POSTER SESSION

Rooms 01 to 33: one poster by room

Rooms 34 to 50: two posters by room

Room: 36

Akhond, Mohammad

Swansea University

Factorised 3d N=4 orthosymplectic quivers

We study the moduli space of 3d N = 4 quiver gauge theories with unitary, orthogonal and symplectic gauge nodes, that fall into exceptional sequences. We find that both the Higgs and Coulomb branches of the moduli space factorise into decoupled sectors. Each decoupled sector is described by a single quiver gauge theory with only unitary gauge nodes. The orthosymplectic quivers serve as magnetic quivers for 5d N = 1 superconformal field theories which can be engineered in type IIB string theories both with and without an O5 plane. We use this point of view to postulate the dual pairs of unitary and orthosymplectic quivers by deriving them as magnetic quivers of the 5d theory. We use this correspondence to conjecture exact highest weight generating functions for the Coulomb branch Hilbert series of the orthosymplectic quivers, and provide tests of these results by directly computing the Hilbert series for the orthosymplectic quivers in a series expansion.

Room: 01

An, Yang

Zhejiang University of Technology

Emergent Gravity to Generic Situations
and Dual Description of Gravitational Force

To realize Emergent Gravity for explaining gravitational force to generic situations, we propose an entropic mechanism, which clarifies the problem in

which occasions can gravitational force be regarded emergent from thermodynamics. It can extract the entropic gradient existing in spacetime through quasi-static processes like heat engines.The explicit derivation of inertial force from the Entanglement First Law requires such entanglement entropy responsible for gravitational attraction to be exactly from the variation of the Casini-Bekenstein Bound and therefore minimal surfaces in holographic explanation.Thus, it can co-exist with Susskind's Complexity Tendency, because they work in their own situations separately. Besides, our work may help understand recent setup such as in Pennington's work for Page Curve.

Room: 02

Aspman, Johannes

Trinity College Dublin

Cutting and gluing with running couplings in N=2 QCD

We consider the effective coupling constant of asymptotically free supersymmetric theories with gauge group SU(2) as function of the order parameter. While this function is multi-valued, it becomes single valued if we identify couplings in the same orbit of the electric-magnetic duality group (or S-duality). We explicitly consider fundamental domains for coupling constants for generic as well as special masses, including those giving rise to the superconformal Argyres-Douglas theories. We demonstrate that these domains consist of at most 6 copies of an SL(2,Z) fundamental domain. While in special cases the fundamental domain coincides with that of a subgroup of SL(2,Z), this is in general not the case due to branch points and cuts.

Room: 37

Babaei-Aghbolagh, Hossein

University of Mohaghegh Ardabili

$T\bar{T}$-like Flows in Non-linear Electrodynamic Theories and S-duality

We investigate the $T\bar{T}$-like flows for non-linear electrodynamic theories in D(=2n)-dimensional spacetime. Our analysis is restricted to the deformation problem of the classical free action by employing the proposed $T\bar{T}$

operator from a simple integration technique. We show that this flow equation is compatible with $T\bar{T}$ deformation of a scalar field theory in D=2 and of a non-linear Born-Infeld type theory in D=4 dimensions. However, our computation discloses that this kind of $T\bar{T}$ flow in higher dimensions is essentially different from deformation that has been derived from the AdS/CFT interpretations. Indeed, the gravity that may be exist as a holographic dual theory of this kind of effective Born-Infeld action is not necessarily an AdS space. As an illustrative investigation in D=4, we shall also show that our construction for the $T\bar{T}$ operator preserves the original SL(2,R) symmetry of a non-supersymmetric Born-Infeld theory.

Room: 03

Basile, Ivano

UMONS

Non-SUSY brane dynamics and the Swampland

We investigate interactions between branes of various dimensions, both charged and uncharged, in some non-supersymmetric string models. These include the USp(32) and U(32) orientifolds of the type IIB and type 0B strings, as well as the SO(16) x SO(16) projection of the exceptional heterotic string. The resulting ten-dimensional spectra are free of tachyons and the combinations of branes that they contain give rise to rich and varied dynamics. We focus on potentials that describe their mutual interactions, both in the probe regime and in the string-amplitude regime, finding qualitative agreement despite the absence of supersymmetry and confirming the Weak Gravity Conjecture for charged branes.

Room: 04

Bomans, Pieter

University of Padova

Chiral algebras and Omega deformations

Every six-dimensional N = (2, 0) SCFT on R^6 contains a set of protected operators whose correlation functions are controlled by a two-dimensional chiral algebra. We provide an alternative construction of this chiral algebra

by performing an ?-deformation of a topological-holomorphic twist of the N = (2, 0) theory on R^6 and restricting to the cohomology of a specific supercharge. In addition, we show that the central charge of the chiral algebra can be obtained by performing equivariant integration of the anomaly polynomial of the six-dimensional theory. Furthermore, we generalize this construction to include orbifolds of the R^4 transverse to the chiral algebra plane.

Room: 38

Chakraborty, Adrita

Indian Institute of Technology Kharagpur

Confinement and Pseudoscalar Glueball Spectrum
in the 2+1D QCD-Like Theory from Non-Susy D2 Brane

We study two important properties of 2+1D QCD, namely confinement and Pseudoscalar glueball spectrum, using holographic approach. The confined state of the bounded quark-antiquark pair occurs in the self-coupling dominated nonperturbative regime, where the free gluons form the bound states, known as glueballs. The gauge theory corresponding to low energy decoupled geometry of isotropic non-supersymmetric D2 brane has running coupling which is found to vary with the energy scale. At BPS limit, this theory reduces to Supersymmetric YM theory. Considering NG action of a test string we calculate the potential of such confined state located on the boundary. The QCD flux tube tension for large quark-antiquark separation is observed to be a monotonically increasing function of running coupling. The mass spectrum of Pseudoscalar glueball is evaluated numerically from the fluctuations of the axion in the gravity theory using WKB approximation. This produces the mass as a function of the string tension and the levels of the energy states. Various results that we obtained quite match with those previously studied through the lattice approach.

