Eurostrings 2022, Lyon

Monday, 25 April 2022 – Friday, 29 April 2022

Ecole Normale Supérieure de Lyon

Posters

Posters / **1**

Emergent strings with broken supersymmetry

Presenter: Ivano Basile, Université de Mons - UMONS
ivano.basile@umons.ac.be

We explore the dramatic consequences of string-scale supersymmetry breaking. We focus on the USp(32) and U(32) orientifolds of the type IIB and type 0B strings, as well as the SO(16) $\times$ SO(16) projection of the exceptional heterotic string, which provide non-tachyonic settings with no moduli directly in ten dimensions. While deceptively innocuous at the level of worldsheet perturbation theory, dynamical gravitational tadpoles backreact on spacetime in a dramatic fashion. We discuss how branes can tame this effect to a certain extent, finding that spacetime universally breaks down at a finite distance, ending in a strongly coupled, highly curved singularity. Remarkably, the dynamics of branes in these settings remains consistent among different complementary regimes despite the absence of supersymmetric protection. We connect the resulting picture with a number of swampland criteria, including the weak gravity, de Sitter and distance conjectures, which are realized via novel mechanisms and provide tantalizing hints for a candidate S-dual heterotic construction of the USp(32) orientifold with "brane supersymmetry breaking".

Posters / **2**

Resolving the Microstructure of Degenerating Superstrata

Presenter: Nejc Ceplak, IPhT Saclay
nejc.ceplak@ipht.fr

One of the proposed resolutions of the information paradox is that black holes are described by ensembles of horizonless fuzzballs. Suitably coherent superpositions of such objects can be described within supergravity. Explicit examples are superstrata: smooth and horizonless microstates of the supersymmetric D1-D5-P black hole, which have a well defined dual description in terms of pure states of the D1-D5 CFT. However, in a particular limit of their parameter space, these geometries seemingly develop a horizon and this contradicts the main idea of the fuzzball proposal. In this talk I will describe a resolution to this contradiction. I will briefly introduce superstrata and describe the limit in which they form a finitely-sized horizon. The appearance of the horizon is a consequence of neglecting certain degrees of freedom in the construction of these geometries. One can avoid the horizon formation by working in a different duality frame and show that the neglected degrees of freedom are crucial in the limit where superstrata degenerate. As an example, I will present a solution which has the same asymptotic charges and SO(4) rotational symmetry as the F1-NS5-P black hole, but has a vanishing horizon area. The formation of a large horizon is prevented by additional D0-D4 brane charge densities which are localised on the NS5-brane. I will then argue that this provides evidence that a horizon does not form in the degenerate limit of superstrata. Finally, I will discuss progress in the construction of microstate geometries in the new duality frame. I will present the relevant six-dimensional BPS equations and show that these can be organised in several layers of linear differential equations. In addition, one can look for the uplifts to higher-dimensional supergravities. Finally, I will present possible explicit horizonless solutions and discuss future directions.

Posters / **3**

Double Field Theory as the Double Copy of Yang-Mills

Presenter: Felipe Diaz-Jaramillo, Humboldt University Berlin
diazfeli@hu-berlin.de

The double copy construction in scattering amplitudes hints at a deep connection between Yang-Mills (YM) theory and gravity. It states, roughly speaking, that exchanging the color information by the kinematic information of gluon scattering amplitudes leads to gravity amplitudes. A first principle understanding of this color-kinematic double copy, however, remains elusive. In the interest of shedding some light on this issue, we show that double field theory naturally arises from

the color-kinematic double copy of YM theory. We state a precise double copy prescription for the quadratic and cubic orders in the YM action, based on the prescription at the level of amplitudes. More precisely, at quadratic order this yields the gauge invariant double field theory, whereas at cubic order it yields the double field theory action subject to a gauge condition that originates from Siegel gauge in string field theory.

Posters / **4**

Triality and the consistent Pauli reductions on $\mathrm{AdS}_3 \times S^3$

Presenter: Camille Eloy, VUB
camille.eloy@vub.be

I will show, using triality, that there are three different consistent $\mathrm{AdS}_3 \times S^3$ truncations of half-maximal six-dimensional supergravity, one for $\mathcal{N} = (2,0)$ and two for $\mathcal{N} = (1,1)$. One of latter has never been studied, and I will demonstrate that it results in a three-dimensional half-maximal theory with a number of interesting features, revealed by recent spectroscopy techniques based on Exceptional Field Theory. Among them, I will present a non-supersymmetric two-parameter family of AdS_3 vacua that enjoys pertubative stability of the full Kaluza-Klein tower. From the two $\mathcal{N} = (1,1)$ truncations, I will finally illustrate that there is no absolute notion of Kaluza-Klein level.

