a classically singular horizon with vanishing Bekenstein-Hawking entropy. For decades, it was thought that higher-curvature corrections resolve the horizon and that the associated Wald entropy is in agreement with the microscopic degeneracy. In this talk I will argue that such resolution is an illusion, which involves a misidentification of the fundamental constituents of the system studied when higher-curvature interactions are introduced. In particular, I will describe how the resolution of the heterotic small black hole reported in the literature involves the introduction of Kaluza-Klein monopoles and solitonic 5-branes. The asymptotic charge of the latter vanishes due to a screening effect induced by the higher-derivative interactions.

Author: RAMIREZ, Pedro F.

Presenter: RAMIREZ, Pedro F.

Contribution ID: **14** Type: **not specified**

Exact results and microstate counting formulae for BPS black holes in the N=2 STU model

Wednesday 23 January 2019 17:30 (30 minutes)

We consider the N=2 STU model of Sen and Vafa. Using its exact duality symmetries, we determine the holomorphic function F that encodes the Wilsonian effective action of the model. We then evaluate the quantum entropy for dyonic BPS black holes in this model, in a certain region of moduli space. We propose a microstate counting formula based on a Siegel modular form of weight 2 as well as on a modular object that takes into account the dependence on the modulus X^0. In passing, we point out connections with the Calogero model and with deformation quantization.

Author: LOPES CARDOSO, Gabriel

Presenter: LOPES CARDOSO, Gabriel

Contribution ID: **15** Type: **not specified**

Probing typical black hole microstates

Thursday 24 January 2019 09:15 (1 hour)

Understanding the geometry of a typical microstate of a large AdS black hole remains an outstanding open problem, which is closely connected to the black hole information paradox. In this talk I will present a proposal for the bulk geometry of typical states. I will discuss how state-dependent perturbations of the CFT Hamiltonian can be used to implement a 1-sided analogue of the "traversable-wormhole" protocol of Gao-Jafferis-Wall. This allows us to probe the region behind the horizon and to gather evidence for the proposed geometry. We identify a precise technical condition for the chaotic behavior of out-of-time-order correlators on typical pure states, necessary for the smoothness of the horizon. We discuss some of these issues in the context of the SYK model.

Author: PAPADODIMAS, Kyriakos

Presenter: PAPADODIMAS, Kyriakos

Contribution ID: **16** Type: **not specified**

Quantum (Super)gravity from Conformal Field Theory

Thursday 24 January 2019 10:15 (30 minutes)

Using knowledge about the spectrum of operator in N=4 SYM, consistency of OPE, and analytic bootstrap techniques, I will obtain loop corrections of IIB supergravity on AdS_5\timesS^5. Along the way, I will discuss a general formula for the leading anomalous dimension of all double trace operators in the supergravity regime.

Author: APRILE, Francesco

Presenter: APRILE, Francesco

Contribution ID: **17** Type: **not specified**

A Quantum Mechanical Model for Holography

Thursday 24 January 2019 11:15 (30 minutes)

Talk about recent work done in 1810.05560 "Strings with non-relativistic conformal symmetry and Limits of the AdS/CFT correspondence."

Author: HARMARK, Troels

Presenter: HARMARK, Troels

Contribution ID: **18** Type: **not specified**

Gravity and Holography Between Newton and Einstein

Thursday 24 January 2019 11:45 (30 minutes)

Newton-Cartan geometry was introduced more than 90 years ago in order to find a geometric formulation of Newtonian gravity. This geometry (including a novel generalisation that includes torsion) has in recent years gained renewed interest as it appears in a variety of settings in modern theory involving gravity, string theory and holography. After a brief introduction, I will talk about recent work on an action principle for non-relativistic gravity, including its Newtonian limit. I will also discuss its relevance in connection to string theory and holography.