Room: 05

Chattopadhyaya, Aradhita

Trinity College Dublin

Gauge-gravity couplings and Gopakumar Vafa invariants

Gauge threshold and gravitational coupling computations in one loop in heterotic on $K3 \times T^2$ orbifolded with order N action predict Gopakumar Vafa invariants and pre-potentials of their type II dual Calabi Yau geometries. Will summarize some results in this area in the following papers.

Room: 39

Choudhury, Sayantan

NISER, Bhubaneswar

Thermalization Phenomena in Quenched
Quantum Brownian Motion in De Sitter Space

In this poster, we study the quantum field theoretic generalization of the Caldeira-Leggett model to describe the Brownian Motion in general curved space-time considering interactions between two scalar fields in a classical gravitational background. The thermalization phenomena is then studied from the obtained de Sitter solution using quantum quench from one scalar field model obtained from path integrated effective action in Euclidean signature. We consider an instantaneous quench in the time-dependent mass protocol of the field of our interest. We find that the dynamics of the field post-quench can be described in terms of the state of the generalized Calabrese-Cardy (gCC) form and computed the different types of two-point correlation functions in this context. We explicitly found the conserved charges of algebra that represents the gCC state after a quench in de Sitter space and found it to be significantly different from the flat space-time results. We extend our study for the different two-point correlation functions not only considering the pre-quench state as the ground state, but also a squeezed state. We found that irrespective of the pre-quench state, the post quench state can be written in terms of the gCC state showing that the subsystem of our interest thermalizes in de Sitter space. Furthermore, we provide a general expression for the two-point correlators and explicitly show the thermalization process by considering a thermal Generalized Gibbs ensemble (GGE).

Finally, from the equal time momentum dependent counterpart of the obtained results for the two-point correlators, we have studied the hidden features of the power spectra and studied its consequences for different choices of the quantum initial conditions.

Room: 39

Choudhury, Sayantan

NISER

Circuit Complexity From Cosmological Islands

Recently in various theoretical works, path-breaking progress has been made in recovering the well-known Page Curve of an evaporating black hole with Quantum Extremal Islands, proposed to solve the long-standing black hole information loss problem related to the unitarity issue. Motivated by this concept, in this paper, we study cosmological circuit complexity in the presence (or absence) of Quantum Extremal Islands in negative (or positive) Cosmological Constant with radiation in the background of Friedmann-Lemaitre-Robertson-Walker (FLRW) space-time. Without using any explicit details of any gravity model, we study the behaviour of the circuit complexity function with respect to the dynamical cosmological solution for the scale factors for the above mentioned two situations in FLRW space-time. using squeezed state formalism. By establishing a relationship among cosmological circuit complexity, Out-of-Time Ordered Correlators (OTOC) and entanglement entropy in the presence of Quantum Extremal Islands for the range of values of Cosmological Constant which represent the chaotic parameter space. Last but not the least, we also comment on the range of the values of Cosmological Constant that represent the non-chaotic regime for which we have studied various other underlying features of circuit complexity function for the present cosmological paradigm.

Room: 06

Cubrovic, Mihailo

Institute of Physics Belgrade

Quantum chaos from traversable wormholes

We consider out-of-time ordered correlation (OTOC) functions in field theories dual to AdS traversable wormholes created by a double-trace deformation within the Gao-Jafferis-Wall protocol. They generically have non-maximal Lyapunov exponents but maximal butterfly velocity. We show that they cannot be related to pole skipping, meaning that quantum chaos in wormholes is not of hydrodynamic origin. We then discuss the holographic renormalization and boundary counterterms of the bulk scalar in the wormhole background and find that significant freedom exists in choosing the (physically consistent) boundary action, stemming from the fact that the wormhole has two boundaries. This freedom can be understood from thermofield dynamics. Within this setup we discuss the physical meaning of the field theory dual of the wormhole, in particular if we have one or two systems and if the mixed states are to be understood as thermal or dynamical mixtures.

Room: 40

David, Marina

University of Michigan

Holographic approaches to black hole entropy

I will show that the Bekenstein-Hawking entropy of asymptotically AdS electrically charged rotating black holes can be computed using methods in holography, from the gravity solution and its boundary conformal field theory, as well as the Kerr/CFT correspondence via the near horizon geometry. These techniques can be applied to extremal and near extremal black holes as well as different limits of the parameter space.

Room: 07

Domokos, Sophia

New York Institute of Technology

Vacua, solitons, and a modified probe limit

Studying defect field theories using brane intersections has long been a major direction in holography. In addition to shedding light on strongly coupled defect- and boundary-CFTS, these models lie at the core of many holographic QCD and CMT models. Here I describe a modified probe approximation for a broad class of non-abelian supersymmetric Dp/Dq intersections in the holographic limit, where the open strings on the probe Dq branes not only decouple, they are well-described by a Yang-Mills theory in curved space. This regime is particularly useful for studying these systems' intricate vacuum structure (which I describe for several types of intersections), and finite-energy BPS states (which I highlight for the special D3/D5 case). [Work in collaboration with Andy Royston.]

Room: 36

Dutta, Semanti

Institute of Mathematical Sciences

Composite operator in Exact Renormalization Group

We will present how to construct composite operator in ERG near Wilson-Fisher fixed point. One can find general expression for relevant and irrelevant operators and the respective anomalous dimension up to the sub-leading order using Polchinski's equation.

Room: 34

El Moumni, Hasan

Ibn Zohr university

Black Hole Shadows in M-theory Scenarios

We study the shadows of four dimensional black holes in M-theory inspired models.We first inspect the influence of M2-branes on such optical aspects

for non-rotating solutions. In particular, we show that the M2-brane number can control the circular shadow size. This geometrical behaviour is distorted for rotating solutions exhibiting cardioid shapes in certain moduli space regions. Implementing a rotation parameter, we analyse the geometrical shadow deformations. Among others, we recover the circular behaviours for a large M2-brane number. Investigating the energy emission rate at high energies, we find, in a well-defined approximation, that the associated peak decreases with the M2-brane number. Moreover, we investigate a possible connection with observations (from Event Horizon Telescope or future devices) from a particular M-theory compactification by deriving certain constraints on the M2-brane number inthe light of the M87* observational parameters.