Posters / **5**

Goldstino Condensates and Anti-Brane Uplifts

Presenter: Maxim Emelin, University of Padua
maxim.emelin@mail.mcgill.ca

We describe an exact renormalization group approach to investigate the formation of composite states of the goldstino in theories with non-linearly realized supersymmetry. We proceed to show that the pure Volkov-Akulov model has an instability towards goldstino condensation and discuss the implications of this fact for string models involving spontaneous supersymmetry breaking via anti-brane uplifts.

Posters / **6**

Rebooting quarter BPS operators in $\mathcal{N} = 4$ Super Yang Mills

Presenter: Giulia Fardelli, Uppsala University
giulia.fardelli@physics.uu.se

In this work we start a systematic study of quarter-BPS operators in $\mathcal{N} = 4$ SYM with gauge group SU(N) at large N. In particular we consider $\mathcal{O}_{pq}$, operators transforming in the $[q,p,q]$ representation of the SU(4) R-symmetry: when expanded in $\mathcal{N} = 2$ supermultiplets, they contain Schur operators making it possible to derive the Ward Identities through the chiral algebra. Our focus will be on the simplest non trivial example, namely the operator in the $[2,0,2]$ representation. In the planar limit this is a double trace operator and, because of that, its OPE analysis will give access to unexplored information on higher trace operators, whose knowledge is crucial to investigate $\mathcal{N} = 4$ SYM away from the leading orders in the large N expansion. I will discuss the results that we obtained in this context by means of modern analytic CFT techniques such as chiral algebra and Lorentzian inversion formula.

Posters / **7**

Gluon scattering in AdS from CFT

Presenter: Pietro Ferrero, University of Oxford
pietro.ferrero@gtc.ox.ac.uk

I will present a class of recently computed holographic correlators between half-BPS operators in a vast array of SCFTs with non-maximal superconformal symmetry in dimensions d=3,4,5,6. Via AdS/CFT, these four-point functions are dual to gluon scattering amplitudes in AdS. Exploiting the notion of MRV limit I will show that, at tree level, all such correlators are completely fixed by symmetries and consistency conditions. Our results encode a wealth of novel CFT data and exhibit various emergent structures, including Parisi-Sourlas supersymmetry, hidden conformal symmetry and color-kinematics duality.

Posters / **8**

Cutting and gluing with running couplings in N=2 supersymmetric QCD

Presenter: Elias Furrer, Trinity College Dublin
furrere@maths.tcd.ie

We consider the order parameter $u = \left\langle \mathrm{Tr}\phi^2 \right\rangle$ as a function of the running coupling constant $\tau \in \mathbb{H}$ of asymptotically free $\mathcal{N} = 2$ QCD with gauge group SU(2) and $N_f \leq 4$ massive hypermultiplets. If the domain for τ is restricted to an appropriate fundamental domain $\mathcal{F}_{N_f}$, the function u is one-to-one. We demonstrate that these domains consist of six or less images of an $\mathrm{SL}(2,\mathbb{Z})$ keyhole fundamental domain, with appropriate identifications of the boundaries. For special choices of the masses, u does not give rise to branch points and cuts, such that u is a modular function for a congruence subgroup Γ of $\mathrm{SL}(2,\mathbb{Z})$ and the fundamental domain is $\Gamma\backslash\mathbb{H}$. For generic masses, however, branch points and cuts are present, and subsets of $\mathcal{F}_{N_f}$ are being cut and glued upon varying the mass. We study this mechanism for various phenomena, such as decoupling of hypermultiplets, merging of local singularities, as well as merging of non-local singularities which give rise to superconformal Argyres-Douglas theories. For $N_f = 4$, the triality group of the flavour symmetry SO(8) gives rise to an orbit of mass configurations, which organises the order parameters into vector-valued bimodular forms.

Posters / **9**

Holographic perspectives for N=2 superconformal theories

Presenter: Francesco Galvagno, ETH Zürich
fgalvagno@phys.ethz.ch

We consider N=2 conformal quiver theories in four dimensions which arise as orbifolds of N=4 Super Yang-Mills. Following the recent Gaberdiel-Gopakumar derivation, we can explicitly construct a worldsheet theory corresponding to the free limit of the 4-d gauge theory. Such worldsheet description matches the planar spectrum with a special distinction between the untwisted and twisted sector with respect to the orbifold action. Furthermore, for a special subclass of protected chiral operators we are able to compute the two- and three-point functions both at weak and strong coupling by using a localization approach. In particular the strong coupling results are finally matched with proper dual supergravity computations, determining a nice realization of AdS/CFT correspondence in N=2 context.