Author: OBERS, Niels

Presenter: OBERS, Niels

Contribution ID: **19** Type: **not specified**

A Geometric Dual of C-Extremization

Thursday 24 January 2019 12:15 (30 minutes)

We consider a class of supersymmetric AdS_3 x Y_7 solutions of Type IIB supergravity holographically dual to 2d (0,2) SCFTs. We show that the R-symmetry and central charge may be computed by extremizing a certain functional depending on only global topological data. In particular, assuming such a solution exists, we may calculate its central charge without knowledge of an explicit metric. We will interpret this as the geometric dual to c-extremization. Finally we will comment on some obstruction results which shed light on a previously noted issue in the literature.

Author: COUZENS, Christopher

Presenter: COUZENS, Christopher

Contribution ID: **20** Type: **not specified**

Large Mass Hierarchies in Strongly Coupled Field Theories from Gauge-Gravity Duality

Thursday 24 January 2019 14:30 (30 minutes)

Strongly coupled theories exhibiting walking dynamics provide a scenario for beyond the Standard Model physics, in which electro-weak symmetry is broken dynamically and the large hierarchy between the electro-weak and Planck energy scales is naturally generated. Due to the spontaneous breaking of approximate scale invariance, a light dilaton can be expected to be present in the spectrum. In this talk, we present an example of a strongly coupled theory with multi-scale dynamics, in which there is a light composite scalar state. Using gauge-gravity duality, we compute the spectrum of scalar and tensor glueballs by studying an 8-scalar sigma-model in five dimensions, the solutions of which include the one-parameter family of backgrounds dual to the baryonic branch of the Klebanov-Strassler field theory. We argue that far out on the moduli space, the ratio of explicit to spontaneous breaking of scale invariance can be made small, leading one of the scalar states, the pseudo-dilaton, to become parametrically light.

Author: ELANDER, Daniel

Presenter: ELANDER, Daniel

Contribution ID: **21** Type: **not specified**

A Supersymmetric Color Superconductor from Holography

Thursday 24 January 2019 15:00 (30 minutes)

N=4 SYM, and deformations thereof, is a model giving rise to a vast number of explicit examples of strong coupling phenomena via holography. In this talk I will consider probing the system with fundamental matter, focusing on a phase at finite isospin density and low temperatures. The ground state consists of a supersymmetric Higgsed phase with spontaneously broken global symmetries, which reflects in the spectrum of the theory. This is the first example of a supersymmetric Higgsed phase at finite charge density, and it is tempting to draw lessons to try to understand color-superconducting phases of QCD that might be realised in astrophysical contexts. [arXiv:1807.09712 and work in progress].

Author: TARRIO, Javier

Presenter: TARRIO, Javier

Contribution ID: **22** Type: **not specified**

Phonon Emergence

Thursday 24 January 2019 16:00 (30 minutes)

Phonons are essential constituents of almost every condensed matter model, yet their dynamical origin is never described. The emergence of phonons from a spatially-modulated order parameter is arguably the best candidate mechanism to explain the anomalous resistivity of strongly-correlated electron systems. The description of the translation-breaking dynamics defines a novel type of effective-theory, which combines aspects of fundamental and standard effective field theories. It implements the Goldstone and analogous low-energy theorems in a constructive way. We show field theoretic and holographic models where phonons and pseudo-phonons emerge dynamically and discuss their theoretical and phenomenological implications.

Author: MUSSO, Daniele

Presenter: MUSSO, Daniele

Contribution ID: **23** Type: **not specified**

The 10d Physics of the GPPZ Flow and Confinement in N=1* Super-Yang-Mills

Thursday 24 January 2019 16:30 (30 minutes)

I will discuss the recent uplift to 10 dimensions of the 5d flow solution of Girardello, Petrini, Porrati, and Zaffaroni (GPPZ). By analyzing the 10d solution, I will show how the GPPZ singularity can be given a 10-dimensional interpretation in terms of 3-branes and 5-branes. Using this interpretation, I will make the connection to N=1* super-Yang-Mills and the Polchinski-Strassler vision of confining and screening vacua in terms of Myers-effect brane polarization.

