KEK Theory workshop 2019

Report of Contributions

https://conference-indico.kek.jp/e/80

Contribution ID: **2** Type: **not specified**

Invited talk

Contribution ID: **3** Type: **not specified**

Short talk

Contribution ID: **4** Type: **not specified**

Poster

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

Quantum Gravity and Naturalness

Tuesday, 3 December 2019 10:30 (40 minutes)

We discuss the possibility that naturalness can be understood as an effect of quantum gravity. In particular, we will consider a mechanism by which the electroweak scale is naturally obtained from the Planck scale.

Presenter: Prof. KAWAI, Hikaru

Session Classification: Invited talks

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

Status of asymptotic safety in gravity-matter systems

Tuesday, 3 December 2019 11:30 (40 minutes)

Asymptotically safe quantum gravity is one of candidates for quantum gravity. It is essential that there exists a non-trivial fixed point for gravitational couplings. In this talk we review the current status of the asymptotic safety scenario for gravity-matter systems.

Presenter: Dr YAMADA, Masatoshi

Session Classification: Invited talks

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

An Approach to Quantum Gravity – Asymptotic Safety –

Tuesday, 3 December 2019 13:30 (40 minutes)

We explain an approach to formulate quantum gravity within the framework of local quantum field theory using functional renormalization group. called asymptotic safety. Starting how the approach is formulated, we intoduce the notion of critical surface and discuss its dimensionality. Several physical aspects of this approach are also discussed including quantum effective action derived from renormalization group equation.

Presenter: Prof. OHTA, Nobuyoshi

Session Classification: Invited talks

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

IR renormalon in a compactified spacetime: the case of the QCD(adj.) on $R^3 \times S^1$

Wednesday, 4 December 2019 09:30 (40 minutes)

An interesting possibility that the ambiguity in perturbation theory caused by the IR renormalon is cancelled by the instability associated with a semi-classical object called bion has been suggested in the context of the resurgence program of asymptotically-free quantum field theories. To reinforce this picture on the IR renormalon, the understanding of the IR renormalon in a compactified space such as $R^{D-1} \times S^1$ seems to be a basic premise. In this talk, I report our recent analysis on the IR renormalon in the gluon condensate in the $SU(N)$ QCD(adj.) on $R^3 \times S^1$ with the Z_N twisted boundary conditions. In the large N limit within the so-called large β_0 approximation, we find that the vacuum polarization of the W-boson, which acquires the twisted momentum from the boundary conditions, gives rise to the renormalon ambiguity that is identical to that in the system in the un-compactified space, R^4. This situation is completely different from that in the 2D CP^{N-1} model on $R^1 \times S^1$ (the analyses on the latter will be presented by Dr. Takaura and Mr. Morikawa).

Presenter: Prof. SUZUKI, Hiroshi

Session Classification: Invited talks

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

Resurgence and Phase Transitions

Wednesday, 4 December 2019 10:30 (40 minutes)

Resurgent asymptotics unifies perturbative and non-perturbative methods in quantum mechanics and quantum field theory, and gives a new perspective on phase transitions. I present an introduction to the basic ideas behind resurgence and several physical examples of phase transitions that can be probed this way, including the finite N approach to large N phase transitions. I also discuss new resurgent extrapolation methods that can extend asymptotic expansions throughout the complex plane.

Presenter: Prof. DUNNE, Gerald

Session Classification: Invited talks

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

Anomaly matching in QCD thermal phase transition

Friday, 6 December 2019 10:30 (40 minutes)

I will talk about a nonperturbative constraint on QCD thermal phase transition. First, I discuss a rigorous constraint from ‘t Hooft anomaly matching when the quarks are massless and we introduce an imaginary baryon chemical potential at the Roberge-Weiss point. Then, I discuss the reason why I think the constraint is also relevant for the QCD phase transition without any imaginary chemical potential and with realistic quark masses.

Presenter: Prof. YONEKURA, Kazuya

Session Classification: Invited talks

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

Sign problem and the tempered Lefschetz thimble method

Wednesday, 4 December 2019 13:30 (40 minutes)

The tempered Lefschetz thimble method (TLTM) [arXiv:1703.00861] is a parallel-tempering algorithm towards solving the numerical sign problem. It uses the flow time of the antiholomorphic gradient flow as a tempering parameter and is expected to tame both the sign and multimodal problems simultaneously. In this talk, after reviewing the TLTM, we apply the method to various problems, including the quantum Monte Carlo simulation of the Hubbard model away from half-filling and the chiral random matrix models with finite temperature and finite chemical potential.

Presenter: Prof. FUKUMA, Masafumi

Session Classification: Invited talks

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

QCD phase diagram and the possibility of topological phases

Thursday, 5 December 2019 10:30 (40 minutes)

I discuss possible phases of QCD at finite temperature, density and/or strong fields. In particular, I discuss the possibility of topological phases in dense QCD matter.

