Abstract 报告摘要汇总

DAY2：2022.11.8 Tuesday 周二

8：45 Tsinghua University and BIMSA：Prof. Shing-Tung Yau
Online Speech

9:00-10:00 TALK 1

BIMSA：Prof. Sergio Cecotti cecotti@sissa.it

Title:
Abstract:

10：00-11：00 TALK 2
Tianjin University：Prof. Junbao Wu junbao.wu@tju.edu.cn

Title: Fermionic BPS Wilson loops in four dimensional $\mathcal{N}$=2 superconformal gauge theories

3 Keywords: Supersymmetry, Line operators, Gauge theories
Abstract:
We construct for the first time Drukker-Trancanelli (DT) type fermionic BPS Wilson loops in four dimensional $\mathcal{N}$=2 superconformal $SU(N)\times SU(N)$ quiver theory and $\mathcal{N}$=4 super Yang-Mills theory. The connections of these fermionic BPS Wilson loops have a supermatrix structure. We construct timelike BPS Wilson lines in Minkowski spacetime and circular BPS Wilson loops in Euclidean space. These Wilson loops involve dimensionful parameters. For generic values of parameters, they preserve one real (complex) supercharge in Lorentzian (Euclidean) signature. Supersymmetry enhancement for Wilson loops happens when the parameters satisfy certain constraints. The nature of such loops is quite different from the Wilson loop operators involving fermions constructed previously in the literature on four-dimensional gauge theories. We hope that further investigations of such new Wilson loops will explore deep structures in both the gauge theories and gauge/gravity dualities. This talk is based on work done with Hao Ouyang.

11：30-12：30 TALK 3
BIMSA：Prof. Yuval Peres yperes@gmail.com
Title: Gravitational allocation to uniform points on the sphere
3 Keywords: Gravitational potential, gradient descent, bipartite matching
Abstract:
Given n uniform points on the surface of a two-dimensional sphere, how can we partition the sphere fairly among them ? "Fairly" means that each region has the same area. It turns out that if the given points apply a two-dimensional gravity force to the rest of the sphere, then the basins of attraction for the resulting gradient flow yield such a partition—with exactly equal areas, no matter how the points are distributed. (See the cover of the AMS Notices at http://www.ams.org/publications/journals/notices/201705/rnoti-cvr1.pdf or the PNAS article http://www.pnas.org/content/early/2018/09/06/1720804115). Our main result is that this partition minimizes, up to a bounded factor, the average distance between points in the same cell. I will also present an application to almost optimal matching of n uniform blue points to n uniform red points on the sphere, connecting to a classical result of Ajtai, Komlos and Tusnady (Combinatorica 1984). I will emphasize open problems on the diameters of the basins and the behavior of greedy matching schemes. Joint work with Nina Holden and Alex Zhai.

14：00-14：45 TALK 4

Tsinghua University：Dr. Pengxiao Hao pxhao@tsinghua.edu.cn

Title: BMS field theories in 2d

3 Keywords: BMS field theory; Galilean conformal theory; non-relativistic quantum field theory

Abstract:

The BMS (Bondi-van der Burg-Metzner-Sachs) symmetry arises as the asymptotic symmetry of flat spacetime at null infinity. The 2d BMS field theories are a kind of non-relativistic quantum field theory equipped with the BMS$_3$ algebra. They serve as the candidates of the dual theory of flat holography and flat space chiral gravity in 3d.

In this talk, I will report our recent study on the BMS field theories, including the properties from the general consideration of symmetry algebra and representation, the appearance of the multiplets. We also calculate the global blocks and develop BMS bootstrap. Besieds, we consider the detailed free scalar and fermion models as the testing ground, solving them by canonical quantization, then organizing them in the language of BMS data. These theories feature novel properties on the primary multiplet, the staggered module and the induced module.

