Corfu2024: Workshop on Noncommutative and Generalized Geometry in String theory, Gauge theory and Related Physical Models

SEPTEMBER 17 - SEPTEMBER 24, 2024

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Scientific Programme

1 Program Summary

Wednesday, September 18, 2024

9:00	9:30	Sasakura, Naoki	Signed eigenvalue distributions of complex random tensors and geometric measure of entanglement of multipartite states
9:30	10:00	Tsuchiya, Asato	Emergence of (3+1)-dimensional expanding spacetime in the type IIB matrix model
10:00	10:30	Wallet, Jean-Christophe	Gauge Theories on Quantum Minkowski Spaces: ρ versus $\varkappa$
10:30	11:00	**Coffee Break**	
11:00	11:30	Vaidya, Sachindeo	New Results in the Strong Coupling Limit of 2-Color 1-Flavour Matrix Model
11:30	12:00	Martinetti, Pierre	Torsion and Lorentz symmetry from twisted spectral triples
12:00	12:30	Giotopoulos, Grigorios	Sheaf topos theory: a rigorous and convenient setting for field theory
12:30	16:00	**Lunch**	
16:00	16:30	Bieliavsky, Pierre	Differential geometrical methods in locally compact quantum groups
16:30	17:00	Arzano, Michele	Quantum particles in non-commutative space-time: an identity crisis
17:00	17:20	Maris, Valentine	Quantum causality in kappa Minkowski
17:20	17:50	**Coffee Break**	
17:50	18:10	Acharyya, Nirmalendu	Supersymmetry and Quantum Phase Transition in a matrix model of SU(2) gauge theory
18:10	18:30	Trzesniewski, Tomasz	(Λ-)BMS symmetries in the Carroll and Galilei limits

Thursday, September 19, 2024

9:00	9:30	Kowalski-Glikman, Jerzy	On quantum and gravity
9:30	10:00	Chirco, Goffredo	Extending JT/SYK duality via so(2,2) Poisson Sigma Model
10:00	10:30	Ferrari, Frank	Jackiw-Teitelboim Quantum Gravity On Finite Geometry
10:30	11:00	**Coffee Break**	
11:00	11:30	Sitarz, Andrzej	Spectral evolution
11:30	12:00	Weber, Thomas	On the Durdevic approach to quantum principal bundles
12:00	12:20	Konjik, Nikola	Propagation of spinors on the angular deformed noncommutative black hole background
12:20	16:00	**Lunch**	
16:00	16:30	Chakraborty, Anwesha	Entanglement harvesting in superposed Minkowski spacetime
16:30	17:00	Kovacik, Samuel	Physics on the fuzzy onion
17:00	17:30	**Coffee Break**	
17:30	17:50	Manta, Alessandro	Higher-Spin extended gravity from the IKKT Matrix Model
17:50	18:10	Adach, Tadeusz	Complex scalar field in $\varkappa$-Minkowski noncommutative spacetime
18:10	18:30	Rusnak, Patrik	Threshold anomaly in Quantum Space
20:30	23:00	**Welcome Reception**	

Friday, September 20, 2024

9:00	9:30	Castellani, Leonardo	Supersymmetric discrete gravity
9:30	10:00	Grigoriev, Maxim	TBA
10:00	10:30	Hasebe, Kazuki	Generating quantum matrix geometry from gauged quantum mechanics
10:30	11:00	**Coffee Break**	
11:00	11:30	Fioresi, Rita	Reduction of Quantum Principal Bundles
11:30	12:00	Hoare, Ben	Diamonds of integrable models
12:00	12:30	Boffo, Eugenia	More lessons from super quantum mechanics
12:30	16:00	**Lunch**	
16:00	16:30	Platania, Alessia	Asymptotic Safety Landscapes at the intersection between Positivity Bounds and Swampland Conjectures
16:30	17:00	Driezen, Sibyll	Utilising the integrability of all Yang-Baxter models
17:00	17:30	**Coffee Break**	
17:30	18:00	Kuznetsova, Zhanna Gennadyevna	Z2*Z2-graded geometry and related physical models
18:00	18:20	Scala, Luca	Half-maximal gauged supergravities from 10d heterotic DFT
19:30	0:30	**Greek Night**	