Presenter: Prof. HIDAKA, Yoshimasa

Session Classification: Invited talks

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

Deep into the Amplituhedron

Wednesday, 4 December 2019 14:30 (40 minutes)

Presenter: Prof. TRNKA, Jaroslav

Session Classification: Invited talks

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

Scattering Amplitudes from Geometries at Infinity

Thursday, 5 December 2019 09:30 (40 minutes)

Presenter: Prof. HE, Song

Session Classification: Invited talks

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

Swampland Phenomenology

Friday, 6 December 2019 09:30 (40 minutes)

Presenter: Prof. YAMAZAKI, Masahito

Session Classification: Invited talks

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

Power of ZN-twisted boundary condition ~Resurgence and Continuity~

Wednesday, 4 December 2019 11:30 (40 minutes)

Quantum field theories on the circle-compactified spacetime are quite worth investigating in terms of finite-T physics, resurgence theory and volume independence. In particular, several evidences indicate that the compactified theories with ZN-twisted boundary condition maintain the vacuum structure of the original uncompactified theory. We discuss this property, called adiabatic continuity, and its implication on resurgence theory by looking into a couple of theories including CP^{N-1} model, Schwinger model, flag sigma model, and 4d QCD. The weapons we use in this talk include semiclassical analysis, ‘t Hooft anomaly matching, and lattice simulations.

Presenter: Prof. MISUMI, Tatsuhiro

Session Classification: Invited talks

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

Asymptotic Freedom in de Sitter Space

Friday, 6 December 2019 11:30 (40 minutes)

We investigate infrared dynamics of four-dimensional Einstein gravity in de Sitter space. With the accelerated expansion of the universe, conformal zero modes accumulate at the horizon. The inflaton reresent the characteristic scale of the zero mode distribution. Furthermore, the introduction of an inflaton in the low energy effective theory is necessary to preserve Lorentz symmetry. We observe and postulate a duality between quantum effects in Einstein gravity and classical evolutions in inflation/quintessence models. The duality implies the effective action of Einstein gravity can be constructed as inflation/quintessence models with manifest general covariance. We show that $g = G_N H^2/\pi$: the only dimensionless coupling of H^2 (Hubble parameter) and G_N (Newton's coupling) in Einstein gravity is screened by the infrared logarithmic fluctuations of the conformal mode. We evaluate the one-loop β function of g with respect to the cosmic time $\log Ht$ as $\beta(g) = -(1/2)g^2$, i.e., g is asymptotically free toward future. We have identified de Sitter entropy $1/g$ with von Neumann entropy of the conformal zero modes. The former evolves according to the β function and Gibbons-Hawking formula. The latter is found to increase by diffusion in the stochastic process at the horizon in a consistent way. Our Universe is located very close to the fixed point $g = 0$ with a large entropy. We discuss possible physical implications of our results such as logarithmic decay of dark energy.

Presenter: Prof. KITAZAWA, Yoshihisa

Session Classification: Invited talks

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

Gravitational Thomas Precession Effect as a New Cosmological Probe

Tuesday, 3 December 2019 14:30 (15 minutes)

Thomas Precession has been extensively studied as a special relativistic effect.In this paper, we study Thomas like precession of spinning tops in the presence of gravitational fields. To establish this effect we evaluate a system whose spin is defined by a spin-four vector near a strong source of gravitational waves. It can be shown that for a system like hydrogen atom in a strong gravitational potential, the energy of gravitational Thomas precession is a significant effect. This effect causes an additional splitting of energy levels near certain sources and this has been studied via quantum mechanical perturbation theory. We further propose this effect can be observed in events involving Primordial Black Holes, Blackholes present in the center of galaxies etc. In this paper we examine the signatures of distribution of primordial blackholes using aforementioned gravitational Thomas Precession. This effect could possibly be a new window to probe the early universe.

Presenter: Mr HEGDE, Anand

Session Classification: Short talks

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

Catalytic Creation of Baby Bubble Universe with Small Positive Cosmological Constant

Tuesday, 3 December 2019 14:45 (15 minutes)

We investigate the decay of metastable de Sitter, Minkowski and anti-de Sitter vacua catalyzed by a black hole and a cloud of strings. We apply the method to the creation of the four dimensional bubble universe in the five dimensional anti-de Sitter spacetime recently proposed by Banerjee, Danielsson, Dibitetto, Giri and Schillo. We study the bounce action for the creation and find that the bubble with very small cosmological constant, of order $\Lambda^{(4)}/M_4^4 \sim 10^{-120}$, is favored by the catalysis by assuming appropriate mass scales of the black hole and the cloud of strings to reproduce the present energy densities of matter and radiation in the bubble universe.

Presenter: Prof. OOKOUCHI, Yutaka

Session Classification: Short talks

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

Evidence for Weak-Coupling Holography from the Gauge/Gravity Correspondence for Dp-branes

Tuesday, 3 December 2019 15:00 (15 minutes)

Gauge/gravity correspondence is regarded as a powerful tool for the study strongly-coupled quantum systems, but its proof is not available. An unresolved issue that should be closely related to the proof is what kind of correspondence exists, if any, when gauge theory is weakly coupled. We report progress about this limit for the case associated with Dp-branes ($0 \leq p \leq 4$), namely, the duality between the $(p+1)$-dimensional maximally supersymmetric Yang-Mills theory and superstring theory on the near-horizon limit of the Dp-brane solution. It has been suggested by supergravity analysis that the two-point functions of certain operators in gauge theory obey power law with the power different from the free-field value for $p \neq 3$. We show for the first time that the free-field result can be reproduced by superstring theory on the strongly curved background. The operator that we consider is of the form $\mathrm{Tr}(Z^J)$, where Z is a complex combination of two scalar fields. We assume that the corresponding string has the worldsheet spatial direction discretized into J bits, and use the fact that these bits become independent particles when string tension is zero.