14：45-15：30 TALK 5

BIMSA：Dr. Wenjie Ma wenjia.ma@bimsa.cn

Title: Shadow Celestial Ampltude

3 Keywords: celestial amplitude, OPE, conformal block expansion

Abstract:

We study scattering amplitudes in the shadow conformal primary basis, which satisfies the same defining properties as the original conformal primary basis and has many advantages over it. The shadow celestial amplitudes exhibit locality manifestly on the celestial sphere, and behave like correlation functions in conformal field theory under the operator product expansion (OPE) limit. We study the OPE limits for three-point shadow celestial amplitude, and general 2 to n-2 shadow celestial amplitudes from a large class of Feynman diagrams.

In particular, we compute the conformal block expansion of the s-channel four-point shadow celestial amplitude of massless scalars at tree-level, and show that the expansion coefficients factorize as products of OPE coefficients.

16：00-17：00 TALK 6

Online Talk：Prof. M.M. Sheikh-Jabbari

Title: Horizon Strings as 3d Black Hole Microstates

Abstract:

We construct microstates of 3d black holes in the Hilbert space of tensionless null strings with non-zero winding along the

bifurcation horizon. Counting these string states we recover the Bekenstein-Hawking entropy and its semiclassical logarithmic corrections.

17:00-17:30 Free Discussion

DAY3：2022.11.9 Wednesday 周三

9:00-10:00 TALK 1

Online Talk：Prof.Eric Sharpe

Title: Generalized symmetries and gauge theory multiverses

Abstract:

In this talk, I will outline higher-form symmetries in quantum field theories, focusing on two-dimensional theories with one-form symmetries. Such theories are equivalent to disjoint unions of quantum field theories, an equivalence known as `decomposition.' I will outline some basic examples and applications.

10：00-11：00 TALK 2

Jilin University：Prof. Hao Ouyang hao.ouyang@su.se

Title: TBA-like equations for non-planar scattering amplitude/Wilson lines duality at strong coupling

3 Keywords: AdS/CFT correspondence, scattering amplitude, Wilson lines

Abstract:

We compute the minimal area of a string worldsheet ending on two infinite periodic light-like Wilson lines in the AdS3 boundary, which is dual to the first non-planar correction to the gluon scattering amplitude in N=4 SYM at the strong coupling. Using the connection between the Hitchin system and the thermodynamic Bethe ansatz (TBA) equations, we present an analytic method to compute the minimal area surface and express the non-trivial part of the minimal area in terms of the free energy of the TBA-like equations. Given the cross ratios as inputs, the area computed from the TBA-like equations matches that calculated using the numerical integration. This talk is based on work done with Hongfei Shu.

11：30-12：30 TALK 3

Fudan University：Prof. Yang Zhou yang_zhou@fudan.edu.cn

Title: Defect localized entropy: Renormalization group and holography

Abstract:

We consider p-dimensional defects in D-dimensional conformal field theories (CFTs) and construct defect localized entropy by performing the replica trick only on the defect while keeping the bulk intact. The defect localized entropy is a measure of entanglement between the degrees of freedom localized on the defect. We show that at the fixed point of defect renormalization group (RG) flow, defect localized entropy is equal to minus defect free energy for universal part. We construct defect C-functions in various dimensions and provide a proof of the monotonicity for p=2,3. We also find the holographic dual of defect

localize entropy.

14：00-14：45 TALK 4

BIMSA：Dr. Yiyu Lin yiyu@bimsa.cn

Title: Thread/state correspondence: the ``thread'' perspective on quantum entanglement in holographic duality

3 Keywords: Holographic duality; emergent gravity; quantum information theory

Abstract:

Many concepts from quantum information theory and network theory have proved useful in the study of holographic duality or emergent gravity. This talk will focus on a simple application of the concepts of conditional mutual information (CMI) from the former and multi-commodity flow (multiflow) from the latter in this regard. In fact, the embodiment of this application is the bit-thread formulation of the Ryu-Takayanagi formula of holographic entanglement entropy. This talk aims to present a "thread" perspective, which is complementary to the "local tensor" perspective, to investigate the structure of quantum entanglement in holographic duality.