Saturday, September 21, 2024

9:00	9:30	Krasnov, Kirill	Metric geometry and differential forms
9:30	10:00	Jonke, Larisa	TBA
10:00	10:30	Valach, Fridrich	A toy model for supergravity
10:30	11:00	**Coffee Break**	
11:00	11:30	Skvortsov, Evgeny	Noncommutative geometry and higher spin gravity
11:30	12:00	Vysoky, Jan	Serre-Swan Theorem for Graded Vector Bundles
12:00	12:30	Basile, Thomas	Massless chiral fields in six dimensions
13:30		**Excursion**	

Sunday, September 22, 2024

9:00	9:30	Cederwall, Martin	BV actions for extended geometry
9:30	10:00	Hassler, Falk	The Generalized Cartan Geometry of α'-corrections
10:00	10:30	Demulder, Saskia	Topological R-fects in Chern-Simons theory and 3d gravity
10:30	11:00	**Coffee Break**	
11:00	11:30	Kurkov, Maxim	Lie-Poisson Electrodynamics
11:30	11:50	Gitsis, Achilleas	Higher-derivative corrections from the deformed Polacek-Siegel construction
11:50	12:10	Ivanisevic, Ilija	Courant bracket twisted simultaneously by a 2-form B and a bi-vector θ
12:10	12:30	Stefas, Stelios	Developments in Fuzzy Gravity
12:30	16:00	**Lunch**	
16:00	16:30	Ramgoolam, Sanjaye	State counting and negative specific heat capacity in matrix and tensor quantum mechanics.
16:30	17:00	Wulff, Linus	TBA
17:00	17:30	**Coffee Break**	
17:30	18:00	Osten, David	Exceptional generalised geometry as a symmetry principle for sigma models
18:00	18:20	Bogdanovic, Djordje	Homotopy Algebra Techniques for Noncommutative Quantum Field Theories
18:20	18:40	Vacchiano, Lucio	The so(2, 2) Poisson Sigma Model, a Yang-Mills extension of JT-Gravity

Monday, September 23, 2024

9:30	10:00	Penati, Silvia	Conformal defects and RG flows
10:00	10:30	Fiore, Gaetano	Quantum groups and quantum reference frames: the twisted Poincaré case
10:30	11:00	**Coffee Break**	
11:00	11:30	Toppan, Francesco	On braided Majorana qubits and Volichenko algebras
11:30	11:50	Davgadorj, Ariunzul	Five-dimensional supersymmetric non-Abelian Chern-Simons theory in Projective superspace
11:50	12:10	Dordevic, Dusan	Holography and first-order gravity formalism
12:10	12:30	Athithamoole, Naveena Kumara	Noncommutative gravity and spacetime perturbations
12:30	16:00	**Lunch**	

2 Detailed Program with Abstracts

2.1 Wednesday, September 18, 2024

Time: 9:00 – 9:30
Speaker: Sasakura, Naoki (Yukawa Institute for Theoretical Physics, Kyoto University)
Title: Signed eigenvalue distributions of complex random tensors and geometric measure of entanglement of multipartite states
Abstract: Eigenvalue/vector distributions of random tensors can systematically be computed as partition functions of quantum field theories of bosons and fermions. In particular, signed distributions, which are the distributions with sign factors coming from Hessian matrices, are expressed as partition functions of four-fermi theories, which are in principle exactly computable. Though the distributions and the signed distributions are different, they have intimate relations in the large-N limit and in particular their edges coincide. In this talk, we obtain the exact closed-form expressions of the signed eigenvalue/vector distributions of complex random tensors with symmetric or independent indices. As applications we determine the asymptotic forms of the geometric measure of entanglement of multipartite states, which agree with the previous numerical study by Fitter, Lancien, and Nechita. We also discuss some open questions.

Time: 9:30 – 10:00
Speaker: Tsuchiya, Asato (Shizuoka University)
Title: Emergence of (3+1)-dimensional expanding spacetime in the type IIB matrix model
Abstract: The type IIB matrix model is a promising candidate for a nonperturbative formulation of superstring theory. Recently we performed complex Langevin simulations by adding a Lorentz invariant mass term as an IR regulator. In this talk, we show some numerical results that suggest the emergence of a smooth (3+1)–dimensional expanding Lorentzian spacetime.