Author: NIEHOFF, Ben

Presenter: NIEHOFF, Ben

Contribution ID: **24** Type: **not specified**

Anisotropic RG Flows, Black Holes and Holography

Thursday 24 January 2019 17:00 (30 minutes)

In this talk, I will describe a new set of anisotropic, non-conformal and confining gauge theories that are holographically realized in gravity by Einstein-Axion-Dilaton systems. In the vacuum, the new solutions describe RG flows from a conformal field theory in the UV to generic scaling solutions in the IR with generic hyperscaling violation and dynamical exponents θ and z. At finite temperature, we discover that the anisotropic deformation reduces the confinement-deconfinement phase transition temperature suggesting a possible alternative explanation of inverse magnetic catalysis solely based on anisotropy. This conjecture is tested in a more realistic model of holographic QCD with backreacted flavors, where one can explicitly track down the chiral transition. We conclude that anisotropy by itself yields qualitatively similar physics than a magnetic field.

Author: PEDRAZA, Juan

Presenter: PEDRAZA, Juan

Contribution ID: **25** Type: **not specified**

A Landscape of de Sitter Vacua?

Friday 25 January 2019 09:15 (1 hour)

The recent swampland conjectures have revived the long-standing debate about whether string theory supports a landscape of de Sitter vacua. After reviewing the KKLT construction of de Sitter solutions, which is at the core of the landscape paradigm, I will show in this talk the recent and not so recent ten-dimensional calculations pointing out problems in the string theory construction.

Author: GRAÑA, Mariana

Presenter: GRAÑA, Mariana

Contribution ID: **26** Type: **not specified**

Low Energy Constraints from Quantum Gravity

Friday 25 January 2019 10:15 (30 minutes)

The requirement that a theory can be consistently coupled to Quantum Gravity can have an impact on low energy physics. After a brief introduction to the so called Swampland Conjectures, which aim to determine the set of EFT that can be consistently completed into to a Quantum Gravity theory, we will focus on some implications of a refined version of the Weak Gravity Conjecture, which states that if a theory contains a non-SUSY AdS stable vacuum it belongs to the Swampland. Applying this conjecture to compactifications of the SM leads to interesting constraints for neutrino masses, the electroweak scale and even the existence of supersymmetry.

Author: HERRAEZ, Alvaro

Presenter: HERRAEZ, Alvaro

Contribution ID: **27** Type: **not specified**

Universality of Squashed-Sphere Partition Functions

Friday 25 January 2019 11:15 (30 minutes)

According to the AdS/CFT correspondence, Conformal Field Theories on squashed spheres are dual to AdS-Taub-NUT geometries in the bulk. By studying novel Taub-NUT solutions in a broad family of higher-curvature gravities, we are able to derive universal relations for the partition function of these CFTs. First, we propose a new formula that automatically computes the free energy in terms of the gravitational Lagrangian evaluated on AdS, and we check that it passes several consistency tests. Then, we use it to obtain new relations between the "small-squashing"expansion of the free energy and the coefficients of the 2- and 3-point functions, and we conjecture that these results hold for any CFT. As a corollary, we also conjecture a direct relation between the Lagrangian of a broad class of higher-curvature theories and the parameters of the 2- and 3-point functions of the dual CFT.

Author: CANO, Pablo

Presenter: CANO, Pablo

Contribution ID: **28** Type: **not specified**

M2- Brane on a Flux Background

Friday 25 January 2019 11:45 (30 minutes)

I will present recent results about supermembrane theory formulated in the presence of constant three form subject to a Target space flux condition. I will show the discreteness of its spectrum that makes it to be well- defined at quantum level. I will discuss about the connection between Target space fluxes and worldvolume fluxes. I will also comment about the relation with matrix models on non- conmutativa tori.