Presenter: Prof. SEKINO, Yasuhiro

Session Classification: Short talks

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

Supersymmetric non-abelian D-brane equations from open pure spinor superstring

Tuesday, 3 December 2019 15:15 (15 minutes)

We have examined the BRS invariance of the open pure spinor superstring to derive equations of motion for a supersymmetric Dp-brane, which should be induced from the DBI action and the Wess-Zumino action. These equations are consistent with the dimensional reduction of equations for a supersymmetric D9-brane obtained by Berkovits and Pershin. They also analyzed non-abelian backgrounds up to quadratic order in "boundary fermions", which are world-volume fermions on D-branes and represent the Chan-Paton factors for open strings. In this talk, we will extend previous results to supersymmetric non-abelian D-brane equations including all boundary fermions.

Presenter: Dr HANAZAWA, Sota

Session Classification: Short talks

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

Renormalon in compactified spacetime and relation with bion

Wednesday, 4 December 2019 15:30 (15 minutes)

Recently, it was conjectured that the perturbative ambiguity known as the renormalon is canceled against the nonperturbative semiclassical object called bion. This conjecture expects this kind of cancellation in the circle compactified spacetime, in which the bion solution is found, as a premise. To examine this conjecture, we study the renormalon structure in the compactified spacetime under the assumption typically realized in large N theories, and find that renormalon is significantly affected by the compactification. This seems to be against naive expectation of recent bion scenario.

Presenter: Dr TAKAURA, Hiromasa

Session Classification: Short talks

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

Topological order in the color-flavor locked phase of (3+1)-dimensional U(N) gauge-Higgs system

Wednesday, 4 December 2019 15:45 (15 minutes)

We study a (3+1)-dimensional U(N) gauge theory with N-flavor fundamental scalar fields, whose color-flavor locked (CFL) phase has topologically stable non-Abelian vortices. The U(1) charge of the scalar fields must be Nk+1 for some integer k in order for them to be in the representation of U(N) gauge group. This theory has a Z_{Nk+1} one-form symmetry, and it is spontaneously broken in the CFL phase, i.e., the CFL phase is topologically ordered if k is not 0. We also find that the world sheet of topologically stable vortices in CFL phase can generate this one-form symmetry.

Presenter: Dr YOKOKURA, Ryo

Session Classification: Short talks

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

Chiral vortical conductivity across a topological phase transition from holography

Wednesday, 4 December 2019 16:00 (15 minutes)

We study the chiral vortical conductivity in a holographic Weyl semimetal model, which describes a topological phase transition from the strongly coupled topologically nontrivial phase to a trivial phase. We focus on the temperature dependence of the chiral vortical conductivity where the mixed gauge-gravitational anomaly plays a crucial role. After a proper renormalization of the chiral vortical conductivity by the anomalous Hall conductivity and temperature squared, we find that at low temperature in both the Weyl semimetal phase and the quantum critical region this renormalized ratio stays as universal constants. More intriguingly, this ratio in the quantum critical region depends only on the emergent Lifshitz scaling exponent at the quantum critical point.

Presenter: Dr JI, Xuanting

Session Classification: Short talks

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

Nuclear states and spectra in holographic QCD

Wednesday, 4 December 2019 16:15 (15 minutes)

A new method to study nuclear physics via holographic QCD is proposed. Multiple baryons in the Sakai-Sugimoto background are described by a matrix model which is a low energy effective theory of D-branes of the baryon vertices. We study the quantum mechanics of the matrix model and calculate the eigenstates of the Hamiltonian. The obtained states are found to coincide with known nuclear and baryonic states, and have appropriate statistics and charges. Calculated spectra of the baryon/nucleus for small baryon numbers show good agreement with experimental data. The model partially explains even the magic numbers of light nuclei, N=2, 8 and 20.

Presenter: Dr MATSUO, Yoshinori

Session Classification: Short talks

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

2d ’t Hooft anomaly, orbifolding, and boundary states

Wednesday, 4 December 2019 16:50 (15 minutes)

We study anomalies for a discrete internal global symmetry G in two-dimensional conformal field theories based on twisted torus partition functions. The ‘t Hooft anomaly of G can be seen from the noncommutativity of two symmetry lines inserted along the nontrivial circles of two-torus and we propose a criterion to detect the ‘t Hooft anomaly, which agrees with the truncated modular S-matrix approach as well as the cohomology classification. The obstruction for orbifolding has been recently interpreted as a mixed anomaly between G and large diffeomorphisms. We clarify the relations among ‘t Hooft anomaly-free, orbifolding condition and invariant boundary state condition, focusing on Wess-Zumino-Witten models.

Presenter: Dr KIKUCHI, Ken

Session Classification: Short talks

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

Does Boundary Distinguish Complexities?