Posters / 10

Generalizing holographic entanglement entropy beyond spatial entanglement

Presenter: Marius Gerbershagen, University of Würzburg
marius.gerbershagen@physik.uni-wuerzburg.de

We introduce a generalized entanglement measure in AdS/CFT measuring entanglement between different fields as well as between spatial degrees of freedom. We explain its definition on the example of two-dimensional holographic conformal field theories and propose a bulk dual in generalization of the Ryu-Takayanagi formula given by the area of codimension two surfaces winding around black hole horizons or naked singularities. Finally, we sketch a possible derivation of this generalized Ryu-Takayanagi formula and comment on higher dimensions.

Posters / 11

Melonic CFTs: The $O(N)^3$ bosonic tensor model

Presenter: Sabine Harribey, CPHT Ecole Polytechnique - Heidelberg University,
sabine.harribey@polytechnique.edu

Tensors models exhibit a melonic large N limit, simpler that the planar limit of random matrices but richer that the limit of vector models. In d dimensions, they give rise to a new family of conformal field theories and provide interesting examples of the renormalization group flow from a free theory in the UV to a melonic large N CFT in the IR. In this poster, I will focus in particular on a quartic bosonic tensor model exhibiting an infrared stable fixed point. I will also discuss some properties of the CFT at the fixed point such as unitarity.

Posters / 12

Non-relativistic approximations of string theory

Presenter: Emil Have, University of Edinburgh
emil.have@ed.ac.uk

What is the geometrical arena of string theory? With the advent of non-Lorentzian geometry, there are tantalising indications of a ”landscape” of non-Lorentzian string theories, suggesting that consistent versions string theory can be defined on such geometries. Perhaps the simplest and most well-studied non-Lorentzian string is the “non-relativistic” string, originally obtained by Gomis and Ooguri more than 20 years ago by taking a limit in a near-critical Kalb-Ramond background. Generalisations to curved space have since been developed that employ either string Newton-Cartan geometry or torsional Newton-Cartan geometry with an additional circle direction. In this talk, I will present a framework based on a $1/c^2$ expansion of closed bosonic string theory and show how the next-to-leading order theory is related to other non-relativistic string models. Finally, I will comment on the NNLO theory and the general higher order structure.

Posters / 13

Black hole perturbations from Liouville correlators

Presenter: Cristoforo Iossa, SISSA, Trieste
ciossa@sissa.it

Reversing the logic of the bootstrap approach in Liouville CFT we explicitly compute the connection formulae for degenerate conformal blocks. In the semiclassical limit of the theory, this amounts to solving the connection problem of Fuchsian ODEs. Generalizing to irregular insertions we solve as

well various confluences of the ODE. Concentrating on the Heun equation and its confluences, we solve the wave equations of perturbations of a large class of black holes. As a working example, we focus on the 4d Kerr black hole, and exactly compute the absorption coefficient, QNMs and Love numbers in terms of combinatorial objects exploiting the AGT duality.

Posters / **14**

Generalised Geometry and consistent truncation.

Presenter: Grégoire Josse, Sorbonne Université
josse@lpthe.jussieu.fr

In this talk I will present how the Generalised geometry framework provides a systematic and simple way to derive consistent truncation of ten and eleven dimension supergravity to any dimension and any amount of supersymmetry.

Posters / **15**

A Wilson-line based new classical action for gluodynamics

Presenter: Hiren Kakkad AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY
kakkad@agh.edu.pl

We derive a new classical action for gluodynamics that has no triple gluon vertices. The lowest-order vertex is the four-point MHV vertex. Higher point vertices include the MHV and MHV-bar vertices, which reduce to the corresponding amplitudes in the on-shell limit. In general, any n-leg vertex has $2 \leq m \leq n-2$ negative helicity legs. Thus it requires fewer diagrams to calculate amplitudes compared to the Cachazo-Svrcek-Witten (CSW) method. The new action is obtained by performing a canonical field transformation of the light cone Yang-Mills action, where the field transformations are directly related to the Wilson line functionals spreading over the self-dual and the anti-self-dual planes. We have checked the action by calculating tree amplitudes up to 8-point Next-to-Next-to-MHV and found agreement with the standard methods. Based on H. Kakkad, P. Kotko, A. Stasto JHEP07(2021)187.

Posters / **16**

An AdS/CFT correspondence at all worldsheet topologies

Presenter: Bob Knighton, ETH Zurich
robejr@ethz.ch

The tensionless limit of string theory on $\mathrm{AdS}_3 \times \mathrm{S}^3 \times \mathrm{T}^4$ with pure NS-NS flux enjoys many remarkable properties that makes it an ideal candidate for study as a holographic model. In particular, its 2D CFT dual is exactly known, and powerful techniques for calculating correlation functions on the worldsheet have been developed, making the duality between these two theories manifest. Recently, a class of worldsheet boundary states describing bulk D-branes have been explored, and have been shown to correspond to boundary states in the dual CFT. We explore worldsheet correlation functions around these D-brane backgrounds, and show that they naturally reproduce the expected dual CFT answer to all orders in the genus expansion. We also consider the contribution of bulk O-planes and their corresponding crosscap states on the worldsheet, and demonstrate how to calculate the non-oriented worldsheet correlators on these backgrounds, which also have a natural interpretation on the dual CFT. As such, we provide evidence of this particular incarnation of the AdS/CFT correspondence for a wide range of worldsheet topologies, including unoriented worldsheets, worldsheets with boundary, and worldsheets with arbitrary genus.