Author: GARCIA DEL MORAL, Maria Pilar

Presenter: GARCIA DEL MORAL, Maria Pilar

Contribution ID: **29** Type: **not specified**

Collisions in AdS and the Quantum Null Energy Condition

Friday 25 January 2019 12:15 (30 minutes)

In this talk I will give an introduction to the Quantum Null Energy Condition (QNEC), which is a unique local energy condition conjectured to be valid for any QFT. QNEC relates the normal null energy condition (NEC) with the second functional null derivative of the entanglement entropy and was inspired from the second law of black hole thermodynamics, even though it is valid in QFTs without gravity. After this introduction I will present some sample computations in holography, where entanglement entropy can be computed using the dual geometry. These examples in particular includes regions in shock wave collisions, that were known to violate NEC, but are now found to saturate QNEC. I end with upcoming work on QNEC in 1+1D holographic CFTs, including leading order quantum corrections in the bulk.

Author: VAN DER SCHEE, Wilke

Presenter: VAN DER SCHEE, Wilke

Contribution ID: **30** Type: **not specified**

Calibrated Entanglement Entropy

Friday 25 January 2019 14:30 (30 minutes)

The Ryu-Takayanagi prescription reduces the problem of calculating entanglement entropy in CFTs to the determination of minimal surfaces in a dual anti-de Sitter geometry. For 3D gravity theories and BTZ black holes, we identify the minimal surfaces as special Lagrangian cycles calibrated by the real part of the holomorphic one-form of a spacelike hypersurface. We show that (generalised) calibrations provide a unified way to determine holographic entanglement entropy from minimal surfaces, which is applicable to warped AdS3 geometries. Based on: https://arxiv.org/abs/1705.08319

Author: DEGER, Nihat Sadik

Presenter: DEGER, Nihat Sadik

Contribution ID: **31** Type: **not specified**

Singularity Theorems and the Stability of Extra Dimensions

Friday 25 January 2019 15:00 (30 minutes)

New singularity theorems are derived for generic warped-product spacetimes of any dimension. The main purpose is to analyze the stability of (compact or large) extra dimensions, such as those arising in string theory, against dynamical perturbations. To that end, the base of the warped product is assumed to be our visible 4-dimensional world, while the extra dimensions define the fibers. Explicit conditions on the warping function that lead to geodesic incompleteness are given. These conditions can be appropriately rewritten, given a warping function, as restrictions on the intrinsic geometry of the extra-dimensional space. A brief discussion of such conditions will be presented.

Author: SENOVILLA, Jose M M

Presenter: SENOVILLA, Jose M M

Contribution ID: **32** Type: **not specified**

Black Hole Interiors and Modular Inclusions

Friday 25 January 2019 16:00 (30 minutes)

We argue that the traversable wormhole induced by a double-trace deformation of the thermofield double state can be understood as a modular inclusion of the algebras of operators. The effect of this deformation is the creation of a new region of spacetime deep in the bulk, corresponding to a non-trivial center between the left and right algebras. This set-up provides a precise framework for investigating how black hole interiors are encoded in the CFT. In particular, we use modular theory to demonstrate that state dependence is an inevitable feature of any attempt to represent operators behind the horizon. Building on this geometrical structure, we propose that modular inclusions may provide a more precise means of investigating the nascent relationship between entanglement and geometry in the context of the emergent spacetime paradigm.

Author: JEFFERSON, Ro

Presenter: JEFFERSON, Ro

Contribution ID: **33** Type: **not specified**

Geometric Inflation

Friday 25 January 2019 16:30 (30 minutes)

We argue that the presence of an inflationary epoch is a natural, almost unavoidable, consequence of the existence of a sensible effective action involving an infinite tower of higher-curvature corrections to the Einstein-Hilbert action. No additional fields besides the metric are required. We show that a family of such corrections giving rise to a well-posed cosmological evolution exists and automatically replaces the radiation-dominated early-universe Big Bang by a singularity-free period of exponential growth of the scale factor, which is gracefully connected with standard late-time ΛCDM cosmology. The class of higher-curvature theories giving rise to sensible cosmological evolution share additional remarkable properties such as the existence of Schwarzschild-like non-hairy black holes, or the fact that, just like for Einstein gravity, the only degrees of freedom propagated on the vacuum are those of the standard graviton.

Author: EDELSTEIN, Jose

Presenter: EDELSTEIN, Jose