Wednesday, 4 December 2019 17:05 (15 minutes)

Recently, Chapman et al. argued that holographic complexities for defects distinguish action from volume. Motivated by their work, we study complexity of quantum states in conformal field theory with boundary. In generic two-dimensional BCFT, we work on the path-integral optimization which gives one of field-theoretic definitions for the complexity. We also perform holographic computations of the complexity in Takayanagi's AdS/BCFT model following by the "complexity = volume" conjecture and "complexity = action" conjecture. We find that increments of the complexity due to the boundary show the same divergent structures in these models except for the CA complexity in the AdS3/BCFT2 model as the argument by Chapman et al. Thus, we conclude that boundary does not distinguish the complexities in general.

Presenter: Dr SATO, Yoshiki

Session Classification: Short talks

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

Wavefunctions and Yukawa couplings on Resolutions of C^N/Z_N Orbifolds

Wednesday, 4 December 2019 17:20 (15 minutes)

We propose matter wavefunctions on resolutions of C^N/Z_N singularities with magnetic fluxes. In this talk, we first discuss the resolution of magnetized T^2/Z_N orbifold models. In the blow-down limit of T^2/Z_N orbifolds, the obtained wavefunctions of chiral zero-modes result in those on the magnetized T^2/Z_N orbifold models, but only the wavefunctions of Z_N-invariant zero-modes receive the blow-up effects around fixed points of T^2/Z_N orbifolds. Such blowup effects change the selection rules and Yukawa couplings among the chiral zero-modes as well as the modular symmetry, in contrast to those on the magnetized T^2/Z_N orbifold models. We also discuss the matter wavefunctions on resolutions of K3 orbifolds.

Presenter: Dr OTSUKA, Hajime

Session Classification: Short talks

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

String Geometry Phenomenology

Wednesday, 4 December 2019 17:35 (15 minutes)

String geometry theory is one of candidates of the non-perturbative formulation of string theory. In order to derive low-energy phenomena, we first need to clarify how supergravity background fields, which represent the space-time and the internal space, are described in string geometry theory. In this presentation, we show that arbitrary configurations of the heterotic supergravity background fields are embedded in configurations of fields of string geometry theory. Especially, the configurations of string geometry satisfy equations of motions of string geometry theory if the embedded supergravity backgrounds satisfy the equations of motions of the heterotic supergravity. We can obtain the perturbative heterotic string theory on the flat space-time if we take the Newtonian limit around the configuration of string geometry corresponding to the flat space-time. Thus, we expect that we can also obtain the perturbative heterotic string theory on the supergravity backgrounds if we take the Newtonian limit around the configurations of string geometry corresponding to the supergravity backgrounds.

Presenter: Prof. SATO, Matsuo

Session Classification: Short talks

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

Hyperbolic Field Space and Swampland Conjecture for DBI Scalar

Thursday, 5 December 2019 13:30 (15 minutes)

We study a model of two scalar fields with a hyperbolic field space and show that it reduces to a single-field Dirac-Born-Infeld (DBI) model in the limit where the field space becomes infinitely curved. We apply the de Sitter swampland conjecture to the two-field model and take the same limit. It is shown that in the limit, all quantities appearing in the swampland conjecture remain well-defined within the single-field DBI model. Based on a consistency argument, we then speculate that the condition derived in this way can be considered as the de Sitter swampland conjecture for a DBI scalar field by its own. We also propose an extension of the de Sitter swampland conjecture to the P(X) theories with more general scalar field. [arXiv: 1905.10950]

Presenter: Dr ZHANG, Yun-Long

Session Classification: Short talks

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

Duality Invariance of Kahler potentials on Generalized Flag Manifolds from Diverse Quiver Gauge Theories

Thursday, 5 December 2019 13:45 (15 minutes)

We present a systematic construction of K¨ahler potentials for various quiver gauge theories, which give pure realizations of the general flag manifolds as target manifolds. There, for arbitrary gener- alized flag manifolds with arbitrary complex structures, we rediscover the K¨ahler potentials given in the basic theory by Bando, Kuramoto, Maskawa and Uehara. In terms of these explicit forms, we confirm that all cluster mutations between different quiver gauge theories always reproduce the same K¨ahler potential. Furthermore these constructions and dualities are applied to Kahlerrian coset space G/H with all classical groups G.

Presenter: Dr OHASHI, Keisuke

Session Classification: Short talks

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

Direct Calculation of Mutual Information of Distant Regions

Thursday, 5 December 2019 14:00 (15 minutes)

We consider the (Renyi) mutual information, I^(n) (A,B)=S^(n)*A +S^(n)_B −S^(n)* A∪B , of distant compact spatial regions A and B in the vacuum state of a free scalar field. The distance r between A and B is much greater than their sizes R A,B . It is known that I^(n)_(A,B)~C^(n)_AB ⟨0|ϕ(r)ϕ(0)|0⟩^2 . We obtain the direct expression of C^(n)_AB for arbitrary regions A and B. We perform the analytical continuation of n and obtain the mutual information. The direct expression is useful for the numerical computation. By using the direct expression, we can compute directly I(A,B) without computing S_A ,S_B and S_A∪B respectively, so it reduces significantly the amount of computation.

