Poster Presentations

List of Presenters

February 18 (Tue) 16:00 – 18:00 (Yukawa Hall, Y206)

1. Gabriel Arenas-Henriquez (YMSC, Tsinghua U)
2. Ivan Arraut (USJ)
3. Chen Bai (KITS)
4. Kosei Fujiki (YITP)
5. Nguyen Hoang Vu (BLTP, JINR)
6. Abhishek Kumar Mehta (APCTP)
7. Chawakorn Maneerat (KCL)
8. Weibo Mao (KITS)
9. Alberto Maya (NU)
10. Madhu Mishra (APCTP)

February 19 (Wed) 16:00 – 18:00 (Yukawa Hall, Y206)

11. Arpita Mitra (POSTECH)
12. Akihiro Miyata (YITP)
13. Debangshu Mukherjee (APCTP)
14. Nakamura Nanami (YITP)
15. Kota Numajiri (Nagoya U.)
16. Fumiya Sano (Science Tokyo/IBS CTPU-CGA)
17. Hoseob Shin (KHU)
18. Hiromasa Tajima (NU)
19. Yusuke Taki (YITP)

Abstract of Presentations

Gabriel Arenas-Henriquez (Yau Mathematical Sciences Center, Tsinghua University)

Title: Generalized Fefferman-Graham and boundary Weyl structures

Abstract: In the framework of AdS/CFT correspondence, the Fefferman-Graham (FG) gauge offers a useful way to express asymptotically anti-de Sitter spaces, allowing a clear identification of their boundary structure. A known feature of this approach is that choosing a particular conformal representative for the boundary metric breaks explicitly the boundary

scaling symmetry. Recent developments have shown that it is possible to generalize the FG gauge to restore boundary Weyl invariance by adopting the Weyl-Fefferman-Graham gauge. In this talk, we focus on three-dimensional gravity and study the emergence of a boundary Weyl structure when considering the most general AdS boundary conditions introduced by Grumiller and Riegler. We extend the holographic renormalization scheme to incorporate Weyl covariant quantities, identifying new subleading divergences appearing at the boundary. To address these, we introduce a new codimension-two counterterm, or corner term, that ensures the finiteness of the gravitational action. From here, we construct the quantum-generating functional, the holographic stress tensor, and compute the corresponding Weyl anomaly, showing that the latter is now expressed in a full Weyl covariant way. Finally, we will briefly comment on an explicit application of this formalism to accelerating black holes where the new corner term plays a crucial role in the computation of the Euclidean on-shell action.

Ivan Arraut (University of Saint Joseph)

Title: Solving the Dark Energy problem via Symmetry constraint

Abstract: We calculate the vacuum energy density after imposing a symmetry constraint emerging from the azimuthal component of the Friedmann Lemaitre Robertson Walker metric (FLRW). We focus on the approximate de-Sitter solution with a scale factor $a(t) \sim e^{Ht}$. In this way, when we calculate the vacuum energy density, we find that there is a natural suppression of the ultraviolet (UV) modes when we intend to integrate over all the vacuum frequencies. With only infrared (IR) modes surviving, this mechanism solves the dark energy problem naturally.

Chen Bai (Kavli Institue for Theoretical Sciences, University of Chinese Academy of Sciences)

Title: Note on multijoining quench

Kosei Fujiki (Yukawa Institute for Theoretical Physics, Kyoto University)

Title: dS/CFT from AdS/BCFT with a localized scalar field

Abstract: The AdS/BCFT duality argues that a gravity dual of BCFT (boundary conformal field theory) can be constructed by inserting end-of-the-world (EOW) brane in AdS. In this presentation, we would like to apply the AdS/BCFT to analyze a lower dimensional dS/CFT. In particular, we consider a localized scalar field on the EOW brane and examine various scalar operator perturbations in dS/CFT to see how the conformal dimensions of the scalar operators affect the dynamics. We will discuss a time-like analogue of g-theorem and its holographic interpretation. This talk is based on the ongoing work with Hiroki Kanda, and

Michitaka Kohara and Tadashi Takayanagi.

Nguyen Hoang Vu (Bogoliubov Labolatory of Theoretical Physics, Joint Institute of Nuclear Physics)

Title: Color superconductivity in general dimensions via holography

Abstract: We generalize the concept of holography for the color superconductivity (CSC) phase by considering d-dimensional Anti de Sitter (AdS) space instead of the traditional 6 dimensions. The corresponding dual field theory is an arbitrary confining gauge theory with $SU(N_c)$ symmetry, like quantum chromodynamics (QCD) CSC. We then use a holographic model based on Einstein-Maxwell gravity in d-dimensional AdS space to investigate this phenomenon for the number of colors $N_c \geq 2$.