Based on arXiv:2110.05509 and work in progress.

Posters / 17

Non-Relativistic Supergravity in Ten Dimensions

Presenter: Johannes Lahnsteiner, University of Groningen
j.m.lahnsteiner@rug.nl

In this talk, I describe recent progress in understanding the background field dynamics of the non-relativistic string theory pioneered by Gomis and Ooguri. Building on earlier developments, I present a non-relativistic supergravity theory and explain how it constrains the dynamics of the background fields. Special attention will be given to the exotic geometric structures that arise in this theory. I will compare the results with those coming from beta function calculations. In the final part of my talk, I will comment on non-relativistic T-duality and an intriguing relation with double field theory.

Posters / 18

S-fold conformal manifolds and ExFT spectroscopy

Presenter: Gabriel Larios, IFT UAM-CSIC and University of Michigan
gabriel.larios@uam.es

Infinite towers of massive modes arise for every compactification of higher dimensional theories. Understanding the properties of these Kaluza-Klein towers on non-trivial solutions with an AdS factor has been a longstanding issue with clear holographic interest, as they describe the spectrum of single-trace operators of the dual CFTs at strong coupling and large N. Here, we focus on supersymmetric families of non-geometric solutions of Type IIB supergravity that describe the conformal manifold of their holographic SCFTs. Recent techniques from Exceptional Field Theory allow the computation of their KK spectra, which encode information about the global properties of the conformal manifolds.

Posters / 19

Degenerate Microstate Solutions: At Moduli Space's End

Presenter: Yixuan Li, IPhT, Université Paris-Saclay
yixuan.li@universite-paris-saclay.fr

Large classes of supergravity solutions that appear to be coherent microstates of the D1-D5-P black hole have been found by the Microstate Geometries program. These solutions have a smooth cap at the bottom of a long but finite throat, replacing the black hole's horizon lying at the bottom of an infinitely-long throat. Because of gravitational blueshift, a small amount of energy as seen from the asympotics will become large at the bottom of their throat; this energy could perturb the smooth structure replacing the horizon, and force the solution to move in moduli space. One possible outcome is that the solution approaches a locus in the boundary of the moduli space where its smooth microstructure degenerates into a horizon. This poster will show how our work [2202.08844] brings to light new degrees of freedom that prevent the horizon to form in the limit where a class of microstate geometries – the so-called superstrata – seem to degenerate into black holes. These correspond, in a dual frame, to local brane density modes along the common D1-D5 circle. The degenerate microstate solutions, carrying these modes, behave locally as two-charge solutions and have vanishing horizon area; while asymptotically, they have the same charges as the three-charge F1-NS5-P black hole.

Based on [arXiv:2202.08844] with Iosif Bena, Nejc Ceplak, Shaun Hampton, Dimitrios Toulikas and Nick Warner.

Posters / **20**

The U-plane of rank-one 4d N=2 KK theories

Presenter: Horia Magureanu, University of Oxford
horia.magureanu@maths.ox.ac.uk

The infrared physics on the Coulomb branch of 4d $\mathcal{N} = 2$ supersymmetric field theories is encoded in the Seiberg-Witten geometry. We revisit this description for rank one QFTs from the perspective of rational elliptic surfaces, making use of their complete classification in the mathematical literature. This perspective naturally extends to 5d SCFTs with E_n symmetry compactified on a circle and introduces tools for understanding aspects of the global flavour symmetry and non-trivial RG flows. Additionally, modular properties of the Seiberg-Witten geometries can be used to determine the corresponding BPS quivers.

Posters / **21**

Type-II Calabi-Yau compactifications, T-duality and special geometry in general spacetime signature

Presenter: Maxime Medevielle, University of Liverpool
maxime.medevielle@liverpool.ac.uk

When performing T-duality on a timelike dimension as well as S-duality, one uncovers a web of type-II string theories which extends to all spacetime signatures and realizes all maximal supersymmetry algebras. In this talk, I will present the N=2 D=4 Supergravity theories one obtains after a Calabi-Yau reduction of the exotic theories. I will present the associated Special Geometry of vector and hypermultiplets, the c-maps relating them, as well as the duality web one finds in 4D. Based on "Type-II Calabi-Yau compactifications, T-duality and special geometry in general spacetime signature", 2111.09017.