Room: 08

Elgood, Zach

Autonomous University of Madrid

The first law of heterotic stringy black hole mechanics at zeroth order in alpha prime

We re-derive the first law of black hole mechanics in the context of the Heterotic Superstring effective action compactified on a torus to leading order in alpha prime, using Wald's formalism, covariant Lie derivatives and momentum maps. The Kalb-Ramond field strength of this theory has Abelian Chern-Simons terms which induce Nicolai-Townsend transformations of the Kalb-Ramond field. We show how to deal with all these gauge symmetries deriving the first law in terms of manifestly gauge-invariant quantities. In presence of Chern-Simons terms, several definitions of the conserved charges exist, but the formalism picks up only one of them to play a role in the first law. The derivation of a first law is a necessary step towards the derivation of a manifestly gauge-invariant entropy formula which is still lacking in the literature. In its turn, this entropy formula is needed to compare unambiguously macroscopic and microscopic black hole entropies.

Room: 35

Filho, Gilberto N S

UFS

Symmetry break in a scalar field theory in a
(1 + 1)-spacetime with periodic potentials

In this work we are considering a relativistic scalar field theory in a (1+1) Poincaré-Minkowski spacetime for a class of periodic potentials and calculate its kinks(antikinks) solution, topological charges, energy density and mass. The symmetry break is from a vacuum expectation value (VEV) zero for a non zero VEV, that means that the supersymmetry (SUSY) and internal symmetry are spontaneously broken.

Room: 41

Firat, Atakan Hilmi

MIT

Hyperbolic Three-String Vertex

Off-shell amplitudes in string field theory require a set of string vertices. I will focus on the hyperbolic string vertices of Costello and Zwiebach, where the underlying vertex is a general pants diagram. Surprisingly, the conformal maps required for explicit evaluation of this vertex are not known. I use the relation between a boundary value problem for Liouville's equation and a monodromy problem for a Fuchsian equation to find such maps.

Room: 09

Furrer, Elias

Trinity College Dublin

Elliptic Loci of SU(3) Vacua

The space of vacua of many four-dimensional, N=2 supersymmetric gauge theories can famously be identified with a family of complex curves. For gauge group SU(2), this gives a fully explicit description of the low-energy effective theory in terms of an elliptic curve and associated modular fundamental domain. The two-dimensional space of vacua for gauge group SU(3)

parametrizes an intricate family of genus two curves. We analyse this family using the so-called Rosenhain form for these curves. We demonstrate that two natural one-dimensional sub loci of the space of SU(3) vacua, E_u and E_v, each parametrize a family of elliptic curves. For these elliptic loci, we describe the order parameters and fundamental domains explicitly. The locus E_u contains the points where mutually local dyons become massless, and is a fundamental domain for a classical congruence subgroup. Moreover, the locus E_v contains the superconformal Argyres-Douglas points, and is a fundamental domain for a Fricke group.

Room: 10

Gautam, Mamta

Indian Institute of Technology Kanpur

Complexity and information geometry in XY spin chain

We study scaling behaviour of Nielson Complexity and Fubini study complexity of XY spin chain near the critical point in the thermodynamic limit .Derivative of complexity show divergence near critical point and that indicate the presence of Quantum phase transition.By calculating scaling behaviour of the derivative of complexity we try to conclude the universality class they belong .

Room: 42

Gerbershagen, Marius

University of Würzburg

Generalizing the Ryu-Takayanagi formula to probe entanglement shadows of BTZ black holes

We define a generalized entanglement measure in the context of the AdS/CFT correspondence that resolves the contribution of strings with different winding numbers and takes into account entanglement between spatial degrees of freedom as well as between different fields of the boundary theory. We find that for thermal states in the setting of the D1/D5 system at and close to the orbifold point, this generalized entanglement entropy is dual to the length of a geodesic in the BTZ geometry with non-zero winding number.

These geodesics are sufficient to probe the entire bulk geometry, including the entanglement shadow and the growth of the behind the horizon region in the two-sided black hole case.

Room: 43

Goel, Akash

Princeton University

Towards a String Dual of SYK

We propose a paradigm for realizing the SYK model within string theory. Using the large N matrix description of $c < 1$ string theory, we show that the effective theory on a large number Q of FZZT D-branes in (p,1) minimal string theory takes the form of the disorder averaged SYK model with J^p interaction. The SYK fermions represent open strings between the FZZT branes and the ZZ branes that underly the matrix model. The continuum SYK dynamics arises upon taking the large Q limit. We observe several qualitative and quantitative links between the SYK model and (p,q) minimal string theory and propose that the two describe different phases of a single system. We comment on the dual string interpretation of double scaled SYK and on the relevance of our results to the recent discussion of the role of ensemble averaging in holography.

Room: 44

Gregori, Daniele

University of Bologna, INFN

Integrability and cycles of deformed N=2 gauge theory

In this poster, I will show an example of a new kind of correspondence between integrable models and N=2 SYM theories, discovered through the use of the ODE/IM correspondence (in its extended version with two singular irregular points). I will focus on the simplest example of the correspondence between pure N=2 SU(2) SYM in the Nekrasov-Shatashvili limit (deformed Seiberg-Witten (SW)) and the Liouville self-dual model, but we have shown that the correspondence holds more generally with some theories with massive flavours and higher rank gauge group. The main result of our

correspondence is an identification between the Q, Y and T functions of integrability with the (deformed SW-) periods of the gauge theories, from which also new results on both sides follow, like a gauge theory interpretation of the functional relations of integrability.

Room: 11

Guerrini, Luigi

University of Parma

A duality for the latitude Wilson loop in ABJM

I will present the operator dual to the latitude BPS Wilson loops in the ABJM model at k=1, and describe it as a novel bound state of Wilson and vortex loops by combining symmetry considerations and new exact results from supersymmetric localization. An explicit description of the mixed operators as a supersymmetric quantum mechanics coupled to the bulk theory will also be provided.