Abhishek Kumar Mehta (Asia Pacific Centre for Theoretical Physics)

Title: Ostrogradsky's formalism in Higher Derivative Fermions

Abstract: We extend the Ostrogradsky's formalism to higher derivative fermionic action and demonstrate that the Ostrogradsky's choice of the canonical variables are amenable to the Dirac Quantization procedure. The procedure correctly reproduces the energy spectrum inferred from the Euclidean Path Integral for the higher derivative fermionic action.

Chawakorn Maneerat (King's College London)

Title: Cosmological Observatories

Abstract: Motivated by the necessity of formulating a quasi-local, holographic description of the de Sitter static patch, we study the theory of general relativity in manifolds with timelike boundaries. We consider conformal boundary conditions in four dimensions, that as opposed to the standard Dirichlet problem, are conjectured to be well-posed. In Lorentzian signature, we study linearised stability subject to conformal boundary conditions. With positive cosmological constant, and when the boundary gets close to the cosmological horizon, we find a novel set of shear and sound modes, that suggest the existence of a description in terms of a conformal fluid with vanishing bulk viscosity. In Euclidean signature, we study the space of static and spherically symmetric solutions subject to conformal boundary data, which define a conformal canonical ensemble. The conformal entropy (to leading order in Newton's constant) is given by the area formula. We find, for the first time, patches of de Sitter space surrounded by a cosmological horizon that have a positive specific heat and satisfy a standard first law of (conformal) thermodynamics. Finally, we comment on the cases with (and without) negative cosmological constant and make contact with the standard AdS/CFT literature. Based on 2310.08648, 2402.04305, and 2412.16305 with D. Anninos, R. Arias, and

D. Galante.

Weibo Mao (Kavli Institue for Theoretical Sciences, University of Chinese Academy of Sciences)
Title: Destroy an quasi-particle

Alberto Maya (Naresuan University)
Title: Noncommutative Hawking radiation
Abstract: One of the current challenges in theoretical physics is trying to create a Quantum Gravity (QG) theory, it could help to reveal the physics at early times of the universe. A natural proposal is given by noncommutative (NC) spacetimes which consist of considering that spacetime coordinates satisfy a non-zero commutator, it allows to remove essential singularities in Einstein solutions. A meaningful result within QG indicates that black holes can radiate particles. To visualize these ideas in order to analyze QG scenarios, the number of particles emitted by NC / charged black holes is presented and discussed.

Madhu Mishra (Asia Pacific Center for Theoretical Physics)
Title: Unraveling the Mysteries of Inflation with Gauss-Bonnet Coupling
Abstract: This talk explores how Gauss-Bonnet coupling sheds new light on inflationary dynamics, potentially resolving long-standing issues such as non-Gaussianity, scalar-tensor ratio discrepancy, and inflationary instability. I will discuss the implications of Gauss-Bonnet coupling for inflationary model-building, cosmological observations, and the quest for new physics beyond the Standard Model.

Arpita Mitra (Pohang University of Science and Technology)
Title: Aspects of entropy functionals and monotonicity along a RG flow

Akihiro Miyata (Yukawa Institute for Theoretical Physics, Kyoto University)
Title: Quantum error correction and black hole interior with a gravitating bath system
Abstract: We investigate quantum error correction properties in a setup where a black hole is entangled with a "gravitating bath", which can be modeled by the doubled PSSY model. When treating an error on the bath system naively with no gravitational back-reaction from the error onto the bath, the associated behavior of the quantum error correction properties is quantitatively similar to those for the non-gravitating bath. However, once we assume that there is a gravitational back-reaction from the error on the bath system where the error is treated as local operators, we find that the resulting quantum error correction properties

deviate from those for the non-gravitating and the gravitating bath without the back-reaction.

Debangshu Mukherjee (Asia Pacific Center for Theoretical Physics)

Title: Emergent factorization of Hilbert space at large N and black hole

Abstract: In this poster, I discuss the emergent factorization of Hilbert space in the low-energy description of matrix models and its implications for the black hole information paradox. I will motivate of our work based on the black hole information paradox. Subsequently, I will present the collective description of the low-energy sector of SU(N) matrix models. The U(N) matrix model story is similar with some nuances concerning background. The factorization of the Hilbert space in this effective low-energy sector leads us to examine the emergence of thermofield dynamics (TFD) state from a specific fine-tuned state of the original theory. Based on this toy model, I will make some speculative comments on the recent progress in the black hole information paradox: black hole complementarity, the island conjecture and holography of information.