Time: 10:00 – 10:30
Speaker: Wallet, Jean-Christophe (IJCLab, U Paris-Saclay, CNRS, Orsay)
Title: Gauge Theories on Quantum Minkowski Spaces: ρ versus $\varkappa$

Time: 11:00 – 11:30
Speaker: Vaidya, Sachindeo (Indian Institute of Science, Bangalore)
Title: New Results in the Strong Coupling Limit of 2-Color 1-Flavour Matrix Model
Abstract: Using variational methods, we numerically investigate the matrix model for the two-color QCD coupled to a single quark (matrix-QCD 2,1) in the limit of ultra-strong Yang-Mills coupling ($g = \infty$). The spectrum of the model has superselection sectors labelled by baryon number B and spin J. We study sectors with B = 0, 1, 2 and J = 0, 1, which may be organised as mesons, (anti-)diquarks and (anti-)tetraquarks. For each of these sectors, we study the properties of the respective ground states in both chiral and heavy quark limits, and uncover a rich quantum phase transition (QPT) structure. We also investigate the division of the total spin between the glue and the quark and show that glue contribution is significant for several of these sectors. For the (B,J) = (0,0) sector, we find that the dominant glue contribution to the ground state comes from reducible connections. Finally, in the presence of non-trivial baryon chemical potential μ, we construct the phase diagram of the model. For sufficiently large μ, we find that the ground state of the theory may have non-zero spin.

Time: 11:30 – 12:00
Speaker: Martinetti, Pierre (U Genova)
Title: Torsion and Lorentz symmetry from twisted spectral triples
Abstract: Implementing Lorentzian structure in Connes noncommutative geometry is still an open question. In this talk, we will show how to generate some Lorentzian structure by twisting the spectral triple of a 4 dimensional riemannian spin manifold. This appears as a particular case of a more general construction, consisting in generating an orthogonal and geodesic preserving torsion from a torsionless Dirac operator.

Time: 12:00 – 12:30
Speaker: Giotopoulos, Grigorios (New York University Abu Dhabi)
Title: Sheaf topos theory: a rigorous and convenient setting for field theory
Abstract: In this talk, I will indicate how the sheaf topos of smooth sets serves as a sufficiently powerful and convenient context to host classical Lagrangian field theory. As motivation, I will firstly recall the naive description of variational Lagrangian field theory, and list desiderata for an ambient category in which this can rigorously be phrased. Secondly, I

will recall the well known problem of 'auxilliary' fermionic coordinates in fermionic field theory. I will then explain how the" topos of sheaves over the site of super Cartesian spaces" naturally formalizes and resolves the above issues.. Time permitting, I will indicate how the setting naturally generalizes to include the description of (perturbative) infinitesimal structure, fermionic fields, and (higher gauge) fields with internal symmetries. This is based on joint work with Hisham Sati and Urs Schreiber

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Time: 16:00 – 16:30
Speaker: Bieliavsky, Pierre (Universite Catholique de Louvain)
Title: Differential geometrical methods in locally compact quantum groups
Abstract: Locally compact quantum groups (LCQG) were introduced in the beginning of the century by S. Vaes and J. Kustermans as a von Neumann (i.e. measurable) version of quantum groups in the context of operator algebra. Since then the theory has been widely developed. However, it appears that, besides compact quantum groups, the theory suffers from a lack of new non-compact examples. In a joint work with V. Gayral, S. Neyshveyev and L. Tuset, we constructed non-formal deformation quantizations of Lie group of Fröbenius type which provide classes of Lie group based examples. The construction is mainly geometrical. In the talk, I will first introduce the notion of locally compact quantum group and then explain the construction. I will also discuss some open questions in that context.

Time: 16:30 – 17:00
Speaker: Arzano, Michele (University of Naples "Federico II" and INFN Napoli)
Title: Quantum particles in non-commutative space-time: an identity crisis
Abstract: TBA

Time: 17:00 – 17:20
Speaker: Maris, Valentine (IJCLab/ENS de Lyon)
Title: Quantum causality in kappa Minkowski
Abstract: Causality in kappa Minkowski space-time is reviewed. We study, in particular, quantum causal structures in 1+1d kappa Minkowski space-time described by a twisted Lorentzian Spectral Triple. Investigation of causality provides a constraint, which is a quantum analog of the speed light limit.