Room: 45

Hamud, Mario Ramos

National Autonomous University of Mexico (UNAM)

The New Flavour of Strings

With the goal in mind of finding in String Theory some guiding principle that singles out the discrete symmetries that might govern the mixing patterns of fermions in the SM, we studied the eclectic flavour group, which arise in the framework of the Narain formalism from compactifying symmetrically the heterotic string on Abelian toroidal orbifolds, and which is a hybrid picture of the traditional flavour symmetries and finite modular symmetries. In this way, motivated by the origin of these symmetries in String Theory, we analysed the phenomenology of some eclectic flavour groups in different extensions of the Standard Model from a bottom-up perspective.

Room: 43

Hazel Mak, S. N.

Brown University

1D, N = 4 Supersymmetric SYK

Proposals are made to describe 1D, N = 4 supersymmetrical systems that extend SYK models by compactifying from 4D, N = 1 supersymmetric Lagrangians involving chiral, vector, and tensor supermultiplets. Quartic fermionic vertices are generated via integrals over the whole superspace, while 2(q-1)-point fermionic vertices are generated via superpotentials. The coupling constants in the superfield Lagrangians are arbitrary, and can be chosen to be Gaussian random. In that case, these 1D, N = 4 supersymmetric SYK models would exhibit Wishart-Laguerre randomness, which share the same feature among other 1D supersymmetric SYK models in literature.

Room: 41

Hegde, Subramanya

Harish-Chandra Research Institute

One-loop integrand from generalised scattering equations

Generalised bi-adjoint scalar amplitudes, obtained from integrations over moduli space of punctured CP_k, are novel extensions of the CHY formalism. These amplitudes have realisations in terms of Grassmannian cluster algebras. Recently connections between one-loop integrands for bi-adjoint cubic scalar theory and D_n cluster polytope have been established. In this paper using the Gr (3, 6) cluster algebra, we relate the singularities of (3, 6) amplitude to four-point one-loop integrand in the bi-adjoint cubic scalar theory through the D_4 cluster polytope. We also study factorisation properties of the (3, 6) amplitude at various boundaries in the worldsheet.

Room: 45

Issifu, Adamu

Federal University of Paraiba

An Effective Model for Glueballs and Dual Superconductivity

The glueballs lead to gluon and QCD monopole condensations as by-products of colour confinement. A colour dielectric function $G(|\phi|)$ coupled with Abelian gauge field is properly defined to mediate the glueball interactions at confining regime after *spontaneous symmetry breaking* (SSB) of the gauge symmetry. The particles are expected to form through quark gluon plasma (QGP) hadronization phase where the free quarks and gluons start clamping together to form hadrons. The QCD-like vacuum $\langle \eta^2 m_\eta^2 F^{\mu\nu} F_{\mu\nu} \rangle$, confining potential $V_c(r)$, string tension σ, penetration depth λ, superconducting and normal monopole densities (n_s, n_n) and the effective masses (m_η^2 and m_A^2) will be investigated at finite temperature T. We also calculate the strong 'running' coupling α_s and subsequently the QCD β-function. *Dual superconducting* nature of the QCD vacuum will be investigated based on monopole condensation.

Room:46

Khanchandani, Himanshu

Princeton University

Conformal Defects from Hyperbolic Space

Conformal defects in an Euclidean CFT can be conveniently described by studying the CFT on a product space consisting of hyperbolic space and a sphere: a codimension q flat or spherical defect in a d dimensional CFT naturally appears when we put the CFT on $H^{d+1-q} \times S^{q-1}$. I will describe the general idea and then apply it to study conformal boundary conditions and monodromy defects in the critical O(N) model. I will also show how one can study RG flows localized on a defect in this setup, and give evidence for conjectured defect F-theorems.

Room: 12

Kidwai, Omar

University of Tokyo

Topological recursion and uncoupled BPS structures for hypergeometric spectral curves

The notion of BPS structure formalizes many of the structures appearing in the study of four-dimensional N=2 QFTs by Gaiotto-Moore-Neitzke as well as Bridgeland's spaces of stability conditions and the generalized Donaldson-Thomas (equivalently, BPS) invariants. We outline a relation in the simplest cases to the formalism of topological recursion (TR), which is a recursive technique originating in the theory of matrix models for constructing symplectic invariants from an initial "spectral curve". This is joint work with K. Iwaki.

Room: 35

Klaewer, Daniel

Mainz University

Modular Curves and the Distance Conjecture

It is conjectured that the neighbourhood of an infinite distance point in the moduli space of quantum gravity features a light tower of states with mass-scale exponentially sensitive to the distance. The question arises whether we can find regions of large diameter in the interior of moduli space where we can avoid such towers. We test this using mirror symmetry and heterotic/IIA duality in 4D N=2. In certain corners, the vector multiplet geometry degenerates to a modular curve, which allows for exact distance calculations. We identify Calabi-Yau threefolds fibered by polarized K3 surfaces of high degree as candidate backgrounds generating large distances. While some of these can be constructed as complete intersections in Grassmannian bundles, we show that there is an upper bound on the degree that censors large distances.

Room: 47

Kolchmeyer, David

Harvard University

Dynamical End-of-the-World Branes in Jackiw-Teitelboim Gravity

Jackiw-Teitelboim gravity with end-of-the-world (EoW) branes has been used to study the black hole information problem. We consider dynamical EoW branes by summing over loops of branes in the Euclidean path integral. The UV divergences that arise are treated in the context of effective field theory. The effective field theory perspective has a natural interpretation in the dual matrix model. The EoW branes make a contribution to the black hole entropy that is consistent with a state-counting interpretation of the entropy. This mechanism resolves a version of the information problem that has been formulated in this model.

Room: 13

las Heras, Camilo

Universidad de Antofagasta

U-duality, non trivial M2-branes and D-branes with fluxes

In this work, we will consider non trivial, U-dual sectors of M2-brane theory with good quantum properties, as discreteness of the supersymmetric spectrum. These sectors are characterized for a non trivial U(1) principal bundle on the worldvolume. The global description of these theories is given in terms of Twisted Torus Bundles with monodromy in SL(2,Z). Moreover, we will show how these non trivial sectors are related with D-branes with RR and NSNS fluxes on the background and worldvolume. These fluxes are produced by the quantization condition that already exists in 11D. Finally, we will show the relation between bound states of strings and Dp-branes in D=10, with these non trivial sectors of M2-brane theory.