Presenter: Dr SHIBA, Noburo

Session Classification: Short talks

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

Quantum null energy condition, weak cosmic censorship, and holography

Thursday, 5 December 2019 14:15 (15 minutes)

We discuss the compatibility of AdS/CFT duality with the bulk and boundary causality which asserts that the fastest null geodesic connecting any two boundary points must lie entirely on the boundary. We show that if this type of causality fails without breaking the averaged null energy condition (ANEC), the weak cosmic censorship must be violated. We also discuss relationships between the bulk and boundary causality and a role of quantum null energy condition derived from ANEC in the context of AdS/CFT duality.

Presenter: Dr ISHIBASHI, Akihiro

Session Classification: Short talks

Contribution ID: **34** Type: **not specified**

S-duality for gauged Argyres-Douglas theories

Thursday, 5 December 2019 11:30 (40 minutes)

Presenter: Prof. NISHINAKA, Takahiro

Session Classification: Invited talks

Contribution ID: **35** Type: **not specified**

A possible solution to the black hole puzzle in semi-classical gravity

Thursday, 5 December 2019 15:00 (3 hours)

We discuss that the black hole geometry around the event horizon in semi-classical gravity could be significantly different from that of the classical one. This is due to the Hawking radiation of the higher angular momentum modes of matter fields that was believed to be irrelevant.

Presenter: Prof. MORITA, Takeshi

Session Classification: Poster

Contribution ID: **36** Type: **not specified**

Infrared renormalon in the supersymmetric $\mathbb{C}P^{N-1}$ model on $\mathbb{R} \times S^1$

Thursday, 5 December 2019 15:00 (3 hours)

In the leading order of the large N approximation, we study the renormalon ambiguity in the gluon (or more appropriately, photon) condensate in the two-dimensional supersymmetric $\mathbb{C}P^{N-1}$ model on $\mathbb{R} \times S^1$ with the $\mathbb{Z}_N$ twisted boundary conditions. In our large N limit, the combination ΛR, where Λ is the dynamical scale and R is the S^1 radius, is kept fixed (we set $\Lambda R \ll 1$ so that the perturbative expansion with respect to the coupling constant at the mass scale $1/R$ is meaningful). We extract the perturbative part from the large N expression of the gluon condensate and obtain the corresponding Borel transform $B(u)$. For $\mathbb{R} \times S^1$, we find that the Borel singularity at $u = 2$, which exists in the system on the un-compactified $\mathbb{R}^2$ and corresponds to twice the minimal bion action, disappears. Instead, an unfamiliar renormalon singularity emerges at $u = 3/2$ for the compactified space $\mathbb{R} \times S^1$. The semi-classical interpretation of this peculiar singularity is not clear because $u = 3/2$ is not dividable by the minimal bion action. It appears that our observation for the system on $\mathbb{R} \times S^1$ prompts reconsideration on the semi-classical bion picture of the infrared renormalon.

Presenter: Mr MORIKAWA, Okuto

Session Classification: Poster

Contribution ID: **37** Type: **not specified**

Sign flip triangulation of the 1-loop NMHV amplituhedron

Thursday, 5 December 2019 15:00 (3 hours)

In this talk, I will talk about the triangulation of the amplituhedron. To obtain higher point amplitude from the general amplituhedron, we need to triangulate it into a simple one. There is some way to triangulate the amplituhedron and some of this gives new representations of the amplitude. I will briefly explain the amplituhedron and its property, then I will talk about the new representation of the amplitude from the sign flip triangulation.

Presenter: Mr KOJIMA, Ryota

Session Classification: Poster

Contribution ID: **38** Type: **not specified**

Cubic vertices for massless higher spin gauge fields in AdS spaces

Thursday, 5 December 2019 15:00 (3 hours)

Higher spin (HS) gauge theory may be regarded as a generalization of the electromagnetic theory of a spin-1 photon and the linearized gravity of a spin-2 graviton. String theory which has infinitely many massive modes may be seen as a broken phase of the HS gauge symmetry. The higher spin gauge theory is expected to gain a deeper understanding of AdS/CFT duality. To gain more insight into the duality, It is necessary to understand quantum spectrum of string in AdS. This is not achieved yet, because the actin of higher spin theory is not completely known in AdS. In this presentation, we consider cubic interaction vertices of bosonic HS fields with spin s1, s2 and s3, in flat and AdS spaces.

Presenter: Mr SUZUKI, Haruya

Session Classification: Poster

Contribution ID: **39** Type: **not specified**

Cancellation of one-loop corrections to scalar masses in Yang-Mills theory with flux compactification

Thursday, 5 December 2019 15:00 (3 hours)

We calculate one-loop corrections to the mass for the zero mode of scalar field in a six-dimensional Yang-Mills theory compactified on a torus with magnetic flux. It is shown that these corrections are exactly cancelled thanks to a shift symmetry under the translation in extra spaces. This result is expected from the fact that the zero mode of scalar field is a Nambu-Goldstone boson of the translational invariance in extra spaces.