14：45-15：30 TALK 5

BIMSA：Prof. Peng Zhao pzhao@bimsa.cn

Title: Bethe-State Counting and the Witten Index

Abstract:

We count the Bethe states of quantum integrable models with twisted boundary conditions using the Witten index of 2d supersymmetric gauge theories. For multi-component models solvable by the nested Bethe ansatz, the result is a novel restricted occupancy problem. For the SU(3) spin chain and the t-J model, we propose formulae for the solution count on singular loci in the space of twist parameters.

15:30-17:30 Coffee Time and Free Discussion

DAY4：2022.11.10 Thursday 周四

9:00-10:00 TALK 1

BIMSA：Prof. Senya Shlosman shlosman@gmail.com

Title: Tracy-Widom distribution and the 3D Ising model

3 Keywords: Airy process, Wulf shape, non-intersecting random walks

Abstract:

I will talk about the formation of the crystals in the 3D Ising model. At low temperatures, such a crystal has flat facets. I will argue that the fluctuations of the boundary of the top layer of the crystal of size N are of the order of N^{1/3}. If scaled properly, the distribution of these fluctuations converges to the Tracy-Widom distribution.

Joint work with Partik Ferrari, **arXiv:2209.14047**

10：00-11：00 TALK 2

Tianjin University：Prof. Hong Lu mrhonglu@gmail.com

Title: Einstein Gravity in 2+epsilon Dimensions

3 Keywords: 2d gravity, black hole, boundary action

Abstract:

Einstein gravity at $D\rightarrow 2$ limit can be obtained from the Kaluza-Klein procedure by taking the dimensions of the internal space to zero while keeping only the breathing mode. The resulting scalar-tensor theory can be further reduced to JT gravity or the Liouville CFT at the large central charge limit, bridging the two important 2d models. We show that the theory has a Lagrangian holographic relation. We construct the general solutions of the theory, including black holes and wormholes for both positive and negative cosmological constants. We obtain the on-shell action of the nearly AdS$_2$ and show that for suitable boundary slices, the Schwarzian action governs the leading-order dynamics at the finite boundary cutoff in later time. For positive cosmological constant, we find that the scalar is well defined on the 2-sphere.

11：30-12：30 TALK 3

Southeast University：Prof. Ryo Suzuki ryosuzuki@seu.edu.cn

Title: Conserved charges in the quantum simulation of integrable spin chains

3 Keywords: Quantum simulation, integrable spin chain, quantum noise

Abstract:

This talk is about the applications of integrable systems to digital quantum computers.

We simulate the time evolution of Heisenberg spin chain from some initial state using digital quantum computers. It is known that the method of integrable Trotterization provides a simple quantum circuit while maintaining integrability.

We performed simulation on a classical and a quantum computer, by implementing an integrable quantum circuit as well as an efficient measurement protocol for the higher conserved charges along the time evolution. Then we investigate quantum noise and its effect on the charges at the early and late stages of time evolution. We expect that the higher-charge measurement can be used for benchmarking quantum computers in future.

This talk is based on joint work arXiv:2208.00576 with Kazunobu Maruyoshi, Takuya Okuda, Juan Pedersen, Masato Yamazaki, and Yutaka Yoshida.

14：00-14：45 TALK 4

BIMSA：Dr. Wei Cui cwei@bimsa.cn

Title: MSW-type compactifications of 6D (1,0) SCFTs on 4-manifolds

3 Keywords: M-theory, superconformal field theories, anomaly polynomial

Abstract:

We study the compactification of 6D (1,0) superconformal field theories (SCFTs) on 4-manifolds under a MSW-type twist. For conformal matter theories, the twist is equivalent to embed the M5 branes wrapping a four-cycle inside a Calabi-Yau 4-fold.