Room: 14

Lee, Siyul

University of Michigan

Microscopic Entropy of AdS3 Black Holes Revisited

We revisit the microscopic description of AdS3 black holes in light of recent progress on their higher dimensional analogues. The grand canonical partition function that follows from the AdS3/CFT2 correspondence describes BPS and near BPS black hole thermodynamics. We formulate an entropy extremization principle that accounts for both the black hole entropy and a constraint on its charges, in close analogy with asymptotically AdS black holes in higher dimensions. We are led to interpret supersymmetric black holes as ensembles of BPS microstates satisfying a charge constraint that is not respected by individual states. This interpretation provides a microscopic understanding of the hitherto mysterious charge constraints satisfied by all BPS black holes in AdS. We also develop thermodynamics and an Attractor mechanism of AdS3 black holes in the near BPS regime.

Room: 48

Li, Yixuan

Institut de Physique Théorique, Université Paris-Saclay

Black Holes and the Swampland: the Deep Throat Revelations

Distances on the moduli space of solutions for black holes and their microstate geometries are usually difficult to compute. However, Swampland notions could provide a major simplification of the problem. In this purpose, I will investigate the connection between 1) the Swampland distance conjecture for metrics and 2) the scaling limit in the moduli space of microstate geometries - where the the geometries throat deepens. I will exhibit two notions of distance on the moduli space of microstate geometries - one from the converse of the Swampland distance conjecture, and one from the Kahler structure of the phase space - that appear to be in tension, and discuss the physical implications of this mismatch.

Room: 48

Li, Yixuan

Insititut de Physique Théorique, Université Paris-Saclay

A Downward Spiral in the Throat: Internal Tidal Disruptions

A geometry that looks like an extremal black hole but that has a smooth cap at the end of a long throat implies physics that deviate from that of the black hole. For instance, if one probes a horizonless microstate geometry with an infalling graviton excitation, one would expect the presence of gravitational echoes. However, tidal excitations at the bottom of the throat would excite the probe as a string, and prevent it to return back to infinity, thus strongly weakening the gravitational echoes. In particular, we show that there exist also tidal effects along the internal (toroidal) directions, which, unexpectedly, alternate between compression and stretching phases upon the string. We explain some physical properties of this oscillation and comment on the dual CFT interpretation of tidal effects on the infalling string.

Room: 15

Lima, Andre Alves

Universidade Federal do Espírito Santo

Twisted Ramond ground states in the deformed D1-D5 CFT

We study the D1-D5 CFT, holographically related to bound states of D1- and D5-branes, after deformation of the free $(T^4)^N/S_N$ orbifold by a scalar modulus operator, in the large-N limit. We compute the correlator of two generic Ramond ground states with two deformation operators, extract OPEs from coincidence limits, and check that the anomalous dimensions of the ground states are protected to second order in perturbation theory.

Room: 16

Linardopoulos, Georgios

NCSR Demokritos

String integrability of defect CFT and
dynamical reflection matrices

The $D3-D5$ probe-brane system is holographically dual to a defect CFT that is known to be integrable. The evidence comes mainly from the study of correlation functions at weak coupling. The present poster focuses on the emergence of integrability on the string theory side. We construct the double row transfer matrix which is conserved when the appropriate boundary conditions are imposed. The corresponding reflection matrix turns out to be dynamical as it depends on both the spectral parameter and the string embedding coordinates.

Room: 17

Lopez-Arcos, Cristhiam

Universidad Nacional de Colombia Sede Medellin

Color-kinematics duality from the Bern-Kosower formalism

We present a novel method to calculate Berends-Giele currents for Yang-Mills, which naturally obey color-kinematics duality. This procedure comes from the pinching technique for reducible one-loop amplitudes for gluons in the Bern-Kosower formalism.

Room: 18

Magill, Matthew

Uppsala University

G2 structures, almost contact 3-structures and BPS cycles

Manifolds with G2 structure always admit a rich space of bonus structures, known as almost contact 3-structures. These appear to be related to BPS cycles and consequentially, may provide a new tool to probe the space of BPS states

Room: 19

Majumder, Suvajit

City, University of London

Protected states from integrability

Protected states in AdS3 backgrounds are computed using Algebraic Bethe ansatz techniques. K3 backgrounds realised as orbifolds of T4 are also included. Results obtained are exact in string coupling.

Room: 20

Mancani, Salvatore

La Sapienza University of Rome

A tale of Orientifolds: new conformal points and dualities in the infrared

In the context of the AdS/CFT correspondence, the large class of toric Calabi-Yau singularities and their dual gauge theories can be represented by toric diagrams and brane tilings. The orientifold projection Ω of such theories can be obtained by a Z_2 involution of the torus, whose fixed loci are either four fixed points or fixed lines. Using a-maximization, one finds the conformal point of these unoriented theories. It turns out that different scenarios may occur for a^{Ω}: 1- its value is half of that before the orientifold projection; 2- it has no maximum; 3- its value is more than halved w.r.t. the parent. This new third scenario signals the existence of a conformal point at lower scales. Furthermore, some theories in third scenario result to be 'dual' to other orientifold of toric theories in first scenario.

Room: 42

Maulik, Sabyasachi

Saha Institute of Nuclear Physics and Homi Bhabha National Institute, India

Holographic entanglement entropy for
$Lif_4^{(2)} \times S^1 \times S^5$ spacetime with string excitations

The (F1,D2,D8) brane configuration with $Lif_4^(2) \times S^1 \times S^5$ geometry is a known Lifshitz vacua supported by massive B-field in type IIA theory. This

system allows exact IR excitations which couple to massless modes of the fundamental string. Due to these massless modes the solutions have a flow to a dilatonic $Lif_4^(3) \times S^1 \times S^5$ vacua in IR. We study the entanglement entropy on the boundary of this spacetime for the strip and the disk subsystems. We find net entropy density of the excitations at first order is independent of the typical size of subsystems. We interpret our results in light of the first law of entanglement thermodynamics.