Nakamura Nanami (Yukawa Institute for Theoretical Physics, Kyoto University)

Title: Large double trace deformation and AdS traversable wormhole

Abstract: In this presentation, we will discuss the relationship between large double trace deformations in CFTs and the AdS traversable wormholes. We argue that we can connect two disconnected AdS spaces at zero temperature via a wormhole by large double trace deformations. We support this idea by computing holographic correlation functions. We will also discuss how the causality looks like in such a model.

Kota Numajiri (Nagoya University)

Title: Jackiw-Teitelboim Gravity and Lorentzian Quantum Cosmology

Abstract: We directly evaluate the probability amplitudes in Jackiw-Teitelboim (JT) gravity using the Lorentzian path integral formulation. By imposing boundary conditions on the scale factor and the dilaton field, the Lorentzian path integral uniquely yields the probability amplitude without contradiction. Under Dirichlet boundary conditions, we demonstrate that the amplitude derived from the Lorentzian path integral is expressed in terms of the modified Bessel function of the second kind. Furthermore, we provide the determinant for various boundary conditions and perform a detailed analysis of the Lefschetz thimble structure and saddle points. In contrast to four-dimensional gravity, we show that the Hartle-Hawking no-boundary proposal is approximately valid in JT quantum cosmology. Furthermore, addressing quantum perturbation issues, we show that the quantum genesis of the two-dimensional universe occurs and exhibits perturbative regularity when the dilaton field is non-zero and

large as an initial condition.

Fumiya Sano (Institute of Science Tokyo / Institute for Basic Science)

Title: Decoherence of the primordial perturbations and Maldacena's consistency conditions

Abstract: Supported by observational evidence indicating that cosmological scalar perturbations were nearly Gaussian at the beginning of the universe, it is anticipated that the origin of these perturbations is quantum fluctuations. Consequently, cosmic inflation provides a valuable laboratory for testing the quantum nature with/of gravity, and evaluating the quantumness of the primordial perturbations is an inevitable step for the purpose. In this presentation, I will first review the evaluation of the quantum coherence in de Sitter spacetime as a measure of quantumness, and then show the consequences of Maldacena's consistency conditions on the decoherence rate.

Hoseob Shin (Kyung Hee University)

Title: Integrated correlators of N=1* theory and holographic free energy

Abstract: We consider the integrated correlator of the stress tensor multiplet in N=4, D=4 super Yang-Mills theory, which is given by the four-mass derivative of the free energy of the N=1* mass-deformed theory on S^4. We analytically compute this integral at the supergravity tree level and verify the AdS/CFT correspondence by comparing the result with that obtained from the BPS solution of the dual supergravity model.

Hiromasa Tajima (QG lab, Nagoya University)

Title: Information during inflation with stochastic approach

Abstract: Using stochastic formalism, I discuss the information during the inflation and gain the meaningful entropy behavior as the guiding behavior for the quantum gravity theory. Arkani-Hamed et al., 2007, gain the inequality that an e-folding number of inflation is bounded by the area entropy of the cosmological horizon multiplied by a coefficient, and they conclude that eternal inflation violates this inequality. Using the analogy of the black hole information loss paradox, they interpret that inequality means the number of modes that become superhorizon in the inflation bounded by the degree of freedom in the inner cosmological horizon bound. To reinterpret this inequality from the aspect of information, we focus on the entanglement entropy between the superhorizon modes and subhorizon modes, and we gain the same result that eternal inflation violates inequality. However, in the context of the black hole information loss paradox, the meaningful entropy behavior, called "Page curve", is considered to include the effect of quantum gravity in the theory. Therefore, to proceed analogy of the black hole, we discuss volume-weighting probability distribution as the

global average of state like the discussion of gaining Page curve and gain the stationary behavior of entropy in late-time we conclude the meaningful entropy behavior.

Yusuke Taki (Yukawa Institute for Theoretical Physics)

Title: Semiclassical saddles of three-dimensional gravity via holography

Abstract: We find out the complex geometries corresponding to the semiclassical saddles of three-dimensional quantum gravity by making use of the known results of dual conformal field theory (CFT), which is effectively given by Liouville field theory. We examine both the cases with positive and negative cosmological constants. We determine the set of semiclassical saddles to choose from the homotopy argument in the Chern-Simons formulation combined with CFT results and provide strong supports from the minisuperspace approach to the quantum gravity. For the case of positive cosmological constant, partial results were already obtained in our previous works, and they are consistent with the current ones. For the case of negative cosmological constant, we identify the geometry corresponding a semiclassical saddle with three-dimensional Euclidean anti–de Sitter space dressed with imaginary radius three-dimensional spheres. The geometry is generically unphysical, but the fact itself should not lead to any problems as derived from consistent dual CFT. We thus find an intriguing example, where the gravity path integral is performed over unphysical geometries.