By dimenisional reduction of anomaly polynomials, we compute the central charge of the 2D SCFTs and then use that to study a gluing rule for these 2D SCFTs. For 6D (2,0) SCFTs on non-compact toric 4-manifolds, under some special equivariant parameters, we find that the chiral algebra of the 2D SCFTs can be arranged to be a direct sum of W algebra.

14：45-15：30 TALK 5

BIMSA：Dr. Fengjun Xu xufengjun321@gmail.com

Title: Topological Defect Lines in Two Dimensional Fermionic CFTs

3 Keywords: Fusion Category, non-invertible symmetry, TDLs.

Abstract:

In this talk, we will talk about topological defect lines (TDLs) in two dimensional (conformal) theories and their roles in category symmetries, which generalize the notion of symmetries by including non-invertible elements. In particular, we will introduce their new features in 2d Fermionic conformal theories, as well as their strong constraints in the study of RG flows. Followed by that, we will utilise these strong constraints to study a RG flow with emergent supersymmetry in two dimensions.

15:30-17:30 Coffee Time and Free Discussion

DAY2：2022.11.11 Friday 周五

9:00-10:00 TALK 1

BIMSA：Prof. Arnav Tripathy arnav.tripathy@gmail.com

Title: Exact Ricci-flat metrics on K3s

Abstract:

I'll give an overview of two dual constructions of K3 manifolds as moduli spaces of 6d N = (1, 0) little string theories. These constructions may be used to obtain explicit analytic expressions for the exact Ricci-flat metrics on K3s. Whether this talk is more mathematical or string-theoretic will depend on audience interest!

10：00-11：00 TALK 2

BIMSA：Prof. Bart Vlaar B.Vlaar@hw.ac.uk

Title: Boundary quantum integrability: a universal approach

3 Keywords: Quantum integrability, boundary conditions, low-dimensional topology

Abstract:

In one mainstream approach to quantum integrability, to specify an integrable model one needs finite-dimensional vector spaces and R-matrices (solutions of Yang-Baxter equations with spectral parameter) acting on tensor products. It is natural to consider related models at the same time and assume that the vector spaces all carry a representation of a suitable quantum algebra A (quasitriangular Hopf algebra). In this case R-matrices are obtained as actions of the universal R-matrix of A. Drinfeld observed that the universal R-matrices of affine quantum groups, if treated carefully, give rise to "trigonometric" R-matrices in representations in this way. In the case of a tensor product of 2-dimensional representations of quantum affine sl2, this recovers the R-matrix of the XXZ Heisenberg spin chain and the 6-vertex model.

One can consider quantum integrable models defined on semi-infinite or finite intervals, e.g. open spin chains. For this one needs to specify boundary conditions. In addition to the R-matrices also solutions of the reflection equation (boundary Yang-Baxter equation), called K-matrices, must be specified. This equation has been studied since the 1980s by Cherednik, Sklyanin, Kulish-Sklyanin, Mezincescu-Nepomechie, and many others. To set up a universal approach, in addition to the Hopf algebra A of "bulk symmetries", one needs a coideal subalgebra B to capture those bulk symmetries which are compatible with the chosen boundary conditions.

We will survey this topic and point out some recent work with A. Appel, which culminates in a boundary version of Drinfeld's observation, thus guaranteeing a limitless supply of "trigonometric" K-matrices.

11：30-12：30 TALK 3

Shsanghai University：Prof. Hong Zhang kilar@shu.edu.cn

Title: The proof of SU(N) AGT conjecture at beta = 1

3 Keywords: AGT conjecture, Selberg integral, Schur polynomials

Abstract:

We offer a rigorous proof of AGT conjecture with SU(N) symmetry at beta=1 limit, based on a recent result on the Selberg integral of Schur polynomials in the mathematics literature.

12:30-17:30 Lunch and Free Discussion