Room: 21

Mitra, Arpita

IISER Bhopal India

Soft factors in the presence of small cosmological constant

At the classical level, the soft factor can be obtained from radiative profiles arising from the gravitational and electromagnetic bremmstrahlung in the vanishing frequency limit. We have studied scattering of a probe particle by a four dimensional AdS black hole background at large impact factor with the small negative cosmological constant. Our analysis is consistent perturbatively to leading order in the cosmological constant and black hole mass parameter. We define a proper "soft limit"of the radiation and extract out the "soft factor"from it. We find the correction to the well known flat space soft factors due to the presence of a small negative cosmological constant. The leading soft factor can be expected to be universal and holds beyond tree level. This allows us to derive a correction to the Ward identity, following the known equivalence between large gauge Ward identities and soft photon theorems in asymptotically flat spacetimes.

Room: 40

Moitra, Upamanyu

Tata Institute of Fundamental Research

(Near-)Extremal Excursions

I will describe some interesting results that have emerged from the studies of near-extremal black holes with a near-horizon AdS(2) factor in the

geometry - in topics as disparate as low-temperature fluid dynamics and the strong cosmic censorship conjecture.

Room: 22

Monaco, Gabriele Lo

IPhT/CEA Saclay

(Non-)Perturbative stability of AdS6 and AdS7 vacua

It has been conjectured by Ooguri and Vafa that any non-supersymmetric AdS vacuum (supported by fluxes) cannot be stable. Such conjecture has severe consequences: for instance, it puts strong constraints on the possibility to realize non-supersymmetric holography. It is important to test it as much as possible in known AdS solutions, in order to understand how instabilities are realized in String Theory and if there is room for counterexamples. I present a detailed study of the stability of two infinite classes of non-supersymmetric vacua: AdS_7 solutions in massive type IIA and AdS_6 solutions in type IIB. I will show that backgrounds with mobile space-filling brane sources sitting at the boundary of the internal manifold are unstable because of tachyonic modes associated to the motion of the brane sources. Moreover, the vacua can also suffer from a second non-perturbative decay channel, mediated by the nucleation of brane bubbles. Finally, I will comment about the possibility to construct particular vacua free of such decay mechanisms.

Room: 47

Obied, Georges

Harvard University

Topological gravity as the early phase of our universe

Motivated by string dualities we propose topological gravity as the early phase of our universe. The topological nature of this phase naturally leads to the explanation of many of the puzzles of early universe cosmology. A concrete realization of this scenario using Witten's four dimensional topological gravity is considered. This model leads to the power spectrum of CMB fluctuations which is controlled by the conformal anomaly coefficients (a, c). In

particular the strength of the fluctuation is controlled by 1/a and its tilt by cg^2 where g is the coupling constant of topological gravity. The positivity of c, a consequence of unitarity, leads automatically to an IR tilt for the power spectrum. In contrast with standard inflationary models, this scenario predicts O(1) non-Gaussianities for four- and higher-point correlators and the absence of tensor modes in the CMB fluctuations.

Room: 24

Oehlmann, Paul-Konstantin

Uppsala University

Gauged 2-form Symmetries in 6D SCFTs coupled to Gravity

Six dimensional superconformal theories generically admit global 2-form symmetries. Such SCFT sectors are also present in gravity theories, where those symmetries are either broken or gauged. We give a general geometric condition in (2,0) and (1,0) theories for such a gauging to be present and analyze the constraint BPS string charges. We also test our proposal via various string dualities, where the light strings of the SCFTs map to non-simply connected gauge groups.

Room: 25

Poddar, Rahul

University of Iceland

Novel Cosets of 2d RCFTs

A new relation between 2D RCFTs has been proposed in arXiv:1602.01022, which constructs a "Coset"theory C by quotienting an RCFT D from a meromorphic theory H. Here, it is manifest through a bilinear product of the characters of the C and D RCFTs (which have the same number of characters) which is equal to a modular invariant character of the meromorphic theory H. These coset relations have played an important role the classification of 2d RCFTs. Characters of RCFT satisfy modular linear differential equations (MLDEs) since the torus partition function is modular invariant. However, there exist solutions which are not physical, since they have negative yet integral q expansion, which are called quasi-characters. Quasi-characters was

introduced in arXiv:1810.09472 where they were used to completely classify all 2 character RCFTS. The existence of quasi-character solutions in order 3 MLDEs was shown in arXiv:2002.01949, by using the fact that when the coset pairs have 3 characters they have the same modular properties, which implied that they are special cases of an infinite series of quasi-characters. We also show that specific combinations of quasi-characters construct admissible characters of arbitrary large Wronskian index, just like the order 2 case. The coset relation was extended in arXiv:2011.09487 to include conformal blocks of 4 point correlators, where we provide substantial evidence that a holomorphic bilinear product of conformal blocks of MMS theories is equal to the $E_8, 1$ current 4 point correlator.

Room: 26

Rathi, Hemant

Indian Institute of Technology, Roorkee

Hawking-Page transition in 2D Gravity

We look the effect of Maxwell Fields and Non-Abelian Fields on JT Gravity and study the phase stability of this model. Systematically, we consider gravitational theory in D = 5 spacetime dimension in presence of cosmological constant which is coupled with SU(2) Yang-Mills Fields and Maxwell Field .We dimensionally reduce this theory from D=5 to D=2 using a proper ansatz for spacetime metric and gauge Fields. We observed that the asymptotically geometry of vacuum and black hole changes due to the presences of gauge charge. The key feature of this theory is that we found a Hawking-Page transition in this model at a certain temperature $T > T_0$. For temperature $T < T_0$, we have only thermal radiation with no black hole. As we gradually increase the temperature and cross the threshold temperature T_0, thermal radiation collapsed to form a globally stable black hole. Hence we conclude that the Non-Abelian Fields are responsible for first order phase transition in generalized JT gravity model

Room: 27

Ravera, Lucrezia

Polytechnic of Turin

Hidden gauge structure of D=11 supergravity

I will present some recent developments regarding supersymmetric Free Differential Algebras describing the vacuum structure of higher-dimensional supergravity theories. I will focus on the case of D=11 supergravity and, in particular, on the emergence of a hidden superalgebra underlying the theory, explaining the group-theoretical role played by the nilpotent fermionic generator naturally appearing for consistency of the model.