Presenter: Mr HIROSE, Takuya

Session Classification: Poster

Contribution ID: **40** Type: **not specified**

Higher spin symmetry in the IIB matrix model with the operator interpretation

Thursday, 5 December 2019 15:00 (3 hours)

We study the IIB matrix model in an interpretation where the matrices are differential operators defined on curved spacetimes. In this interpretation, coefficients of higher derivative operators formally appear to be massless higher spin fields. With my poster, we discuss whether the unitary symmetry of the matrices includes appropriate higher spin gauge symmetries. We find that the additional auxiliary fields need to be introduced in order to formulate the manifest symmetries, with which potentially unstable components are eliminated. As a result, we observe that the independent physical DoF are the transverse components of that symmetric field, and that the theory describes the corresponding higher spin field. We also find that the field is not the Fronsdal field, rather the generalization of curvature.

Presenter: Mr SAKAI, Katsuta

Session Classification: Poster

Contribution ID: **41** Type: **not specified**

D3-brane analysis for the superconformal index in orbifold quiver gauge theories

Thursday, 5 December 2019 15:00 (3 hours)

We study the orbifold type of AdS5/CFT4 correspondence for finite N by using the superconformal index. Especially, we calculate the finite N corrections to the superconformal index from the dual gravity theory. Our method is based on the assumption that D3-branes wrapped around three-cycles in the internal space reproduce the finite N corrections. As a result we find this approach actually gives the known superconformal index (localization result) for leading corrections for orbifold quiver gauge theories.

Presenter: Mr FUJIWARA, Shota

Session Classification: Poster

Contribution ID: **42** Type: **not specified**

Finite N corrections to the superconformal index of toric quiver gauge theories

Thursday, 5 December 2019 15:00 (3 hours)

We study the finite N AdS/CFT correspondence between the Type IIB string theories on AdS5×SE5 and quiver gauge theories, where SE5 is a five-dimensional Sasaki-Einstein manifold. Our assumption is that D3-branes wrapping on the three-cycles in the internal space give the finite N corrections to the index. We calculate the index of wrapped D3-branes and get the non-trivial coincidence for leading finite N corrections in comparison with the localization results from the gauge theory.

Presenter: Mr MORI, Tatsuya

Session Classification: Poster

Contribution ID: **43** Type: **not specified**

Instability of Higgs Vacuum via String Cloud

Thursday, 5 December 2019 15:00 (3 hours)

We study the instability of the Higgs vacuum caused by a cloud of strings. By the catalysis, the decay rate of the vacuum is highly enhanced and when the energy density of the cloud is larger than the critical value, the semi-classical vacuum decay occurs. We also discuss the relation between the cloud of strings and observational constraints on cosmic strings in terms of the catalysis, providing constraints on the parameters of the Higgs potential.

Presenter: Mr KOGA, Issei

Session Classification: Poster

Contribution ID: **44** Type: **not specified**

Superconformal index and supersymmetry enhancement of S-fold theories

Thursday, 5 December 2019 15:00 (3 hours)

Recently concrete models of 4d N=3 superconformal field theories called S-fold theories are constructed by Garcia-Etxebarria and Regalado. Although it is difficult to study these theories due to the lack of the Lagrangian description and the strong coupling, it is expected that there is a non-trivial supersymmetry enhancement for rank one and two theories by Aharony and Tachikawa. In this poster, we evaluate the first non-trivial finite rank corrections to the superconformal index of these theories by using AdS/CFT correspondence and check the supersymmetry enhancement. To evaluate the index in finite rank, we mainly focus on the D3-branes wrapping a non-trivial three cycle on AdS side interpreted as Pfaffian-like operators on CFT side. We see that our results agree with the results expected from the supersymmetry enhancement.

Presenter: Mr ARAI, Reona

Session Classification: Poster

Contribution ID: **45** Type: **not specified**

Dynamics of Revolving D-Branes at Short Distances

Thursday, 5 December 2019 15:00 (3 hours)

We study the behavior of the effective potential between revolving Dp-branes at all ranges of the distance r, interpolating regions on which r is larger and smaller than the string length. Since the one-loop open string amplitude cannot be calculated exactly, we instead employ an efficient method of partial modular transformation. The method is to perform the modular transformation partially in the moduli parameter and rewrite the amplitude into a sum of contributions from both of the open and closed string massless modes. It is nevertheless free from the double counting and can approximate the open string amplitudes with less than 3% accuracy. From the D-brane effective field theory point of view, this amounts to calculating the one-loop threshold corrections of infinitely many open string massive modes. We show that threshold corrections to the ω^2r^2 term of the moduli field r cancel among them, where ω is the angular frequency of the revolution and sets the scale of supersymmetry breaking. This cancellation suggests a possibility to solve the hierarchy problem of the Higgs mass in high scale supersymmetry breaking models.

Presenter: Mr OHTA, Hikaru

Session Classification: Poster

Contribution ID: **46** Type: **not specified**

How information geometry is encoded in bulk geometry

Thursday, 5 December 2019 15:00 (3 hours)

We study how information geometry is described by bulk geometry in the gauge/gravity correspondence. We consider a quantum information metric that measures the distance between the ground states of a CFT and a theory obtained by perturbing the CFT. Using the GKP-Witten relation, we find a universal formula that expresses the quantum information metric by a geometrical quantity in a back-reacted bulk geometry.