Posters / **22**

On fixed points and phase transitions in five dimensions

Presenter: Francesco Mignosa, SISSA Trieste
fmignosa@sissa.it

Supersymmetric gauge theories in five dimensions, although power counting non-renormalizable, are known to be in some cases UV completed by a superconformal field theory. Many tools, such as M-theory compactification and pq-web constructions, were used in recent years in order to deepen our understanding of these theories. This framework gives us a concrete way in which we can try to search for additional IR conformal field theory via deformations of these well-known superconformal fixed points. Recently, the authors of 2001.00023 proposed a supersymmetry breaking mass deformation of the E_1 theory which, at weak gauge coupling, leads to pure SU(2) Yang-Mills and which was conjectured to lead to an interacting CFT at strong coupling. During this talk, I will provide an explicit geometric construction of the deformation using brane-web techniques and show that for large enough gauge coupling a global symmetry is spontaneously broken and the theory enters a new phase which, at infinite coupling, displays an instability. The Yang-Mills and the symmetry broken phases are separated by a phase transition. Quantum corrections to this analysis are discussed, as well as possible outlooks. Based on arXiv: 2109.02662

Posters / **23**

Metastable antibranes

Presenter: Nam Huy Nguyen
nam.h.nguyen@durham.ac.uk

Despite their consequential applications in holographic QFT, string cosmology, and black hole physics, certain aspects of metastable antibranes in warped throats are not yet fully understood. In this talk/poster, I will introduce the Kachru-Pearson-Verlinde (KPV) configuration, a frequently-discussed metastable configuration of anti-D3 branes at the tip of a Klebanov-Strassler (KS) throat, and briefly recap the decade-long discussions on its existence. I will present an analytic perturbative supergravity solution that captures the backreaction of the polarised state of anti-3 branes in a warped, fluxed throat. I'll discuss how this perturbative solution, taken in conjunction with previous results, serves as strong evidence in favour of the existence of the KPV state. I will also discuss the classical stability of the KPV state.

Based on a recent paper [2112.04514] with Vasilis Niarchos. Also, greatly influenced by previous works [1812.01067] (PRL), [1904.13283] (JHEP), and [1912.04646] (JHEP) with Jay Armas, Vasilis Niarchos, Niels Obers, and Thomas Van Riet.

Posters / **24**

Expanding General Relativity in the Speed of Light

Presenter: Gerben Oling, Nordita
gerben.oling@su.se

I will introduce the ultra-local expansion of general relativity, explain its connection to the 3+1 decomposition, and discuss some non-trivial solutions. There has recently been remarkable progress in the covariant description of non-relativistic gravity. In particular, it was shown how a non-relativistic large speed of light expansion of general relativity leads to a covariant description of dynamical Newton-Cartan geometry. Conversely, the opposite 'ultra-local' small speed of light expansion leads to dynamical Carroll geometry. This ultra-local expansion leads to rich dynamics at leading and next-to-leading order with potential applications to cosmology and flat space holography.

Posters / **25**

Islands for Entanglement Negativity

Presenter: Himanshu Parihar, Indian Institute of Technology Kanpur, India
himansp@iitk.ac.in

We advance two alternative proposals for the island contributions to the entanglement negativity of various pure and mixed state configurations in quantum field theories coupled to semiclassical gravity. The first construction involves the extremization of an algebraic sum of the generalized Renyi entropies of order half. The second proposal involves the extremization of the sum of the effective entanglement negativity of quantum matter fields and the backreacted area of a cosmic brane spanning the entanglement wedge cross section which also extremizes the generalized Renyi reflected entropy of order half. These proposals are utilized to obtain the island contributions to the entanglement negativity of various pure and mixed state configurations involving the bath systems coupled to extremal and non-extremal black holes in JT gravity demonstrating an exact match with each other. Furthermore, the results from both the proposals match precisely with the island contribution to half the Renyi reflected entropy of order half providing a strong consistency check. We then allude to a possible doubly holographic picture of our island proposals and provide a derivation of the first proposal by determining the corresponding replica wormhole contributions.

Posters / **26**

Carrollian and Galilean conformal higher-spin algebras in any dimensions

Presenter: Simon Pekar, UMONS
simon.pekar@umons.ac.be

We present higher-spin algebras containing a Poincaré subalgebra and with the same set of generators as the Eastwood-Vasiliev algebras in any space-time dimension $D \geq 3$. Given these properties, they can be considered either as candidate rigid symmetries for higher-spin gauge theories in Minkowski space or as Carrollian conformal higher-spin symmetries in one less dimension. We use the same techniques to also define higher-spin algebras with the same set of generators and containing a Galilean conformal subalgebra.