Time: 17:50 – 18:10
Speaker: Acharyya, Nirmalendu (Indian Institute of Technology, Bhubaneswar)
Title: Supersymmetry and Quantum Phase Transition in a matrix model of SU(2) gauge theory
Abstract: Matrix model (MM) of SU(2) gauge theory with massless adjoint fermions exhibit $\mathcalN=1$ SUSY with global $U(1)_R$ symmetry. The quantum mechanical MM provides a simplified framework to numerically study certain interesting aspects of this system. We construct the color-singlet spin-0 and spin-1/2 energy eigenstates using a variational technique and estimate their energies for both weak and strong coupling. At very weak coupling ($g\sim0$), the ground state (GS) has spin-0 with R=-3. As g increases, the energy gap between lowest spin-0 states with R=-1 and R=-3 decreases and GS exhibit a level crossing QPT at weak coupling (at g 0.25). The system has SUSY in both phases at weak coupling: spin-0 GS is unique and a SUSY-singlet. The excited spin-0 states are super-partners of spin-1/2 energy eigenstates. At strong coupling, GS is 2-fold degenerate (with R=±1) which breaks $U(1)_R$, while the lightest spin-1/2 state is unique. We explore the fate of SUSY in such a scenario.

Time: 18:10 – 18:30
Speaker: Trzesniewski, Tomasz (University of Wroclaw)
Title: (Λ-)BMS symmetries in the Carroll and Galilei limits
Abstract: There are two threads in the research on symmetries of space-time that originated in the 1960s but have been reinvigorated by the increased interest over the past few years: BMS symmetry (later extended by Barnich and Troessaert) and the kinematical symmetries other than Poincare or (anti-)de Sitter (especially the Carroll and Galilei ones). At their intersection, one may consider the Carrollian and Galilean contraction limits of BMS algebras. It turns out that we can consistently define such contractions for 3D BMS and (partially) 3D Λ-BMS algebras, while in the case of 4D BMS (in the sense of Barnich and Troessaert) we only obtain quasi-Carrollian/Galilean BMS algebras. This can be compared with the recent studies of contractions of the original BMS algebra, in which their authors came to quite different conclusions. Furthermore, in the context of quantum gravity, quantum-group deformations are being generalized to both BMS and various kinematical algebras and hence it should be worthy to also analyze the interplay between the deformations of BMS algebras and their Carrollian or Galilean contractions.

2.2 Thursday, September 19, 2024

Time: 9:00 – 9:30
Speaker: Kowalski-Glikman, Jerzy (Inst. Theor. Phys, University of Wroclaw & NCNR, Warsaw)
Title: On quantum and gravity
Abstract: This is going to be a general talk about some new, exciting developments in the field of quantum gravity.

Time: 9:30 – 10:00
Speaker: Chirco, Goffredo (University of Naples Federico II)
Title: Extending JT/SYK duality via so(2,2) Poisson Sigma Model
Abstract: I will discuss recent work on a Yang-Mills extension of JT gravity via an so(2,2) Poisson Sigma model on a two dimensional manifold with boundary. Focus will be set on the extended boundary dual dynamics of the model, whose action derived in terms of coadjoint orbits of the Virasoro/Kac-Moody group, will comprise a Schwarziann derivative for the JT-sector, a particle on a group for the YM sector, plus interactions.

Time: 10:00 – 10:30
Speaker: Ferrari, Frank (U Libre Bruxelles & Int Solvay Inst)
Title: Jackiw-Teitelboim Quantum Gravity On Finite Geometry

Time: 11:00 – 11:30
Speaker: Sitarz, Andrzej (Jagiellonian University, Krakow)
Title: Spectral evolution
Abstract: I'll discuss the spectral approach to evolution of geometries using operator approach and spectral action principle.