Room: 38

Rodriguez, Alejandro

Universidad de Buenos Aires

Supersymmetry, T-duality and higher-derivative corrections.

Higher-derivative interactions and transformation rules of the fields in the effective field theories of the massless string states are strongly constrained by space-time symmetries and dualities. Here we use an exact formulation of ten dimensional N = 1 supergravity coupled to Yang-Mills with manifest T-duality symmetry to construct the first order -corrections of the heterotic string effective action. The theory contains a supersymmetric and T-duality covariant generalization of the Green-Schwarz mechanism that determines the modifications to the leading order supersymmetry transformation rules of the fields. We compute the resulting field-dependent deformations of the coefficients in the supersymmetry algebra and construct the invariant action, with up to and including four-derivative terms of all the massless bosonic and fermionic fields of the heterotic string spectrum.

Room: 23

Royston, Andy

Penn State Fayette

Accelerating Solitons

We show that the leading semiclassical behavior of soliton form factors at arbitrary momentum transfer is controlled by solutions to a new wavelike integro-differential equation that describes solitons undergoing acceleration.

We work in the context of two-dimensional linear sigma models with kink solitons for concreteness, but our methods are purely semiclassical and generalizable.

Room: 28

Schachner, Andreas

University of Cambridge

The Standard Model Quiver from Singular de Sitter String Compactifications

With the advent of the string landscape, the realisation of the Standard Model in general string theory compactifications to 4D has become a primary focus. This talk concerns novel constructions of the Standard Model in global set-ups of type IIB Calabi-Yau compactifications. We argue that the Standard Model quiver can be embedded into Calabi-Yau threefolds through orientifolded D3 branes at del Pezzo singularities dPn with n 5. To illustrate our approach, we explicitly construct local dP5 models via a combination of Higgsing and orientifolding. This procedure reduces the original dP5 quiver gauge theory to the Left-Right symmetric model with three families of quarks and leptons as well as a Higgs sector to further break the symmetries to the Standard Model gauge group. Subsequently, we establish explicit embeddings of the local model in a global Calabi-Yau compactification. We show that moduli can be stabilised in 4-dimensional de Sitter vacua with uplifting provided by T-branes.

Room: 49

Shashi,Sanjit

University of Texas at Austin

BCFT Correlator Structure from Geodesics

We extend the geodesic approximation, which equates a saddle-point approximation over geodesic lengths in the bulk to large-dimension scalar operators in the boundary, to spacetimes with boundaries. Such a geodesic approximation formally sums over paths which reflect against the brane any number of times. We then focus on planar effective AdS/BCFT models with tension, in which there are only ever zero or one reflections classically. We

first find agreement between the exponential of a geodesic terminating on the brane and the full one-point function read from the scalar field's near-boundary modes. We then use the prescription to compute a two-point function, finding a "correlation-decorrelation" phase transition at sufficiently negative tension and a countable number of boundary operators in the BOP expansion dependent on the brane tension.

Room: 29

Silva, Alex de Albuquerque

Universidade Federal de Campina Grande

Classical tests of General Relativity in thick branes

Classical tests of General Relativity in braneworld scenarios have been investigated recently with the purpose of posing observational constraints on the parameters of some models of infinitely thin brane. Here we consider the motion of test particles in a thick brane scenario that corresponds to a regularized version of the Garriga-Tanaka solution, which describes a black hole solution in RSII model, in the weak field regime. By adapting a mechanism previously formulated in order to describe the confinement of massive tests particles in a domain wall (which simulates classically the trapping of the Dirac field in a domain wall), we study the influence of the brane thickness on the four-dimensional (4D) path of massless particles. Although the geometry is not warped and, therefore, the bound motion in the transverse direction is not decoupled from the movement in the 4D-world,we can find an explicit solution for the light deflection and the time delay, if the motion in the fifth direction is a high frequency oscillation. We verify that, owing to the transverse motion, the light deflection and the time delay depend on the energy of the light rays. This feature may lead to the phenomenon of gravitational rainbow. We also consider the problem from a semi-classical perspective, investigating the effects of the brane thickness on the motion of the zero-mode in the 4D-world.

Room: 46

Singh, Rajeev

Institute of Nuclear Physics Polish Academy of Sciences

Conformal symmetry and spin hydrodynamics

We study and analyse the conformal transformations of different conservation laws in the spin hydrodynamics framework.

Room: 50

Söderberg, Alexander

Theoretical physics, Uppsala university

On Analytic Bootstrap for Interface and Boundary CFT

We use analytic bootstrap techniques for a CFT with an interface or a boundary. Exploiting the analytic structure of the bulk and boundary conformal blocks we extract the CFT data. We further constrain the CFT data by applying the equation of motion to the boundary operator expansion. The method presented in this paper is general, and it is illustrated in the context of perturbative Wilson-Fisher theories.

Room: 30

Soni, Ronak M

Stanford University

A Bridge to the Island?

We study the Page curve and the island rule for black holes evaporating into gravitating baths, with an eye towards establishing a connection with the ER=EPR proposal. We consider several models of two entangled 2d black holes in Jackiw-Teitelboim (JT) gravity with negative cosmological constant. The first, "doubled PSSY,"model is one in which the black holes have end-of-the-world (ETW) branes with a flavour degree of freedom. We study highly entangled states of this flavour degree of freedom and find an entanglement-induced Hawking-Page-like transition from a geometry with two disconnected black holes to one with a pair of black holes connected by a wormhole, thus realising the ER = EPR proposal. The second model is a dynamical one in which the ETW branes do not have internal degrees of freedom but the JT gravity is coupled to a 2d CFT, and we entangle the black holes by coupling the two CFTs at the AdS boundary and evolving for a long time. We study the entanglement entropy between the two black holes and find that the story is substantially similar to that with a non-gravitating thermal bath. In the third model, we couple the two ends of a two-sided eternal black hole and evolve for a long time. Finally, we discuss the possibility of a Hawking-Page-like transition induced by real-time evolution that realises the ER = EPR proposal in this dynamical setting.