Posters / **27**

Sailing past the End of the World and discovering the Island

Presenter: Pietro Pelliconi, Université de Genève
pietro.pelliconi@unige.ch

Large black holes in anti-de Sitter space have positive specific heat and do not evaporate. In order to mimic the behavior of evaporating black holes, one may couple the system to an external bath. In this paper we explore a rich family of such models, namely ones obtained by coupling two holographic CFTs along a shared interface (ICFTs). We focus on the limit where the bulk solution is characterized by a thin brane separating the two individual duals. These systems may be interpreted in a double holographic way, where one integrates out the bath and ends up with a lower-dimensional gravitational braneworld dual to the interface degrees of freedom. Our setup has the advantage that all observables can be defined and calculated by only relying on standard rules of AdS/CFT. We exploit this to establish a number of general results, relying on a detailed analysis of the geodesics in the bulk. Firstly, we prove that the entropy of Hawking radiation in the braneworld is obtained by extremizing the generalized entropy, and moreover that at late times a so-called 'island saddle' gives the dominant contribution. We also derive Takayanagi's prescription for calculating entanglement entropies in BCFTs as a limit of our ICFT results.

Posters / **28**

String Black Hole Thermodynamics at First Order in Alpha'

Presenter: David Pereñiguez, IFT UAM/CSIC, Madrid
david.perenniguez@uam.es

The Iyer-Wald prescription has been successfully used to derive black hole entropy formulas for higher-derivative, pure gravity theories. However, this does not account for gauge symmetry in the presence of matter gauge fields and, in some cases, the resulting black hole entropy formulas are not Lorentz and gauge invariant. In particular, this is the case for the effective action of the heterotic string at first order in alpha', due to the presence of gravitational and YM CS terms. In this talk I will show how to handle matter gauge fields systematically and, as a result, I will obtain a manifestly gauge- and Lorentz-invariant entropy formula for HST at first order in alpha'. I will also report on progress on the inclusion of charges not associated to gauge symmetry (like magnetic ones) in a duality-invariant guise. This talk is based on [2012.13323], [2012.14892], [2106.07495] and work in progress.

Posters / 29

Multipoint correlators on the supersymmetric Wilson line defect CFT

Presenter: Giulia Peveri, Humboldt-Universität zu Berlin
giulia.peveri@physik.hu-berlin.de

One dimensional CFTs are an exceptional laboratory in which we can test novel techniques in order to solve higher dimensional CFTs. They are also relevant from an holographic point of view, as in the case of conformal line defects in 4d N=4 Super Yang-Mills. In this poster, I am going to present a recursive prescription to compute, up to one loop, 4d N=4 SYM n-point correlation functions realised inserting protected operators on a 1/2-BPS Wilson line. Interestingly, these correlators are annihilated by a special class of differential operators, that can be considered as a multipoint extension of the superconformal Ward identities satisfied by the four-point functions.

Posters / 30

Exact results in a N=2 superconformal gauge theory at strong coupling

Presenter: Alessandro Pini, I.N.F.N.- Sezione di Torino
alessandro.pini@to.infn.it

We consider the N=2 SYM theory with gauge group SU(N) and a matter content consisting of one multiplet in the symmetric and one in the anti-symmetric representation of the gauge group. This theory is conformal and it admits a large-N ‘t Hoof t expansion and a gravity dual given by a particular orientifold of AdS_5 X S^5. We analyze this gauge theory relying on the matrix model provided by localization à la Pestun. Even though this matrix model has very non-trivial interactions, by exploiting the full Lie algebra approach to the matrix integration, we show that a large class of observables can be expressed in a closed form in terms of an infinite matrix depending on the ‘t Hooft coupling λ. These exact expressions can be used to generate the perturbative expansions at high orders, and also to study analytically the leading behavior at strong coupling. Finally we compare these predictions to a direct Monte Carlo numerical evaluation of the matrix integral and to the Padé resummation derived from very long perturbative series.

Posters / 31

Towards holographic integrable deformations of Warped CFTs

Presenter: Rahul Poddar, University of Iceland
rap19@hi.is

Integrable deformations of 2-dimensional quantum field theories include the $T\bar{T}$ and $J\bar{T}$ deformations. These deformations are well defined in any translationally invariant quantum field theory, including QFTs without Lorentz invariance, such as Warped CFTs. Warped CFTs have been shown to be holographically realized through so-called lower spin gravity. By adapting the deformed boundary conditions recently discussed in the context of holographic dual to $T\bar{T}$ and $J\bar{T}$ deformed CFTs to the warped geometry context, we investigate how a $T\bar{T}$ deformed Warped CFT affects a bulk geometry.