Time: 11:30 – 12:00
Speaker: Weber, Thomas (Charles University in Prague)
Title: On the Durdevic approach to quantum principal bundles
Abstract: In this talk we revisit the noncommutative differential geometry framework developed by M. Durdevic in the 90's. Starting from a Hopf-Galois extension, a bicovariant differential calculus on the structure Hopf algebra and a complete calculus on the total space algebra, we introduce vertical, horizontal and basic forms. These are related via the noncommutative Atiyah sequence and we obtain a graded Hopf-Galois extension, amplifying the initial data. The total space algebra and complete calculus further admit a natural braiding operation induced from the (graded) translation map. We spell out the above structures explicitly for the noncommutative 2-torus and the quantum Hopf fibration and further discuss examples on crossed product calculi. This is based on collaborations with A. Del Donno, E. Latini and A. Sciandra.

Time: 12:00 – 12:20
Speaker: Konjik, Nikola (University of Belgrade)
Title: Propagation of spinors on the angular deformed noncommutative black hole background
Abstract: Some noncommutative (NC) theories possess a certain type of dualities that are implicitly built within their structure. In this paper we establish still another example of this kind. More precisely, we show that the noncommutative U(1) gauge theory coupled to a NC scalar/spinor field and to a classical geometry of the Reissner Nordstrom (RN) type is completely equivalent at the level of equations of motion to the commutative U(1) gauge theory coupled to a commutative scalar field and to a classical geometry background, different from the starting RN background. The new (effective) metric is obtained from the RN metric by switching on an additional nonvanishing r-phi component. Using this duality between two theories and physical systems they describe, we formulate an effective approach to studying a dynamics of spin 1/2 fields on the curved background of RN type with an abiding noncommutative structure. We calculate QNM spectrum of fermions in this type of space.

Time: 16:00 – 16:30
Speaker: Chakraborty, Anwesha (University of Melbourne)
Title: Entanglement harvesting in superposed Minkowski spacetime
Abstract: In any prospective unifying theory of quantum gravity, it should be possible to merge the fundamental concepts of quantum superposition and spacetime, leading to the notion of "spacetime superpositions"—quantum superpositions

of distinct spacetimes not connected by a global coordinate transformation. In this context, we examine the quantum-gravitational effects arising from superpositions of periodically identified Minkowski spacetimes, i.e., Minkowski spacetime with periodic boundary conditions, each characterized by different lengths. By coupling relativistic quantum matter to fields on such a spacetime background—modeled using the Unruh-DeWitt particle detector framework—we demonstrate how, in principle, one can "measure" the field-theoretic effects induced by such a spacetime superposition. Specifically we study its effect on entanglement harvesting and compare it with usual Minkowski spacetime.

Time: 16:30 – 17:00
Speaker: Kovacik, Samuel (Comenius University in Bratislava)
Title: Physics on the fuzzy onion
Abstract: Recently, a matrix formulation of a three-dimensional quantum space was proposed. The basic idea is that (in)finite number of fuzzy spheres is glued together. In this talk, I will provide a brief overview of field theories formulated in it.

Time: 17:30 – 17:50
Speaker: Manta, Alessandro (University of Vienna)
Title: Higher-Spin extended gravity from the IKKT Matrix Model
Abstract: The weakly coupled regime of IKKT matrix model contains Einstein-Hilbert gravity on a background of 4-dimensional spacetime and fuzzy extra dimensions. We study such effective action explicitly from a remarkable SO(1,9) character, with explicit calculations for the case of a covariant cosmological quantum spacetime. In particular we can show the form of the Newton constant in terms of the geometry of the fuzzy extra dimensions at one loop, and argue for the finiteness of the one-loop effective action. Furthermore, we exhibit a mechanism for the extra dimensions to stabilize at 1-loop in certain regimes of validity.