Room: 31

Suzuki, Ryo

Shint-Tung Yau Center of Southeast University

Oscillating multiple giants

Superstring theory on AdS5xS5 has the BPS D3-brane states called giant gravitons, which corresponds to the operators with huge dimensions in N=4 super Yang-Mills. I discuss the extension of this correspondence, and propose an all-loop ansatz. On the gauge theory side, thanks to the development of finite group methods, the mixing of huge operators can be simplified to the harmonic oscillators of an effective U(p) theory, where p corresponds to the

number of giant gravitons. On the string theory side, the classical equations of motion for the non-maximal giant graviton are solved perturbatively, so that the excitation spectrum remains gapless.

Room: 50

Trivedi, Oem

Ahmedabad University

Rejuvenating the hope of a swampland consistent inflated multiverse with tachyonic inflation in the high energy RS-II Braneworld

The swampland conjectures from string theory have had some really interesting implications on cosmology, in particular on inflationary models. Some models of inflation have been shown to be incompatible with these criterion while some have been shown to be severely fine tuned, with most of these problems arising in single field inflationary models in a General relativistic cosmology. Recent works have although optimistically shown that single field models in more general cosmologies can be consistent with these conjectures and hence there is an optimism that not all such models lie in the swampland. However a paradigm of inflation which has been shown to not be perfectly okay with the conjectures is eternal inflation. So in this work, we discuss Tachyonic inflation in the high energy RS-II Braneworld scenario in the context of the swampland conjectures while also considering the possibility of swampland consistent eternal inflation. We show that our concerned regime evades all the prominent swampland issues for single field inflation being virtually unscathed. After this, we show that the main conflicts of eternal inflation with the swampland can easily be resolved in the considered tachyonic scenario and in particular, we also discuss the exciting prospect of a Generalized Uncertainty Principle facilitating the notion of Swampland consistent eternal inflation. Our work as a whole reignites the possibility that there can be a swampland (and possibly, quantum gravitationally) consistent picture of a "Multiverse"

Room: 44

van Beest, Marieke

University of Oxford

Holography, 1-Form Symmetries, and Confinement

I will discuss confinement in 4d $N = 1SU(N)$ SYM from a holographic point of view, focusing on the 1-form symmetry and its relation to chiral symmetry breaking. In the 5d supergravity dual, obtained by truncation of the Klebanov-Strassler solution, I will explain how to identify the topological couplings that determine the 1-form symmetry and its 't Hooft anomalies. One such coupling is a mixed 0-form/1-form symmetry anomaly closely related to chiral symmetry breaking in gapped confining vacua. I will also show how we identify, from the dual gravity description, the IR 4d topological field theory, which realises chiral symmetry breaking and matches the mixed anomaly.

Room: 37

Yoon, Junggi

KIAS

TTbar-deformed Fermionic Theories Revisited

We revisited TTbar deformations of d=2 theories with fermions with a view toward the quantization. As a simplest illustration, we compute the deformed Dirac bracket for a Majorana doublet and confirm the known eigenvalue flows perturbatively. We mostly consider those TTbar theories that can be reconstructed from string-like theories upon integrating out the worldsheet metric. We obtain a known non-supersymmetric TTbar deformation of a N=(1,1) theory from Green-Schwarz-like model, implying hidden supercharges which we do construct explicitly. This brings us to ask about different TTbar deformations, such as manifestly supersymmetric TTbar and also more generally via the symmetric energy-momentum. We show that, for theories with fermions, generic such choices lead us to doubling of degrees of freedom, with potential unitarity issues. We show that the extra sector develops a divergent gap in the "small deformation"limit and decouples in the

infrared, although it remains uncertain in what sense these can be considered as a deformation.

Room: 32

Zhang, Hao

University of Pennsylvania

Effective Field Theory for 6D (1,0) RG Flows

Motivated by its potential use in constraining the structure of 6D renormalization group flows, we determine the low energy dilaton-axion effective field theory of conformal and global symmetry breaking in 6D conformal field theories (CFTs). While our analysis is largely independent of supersymmetry, we also investigate the case of 6D superconformal field theories (SCFTs), where we use the effective action to present a streamlined proof of the 6D a-theorem for tensor branch flows, as well as to constrain properties of Higgs branch and mixed branch flows. An analysis of Higgs branch flows in some examples leads us to conjecture that in 6D SCFTs, an interacting dilaton effective theory may be possible even when certain 4-dilaton 4-derivative interaction terms vanish, because of large momentum modifications to 4-point dilaton scattering amplitudes. This possibility is due to the fact that in all known $D > 4$ CFTs, the approach to a conformal fixed point involves effective strings which are becoming tensionless.

Room: 33

Zhao, Suting

University of Wuerzburg

Symmetry resolved entanglement in AdS3/CFT2

We consider symmetry-resolved entanglement entropy in AdS3/CFT2 coupled to U(1) Chern-Simons theory. We identify the holographic dual of the charged moments in the two-dimensional conformal field theory as a charged Wilson line in the bulk of AdS3, namely the Ryu-Takayanagi geodesic minimally coupled to the U(1) Chern-Simons gauge field. We identify the holonomy around the Wilson line as the Aharonov-Bohm phases which, in the two-dimensional field theory, are generated by charged U(1) vertex

operators inserted at the endpoints of the entangling interval. We use our method to derive the symmetry-resolved entanglement entropy for Poincare patch and global AdS3, as well as for the conical defect geometries. In all three cases, the symmetry resolved entanglement entropy is determined by the length of the Ryu-Takayanagi geodesic and the Chern-Simons level k, and fulfills equipartition of entanglement. The asymptotic symmetry algebra of the bulk theory is of $u(1)_k$ Kac-Moody type. Employing the $u(1)_k$ Kac-Moody symmetry, we confirm our holographic results by a calculation in the dual conformal field theory.