Posters / **32**

Quantum bit threads

Presenter: Andrew Rolph, University of Amsterdam
a.d.rolph@uva.nl

Quantum entanglement and spacetime geometry have a deep connection in holographic systems, and this is most clearly seen through the Ryu-Takayanagi prescription. I describe a new flow-based reformulation of holographic entanglement entropy that is equivalent to the quantum extremal surface (QES) prescription, and so accurate to all orders in bulk quantum corrections. The proposal is inspired by considerations of bit threads in doubly holographic models. Equivalence to the QES prescription is proven with a novel generalisation of the Riemannian max-flow min-cut theorem. I will explain the proposal's properties, as well as discuss ways in which islands and spacetime are emergent phenomena from the quantum bit thread perspective.

Posters / **33**

Trans-IR Flows to Black Hole Singularities

Presenter: Sanjit Shashi, UT Austin
sshashi@utexas.edu

We study analytic continuations of holographic renormalization group (RG) flows beyond the infrared (IR) fixed point. Such "trans-IR" flows are a natural framework for describing physics inside of black holes. First, we construct an a-function which, in holographic setups, satisfies a monotonicity theorem even along trans-IR flows. Using this function, we argue that the degrees of freedom "thin out" and vanish when flowing to a trans-IR endpoint, represented by a black hole singularity. We then recast well-studied quantum information probes in the language of trans-IR flows. In particular, 2-point correlations and complexity from action probe the trans-IR fully, generally in a complementary manner controlled by a critical boundary time on the order of the thermal scale.

Posters / **34**

From S-folds to *exactly* marginal deformations without supersymmetry

Presenter: Colin Sterckx, Université Libre de Bruxelles
colin.sterckx@ulb.be

We review recent progress stemming from the Type IIB S-folds program. S-folds are non-geometric backgrounds of type IIB supergravity of the form $\mathrm{AdS}_4 \times \mathrm{S}^1 \times \mathcal{M}$ involving a non-trivial $\mathrm{SL}(2,\mathbb{Z})$ monodromy around the S^1. We engineered flat deformations of such background. These deformations are conjectured to be dual to *exactly* marginal deformations of the CFT dual to the S-fold. Interestingly, these deformations provide a controlled mechanism for supersymmetry breaking of certain S-folds while preserving stability. We give a geometric interpretation of these deformations in terms of mapping tori. Based on 2112.11966 [hep-th] and 2109.06032.

Posters / **35**

Physics of the three-dimensional analog of Klebanov-Strassler

Presenter: Javier Subils, Nordita
javier.subils@su.se

I will present a family of solutions of Type IIA supergravity that holographically describe gauge theories with interesting IR dynamics. We will examine how this family interpolates between conformal and confining regimes and study the different physics that Wilson loops and entanglement entropies can probe in these theories. Finally, we will uncover a rich finite temperature phase diagram, endowed with a triple point, a critical point where a second order phase transition occurs and a branch of phase transitions occurring at finite temperature but vanishing entropy.

Posters / **36**

SUSY enhancement on the squashed three-sphere

Presenter: Charles Thull, Uppsala University
charles.thull@physics.uu.se

In this talk, I will discuss mass deformed $\mathcal{N} = 2$ theories on the squashed three-sphere. By embedding all the background fields into an extended supergravity I show how fine-tuning the mass leads to an enhancement of the supersymmetry to $\mathcal{N} = 4$. In the case where the 3d partition function is a limit of a 4d index only states annihilated by additional supercharges contribute to the 4d index at these specific mass points. The enhanced supersymmetry leads to simplifications of the localized partition function. Notably we can use it to explain the recently observed squashing independence of the free energy in mass deformed ABJ(M) theory. I will report on ongoing work on $\mathcal{N} = 4$ dualities on the squashed three-sphere.

Posters / **37**

Holography of time machines

Presenter: Marija Tomasevic, CPHT, Ecole Polytechnique
marija.tomasevic@polytechnique.edu

We use holography to examine the response of interacting quantum fields to the appearance of closed timelike curves in a dynamically evolving background that initially does not contain them. For this purpose, we study a family of two-dimensional spacetimes that model very broad classes of wormhole time machines. The behavior of strongly coupled conformal theories in these spacetimes is then holographically described by three-dimensional AdS bulk geometries that we explicitly construct. The dual bulk spacetime is free from any divergences, but splits into two disconnected components, without and with CTCs, which are joined only through the boundary; then, passages across the chronology horizon are impossible for any field excitations. In dual terms, the strong self-interaction of the CFT suffices to enforce – without any gravitational backreaction – the chronology protection principle in the most explicit manner: by completely decoupling the pathological part from the rest of the spacetime. We also find that entangling the CFTs in two separate time machines connects them through a traversable bulk wormhole. Nevertheless, any entanglement-assisted chronology violations will be prevented by quantum bulk corrections, i.e., subleading 1/N effects, again without needing any gravitational backreaction of the CFT.