Presenter: Mr YAMASHIRO, Kazushi

Session Classification: Poster

Contribution ID: **47** Type: **not specified**

Complex Langevin Simulation of 2D U(1) gauge theory with a theta term

Thursday, 5 December 2019 15:00 (3 hours)

The Monte Carlo simulation of gauge theories with a theta term is quite difficult due to the sign problem. The complex Langevin method is a promising approach to solve this problem. We applied this method to the 2D U(1) gauge theory, which is analytically solvable, in order to check the validity of the method. We were able to reproduce the exact results in the whole region of -pi <= theta <= pi by using the definition of the topological charge defined by the log of plaquettes and by introducing a puncture on the 2D torus. We also discuss the application of the method to the 4D SU(N) case.

Presenter: Mr MATSUMOTO, Akira

Session Classification: Poster

Contribution ID: **48** Type: **not specified**

On UV-finiteness of supersymmetric gradient flow in N=1 SQCD

Thursday, 5 December 2019 15:00 (3 hours)

I will discuss perturbation theory of supersymmetric gradient flow in 4D N = 1 SQCD. The perturbation theory consists of a perturbative expansion of 4D SQCD and an iterative expansion of the flow equation. In order to prove UV-finiteness of flow theory, it is necessary to calculate its correlation functions and to construct a d+1-dimensional theory which reproduces the same perturbation series.

Presenter: Mr SUZUKI, Mitsuyo

Session Classification: Poster

Contribution ID: **49** Type: **not specified**

Double field inflation of generalized dilaton-axion models with a new Fayet-Iliopoulos (FI) term

Thursday, 5 December 2019 15:00 (3 hours)

In this talk, we are going to talk about inflation dynamics by KKLT-like model modified by a new Fayet-iliopoulos (FI) term. KKLT model, motivated by superstring theory, gives the AdS vacuum, which is phenomenologically forbidden. Although previous studies solved this problem by adding a D3 bar or D7 contribution to uplift the vacuum to zero, it is not flat enough to provide the initial slow-roll environment. In this talk, we show that a new FI term without R gauged symmetry can provide this. We also show the parameters of dS vacuum and inflation dynamics.

Presenter: Mr MAN, Ping Kwan

Session Classification: Poster

Contribution ID: **50** Type: **not specified**

Emergent quantum spacetime from stochastic processes of matrix models

Thursday, 5 December 2019 15:00 (3 hours)

Towards formulating quantum gravity, we present a mechanism of the emergence of spacetime geometry from randomness. In [Fukuma-NM-Umeda, [arXiv:1705.06097]], we defined for a given stochastic process "the distance between configurations," which enumerates the difficulty of transition. In this talk, we consider large-N matrix models, in which we regard eigenvalues as spacetime coordinates. We define the distance from the effective stochastic process for one eigenvalue, and argue that this definition can be interpreted in noncritical string theory as probing the classical geometry with a D-instanton. We further show that, when we apply our formalism to the U(N) matrix model by treating the 't Hooft coupling as another dynamical variable, an AdS black hole geometry emerges in the extended configuration space, where the horizon corresponds to the Gross-Witten-Wadia phase transition point. This talk is based on [Fukuma-NM, in preparation].

Presenter: Mr MATSUMOTO, Nobuyuki

Session Classification: Poster

Contribution ID: **51** Type: **not specified**

Complex poles and spectral functions of Landau gauge QCD and QCD-like theories

Thursday, 5 December 2019 15:00 (3 hours)

We investigate the analytic structures of the gluon and quark propagators of an effective model of the Landau gauge QCD and QCD with many quark flavors, which can be obtained by adding effective mass terms to the standard Faddeev-Popov Lagrangian. We derive general relationships between the number of complex poles and the sign of the spectral function under some assumptions on the asymptotic behaviors of the propagator. Based on this relation, in particular, we find a transition of the number of complex poles of the gluon propagator, depending on the number of quark flavors and their mass. We furthermore discuss the formal aspects of complex poles.

Presenter: Ms HAYASHI, Yui

Session Classification: Poster

Contribution ID: **52** Type: **not specified**

TT-bar deformation in large N limit

Thursday, 5 December 2019 15:00 (3 hours)

We consider two dimensional TT-bar deformed O(N) invariant massive scalar theory in large N limit, and investigate its renormalizability at 1/N (next to leading) level. As a result, we find that we need to renormalize the deformation parameter at leading level, and non-local counterterms at 1/N (next to leading) level. Also we find that positivity of state space is violated in the UV region even after renormalization.

Presenter: Mr HARUNA, Junichi

Session Classification: Poster

Contribution ID: **53** Type: **not specified**

Tricritical point and non-equilibrium phase transition in gauge gravity duality

Thursday, 5 December 2019 15:00 (3 hours)

We study the phase structure associated with the chiral symmetry in the D3-D7 model. We find the non-equilibrium phase transition for massless quarks in the presence of a constant current and a magnetic field. This non-equilibrium phase transition is related to the chiral symmetry breaking. We also discover the tricritical point in the phase diagram.

Presenter: Mr MATSUMOTO, Masataka

Session Classification: Poster

Contribution ID: **54** Type: **not specified**

From 3d dualities to hadron physics

Thursday, 5 December 2019 15:00 (3 hours)

When one of the space-time dimension is compactified on the circle, the QCD exhibits the chiral phase transition at some critical radius. When we further turn on a background theta term which depends on the compactified coordinate, a topological ordered phase appears at low energy via the winding of the theta. We discuss what kind of theories can describe the physics near the critical point by requiring the matching of topological field theories in the infrared. As one of the possibilities, we propose a scenario where the rho and omega mesons form a U(Nf) gauge theory near the critical point. In the phase where the chiral symmetry is restored, they become the dual gauge boson of the gluon related by the level-rank duality between the three dimensional gauge theories.

Presenter: Mr KAN, Naoto

Session Classification: Poster

Contribution ID: **55** Type: **not specified**

Localization of gauge field on 3-branes and Higgs mechanism

Thursday, 5 December 2019 15:00 (3 hours)

We provide complete and self-contained formulas about localization of massless/massive Abelian gauge fields on topological solitons in generic D dimensions via a field dependent gauge kinetic term. The localization takes place when a stabilizer (a scalar field) is condensed in the topological soliton. We show that the localized gauge bosons are massless when the stabilizer is neutral. On the other hand, they become massive for the charged stabilizer as a consequence of interplay between the localization mechanism and the Higgs mechanism. finally, As these application, we show the relation with D-brane in superstring theory.

Presenter: Mr KAWAGUCHI, Masaki

Session Classification: Poster

Contribution ID: **57** Type: **not specified**

Entropy generation and decay of the cosmological constant in Liouville gravity

Thursday, 5 December 2019 15:00 (3 hours)

We investigated quantum infrared dynamics in 2D Liouville gravity with a positive cosmological constant and a large central charge $c > 25$. Superhorizon fluctuations of the conformal mode of the metric dynamically screen the cosmological constant, and the dS entropy increases simultaneously. We can identify the dS entropy with the von Neumann entropy of the conformal zero mode. This quantum time evolution can also be described by a classical inflation theory.

Presenter: Dr HIROYUKI, Kitamoto

Session Classification: Poster

Contribution ID: **58** Type: **not specified**

Decoding the Path Integral: Resurgence and Non-Perturbative Physics

Tuesday, 3 December 2019 16:30 (1 hour)

There are several important conceptual and computational questions concerning the Minkowski space path integral, which have recently been approached from a new perspective motivated by "resurgent asymptotics", which is a novel mathematical formalism that seeks to unify perturbative and non-perturbative physics. In this general talk, I will introduce the
basic ideas, report on some examples in quantum mechanics and quantum field theory, and discuss future prospects.

Presenter: Prof. DUNNE, Gerald

Session Classification: Colloquium

Contribution ID: **59** Type: **not specified**

Application of the tensor renormalization group method to non-Abelian lattice gauge theories

Thursday, 5 December 2019 15:00 (3 hours)

The tensor renormalization group method is a powerful tool to study lattice models, which works even with models that have sign problem. However, so far, its application to gauge theory has been restricted the U(1) and SU(2) cases. In this work, we apply it to two-dimensional U(N) gauge theories which are exactly solvable. We are able to extract the large-N behaviors of the model such as the Eguchi-Kawai reduction and the Gross-Witten phase transition. We also study the model with a theta-term, which has the sign problem, and reproduce exact results.

Presenter: Mr YOSPRAKOB, Atis

Session Classification: Poster

Contribution ID: **60** Type: **not specified**

Complex Langevin simulation of the Lorentzian type IIB matrix model

Thursday, 5 December 2019 15:00 (3 hours)

The type IIB matrix model has been studied as a candidate of non-perturbative formulation of superstring theory. In particular, by Monte Carlo simulation of the Lorentzian type IIB matrix model, (3+1)-dimensional expanding space-time was shown to emerge dynamically. With its detailed analysis, we found that the emergent 3-dimensional space is essentially described by the Pauli matrices, we call this structure as the Pauli-matrix structure. In fact, the Monte Carlo simulation of the Lorentzian type IIB matrix model has the sign problem. Therefore, we had used an approximation to avoid the sign problem in the previous works. However, there is a subtlety in the approximation, and it might cause the Pauli-matrix structure. In this work, we generalize the model by introducing two parameters which are related to the Wick rotation on the world sheet and in the target space. We perform the complex Langevin simulation of the generalized model to overcome the sign problem. As a result, we can see a deviation from the Pauli-matrix structure as we approach to the original model without losing the expanding behavior.

Presenter: Mr HIRASAWA, Mitsuaki (SOKENDAI)

Session Classification: Poster

Contribution ID: **61** Type: **not specified**

Unitary matrix model with the logarithmic potential

Thursday, 5 December 2019 15:00 (3 hours)

We study the unitary one-matrix model with the logarithmic potential. It has been known that a hermitian one-matrix model with a logarithmic potential yields the prepotential of 4d N=2 SU(2) SUSY gauge theory as its large-N free energy. We give a rigorous proof that the unitary matrix model with the potential of the same form as the hermitian matrix model for 4d N=2 Nf=2 SU(2) SUSY gauge theory yields the identical prepotential of it, although the parameter identifications of each model are slightly different. This result has been anticipated by Itoyama, Oota, and Yano.

Presenter: Mr TASHIRO, Hitomi (SOKENDAI)

Session Classification: Poster