Posters / **38**

Higher-spin extension of (self-dual) Yang-Mills and twistor theory

Presenter: Tung Tran, UMONS
vuongtung.tran@umons.ac.be

Twistor actions for higher-spin extension of (self-dual) Yang-Mills (HS-(SD)YM) are constructed via the (inverse) Penrose transform. Due to various theorems on twistor cohomology representatives, it can be shown that the twistor actions for the above theories are unique. We further comment on a remarkable relation between HS-YM and the induced higher-spin theory from the IKKT-matrix model.

Posters / **39**

A modern view on Universal Asymptotic Formulae in 2d CFTs

Presenter: Ioannis Tsiares, IPhT, CEA-Saclay
ioannis.tsiares@ipht.fr

Any two-dimensional Conformal Field Theory (CFT) is defined via a list of primary operators, along with their scaling dimensions, spins and OPE coefficients. This set of data, along with the central charge, uniquely defines any correlation function of the theory on an arbitrary Riemann surface. Using consistency conditions like crossing symmetry and modular invariance, one can show that there are features of this data that are universal for all two-dimensional CFTs. A celebrated example of that statement is the Cardy formula for the asymptotic density of primary states at any finite value of the central charge greater than unity. The purpose of this talk is to present a new such universal formula that involves the square of the OPE coefficients for heavy operators at finite central charge. The derivation bypasses the need to compute Virasoro Blocks and uses the relatively old but newly-analyzed tool of the Fusion and Modular kernels, which relate Virasoro blocks in a given channel with a linear combination of blocks in a different channel. Their closed-form expression is known at finite central charge (greater than unity) due to B.Ponsot and J.Teschner. We will also demonstrate that general crossing kernels for arbitrary Virasoro blocks on any Riemann surface can be readily constructed out of the known kernels for the sphere four-point and the torus one-point conformal blocks.

Posters / **40**

Poisson-Lie duality and exceptional generalised geometry

Presenter: Fridrich Valach, Imperial College London
f.valach@imperial.ac.uk

I will discuss G-algebroids — objects generalising Lie and Courant algebroids — and show how to use them to obtain new insights in the areas of exceptional generalised geometry, consistent truncations, and Poisson-Lie U-duality. This is a joint work with M. Bugden, O. Hulík and D. Waldram.

Posters / **41**

Connecting 5d Higgs Branches via Fayet-Iliopoulos Deformations

Presenter: Marieke van Beest, University of Oxford
vanbeest@maths.ox.ac.uk

I will describe how the geometry of the Higgs branch of 5d superconformal field theories (SCFTs) is transformed under general movement along the extended Coulomb branch. By working directly with the magnetic quiver, I will demonstrate a correspondence between Fayet-Iliopoulos deformations in 3d and 5d mass deformations. This relation provides a new perspective on the interconnectedness of 8 supercharge SCFTs, that can be utilized to establish a local version of mirror symmetry, when the Higgs branch has multiple cones and the mirror map is not globally well-defined.

Posters / **42**

Microcanonical Action and the Entropy of Hawking Radiation

Presenter: Manus Visser, University of Geneva
manus.visser@unige.ch

The island formula – an extremization prescription for generalized entropy – is known to result in a unitary Page curve for the entropy of Hawking radiation. This semi-classical entropy formula has been derived for Jackiw-Teitelboim (JT) gravity coupled to conformal matter using the "replica trick" to evaluate the Euclidean path integral. Alternatively, for eternal Anti-de Sitter black holes, we derive the extremization of generalized entropy from minimizing the microcanonical action of an entanglement wedge. The on-shell action is minus the entropy and arises in the saddle-point approximation of the (nonreplicated) microcanonical path integral. When the black hole is coupled to a bath, islands emerge from maximizing the entropy at fixed energy, consistent with the island formula. Our method applies to JT gravity as well as other two-dimensional dilaton gravity theories.

Posters / **43**

Black Hole Entropy Sourced by String Winding Condensate

Presenter: Yoav Zigdon, Ben-Gurion University of the Negev
yoavzig@post.bgu.ac.il

We study black holes in string theory. In Euclidean signature, the radial-time part of their geometry is described by a shrinking thermal cycle, resembling a cigar. We argue that, using a simple effective field theory, the entropy possessed by string modes that wrap this cycle matches the Bekenstein-Hawking entropy. Two specific examples of (large) black holes geometries are studied, a) asymptotically flat Schwartzschild in $D > 3$ dimensions times T^{10-D}, b) the $D = 2$ $SL(2, R)_k/U(1)$ cigar times $S^3 \times T^5$. In case b), we found that instead of a smooth tip, the geometry in which a winding condensate backreacts approaches a "puncture" where the local radius of the thermal circle and its derivatives vanish. This realizes the phenomenon of topology change in the presence of winding condensation. In the context of the black hole/string transition in type II superstring theory, the punctured black hole geometry has the same topology as a "string geometry", implying that there is no obstruction to a smooth transition from the point of view of the superconformal index, in contrast to a previous statement that was made in the literature.