Time: 17:50 – 18:10
Speaker: Adach, Tadeusz (University of Wroclaw)
Title: Complex scalar field in $\varkappa$-Minkowski noncommutative spacetime
Abstract: I will present some results that we have obtained in improving our understanding and formulation of the theory of free scalar fields in noncommutative spacetime whose symmetries are characterized by the $\varkappa$-Poincaré quantum group, extending previous work[1][2]. In particular I will focus on the deformed Noether charges associated with $\varkappa$-Poincaré and their algebra, as well as discrete symmetries and their implications for possible phenomenology. References: [1] M. Arzano, A. Bevilacqua, J. Kowalski-Glikman, G. Rosati and J. Unger, "$\varkappa$-deformed complex fields and discrete symmetries," Phys. Rev. D 103 (2021) no.10, 106015 [2] A. Bevilacqua, J. Kowalski-Glikman and W. Wislicki, "$\varkappa$-deformed complex scalar field: Conserved charges, symmetries, and their impact on physical observables," Phys. Rev. D 105 (2022) no.10, 105004

Time: 18:10 – 18:30
Speaker: Rusnak, Patrik (Comenius University Bratislava)
Title: Threshold anomaly in Quantum Space
Abstract: In October 2022, a significant challenge to the principles of special relativity emerged with the detection of a high-energy photon at LHAASO. According to conventional understanding, such a detection should have been impossible due to the attenuation caused by CMB photons. While theories like doubly special relativity provide some explanation, we sought to investigate the Quantum Space (QS) theory as a potential solution to this anomaly. Our exploration led us to derive a modified dispersion relation from the energy-momentum relation within QS, which aligns with dispersion relations proposed in other theories. By assuming a correction to this dispersion relation, we could ascertain the lower limit of the scaling parameter in QS theory simply by knowing the energy of the observed photon.

2.3 Friday, September 20, 2024

Time: 9:00 – 9:30
Speaker: Castellani, Leonardo (East Piedmont University and INFN-Torino)
Title: Supersymmetric discrete gravity
Abstract: Differential calculus on finite groups is used to construct discrete supergravities in D=4. This (mildly) noncommutative calculus provides a canonical way to discretize field theories. As examples we consider theories on (Z_N)^4 and S_3.

Time: 9:30 – 10:00
Speaker: Grigoriev, Maxim (Lebedev Institute)
Title: TBA

Time: 10:00 – 10:30
Speaker: Hasebe, Kazuki (Sendai NCT)
Title: Generating quantum matrix geometry from gauged quantum mechanics
Abstract: Quantum matrix geometry is the underlying geometry of M(atrix) theory. Expanding upon the idea of level projection, we propose a quantum-oriented non-commutative scheme for generating the matrix geometry of the coset space G/H. We employ this scheme to unveil unexplored matrix geometries by utilizing gauged quantum mechanics on higher dimensional spheres. The resultant matrix geometries manifest as pure quantum Nambu geometries: Their non-commutative structures elude capture through the conventional commutator formalism of Lie algebra, necessitating the introduction of the quantum Nambu algebra. This matrix geometry embodies a one-dimension-lower quantum internal geometry featuring nested fuzzy structures. We demonstrate how these quantum Nambu geometries give rise to novel solutions in Yang-Mills matrix models.

Time: 11:00 – 11:30
Speaker: Fioresi, Rita (University of Bologna)
Title: Reduction of Quantum Principal Bundles
Abstract: We develop the theory of reduction of quantum principal bundles over projective bases. We show how the sheaf theoretic approach can be effectively applied to certain relevant examples as the Klein model for the projective spaces; in particular we study in the algebraic setting.

Time: 11:30 – 12:00
Speaker: Hoare, Ben (Durham University)
Title: Diamonds of integrable models
Abstract: There are two well-known origins of 2-dimensional integrable QFTs from 4 dimensions – localisation of 4d Chern-Simons and symmetry reduction of 4d anti self-dual Yang-Mills. It is a conjecture of Costello that these can be unified in a diamond of theories, starting from holomorphic Chern-Simons theory in 6 dimensions. It has been shown how this works for the simplest class of theories, including the principal chiral model with a Wess-Zumino term, by Bittleston and Skinner. In this talk I will discuss what happens when we look at more involved setups and the interesting new integrable models that we find. This talk is based on work with Lewis Cole, Ryan Cullinan, Joaquin Liniado and Dan Thompson.

Time: 12:00 – 12:30
Speaker: Boffo, Eugenia (Comenius University Bratislava)
Title: More lessons from super quantum mechanics
Abstract: A second quantization approach to a super quantum mechanical model is comparable to string field theory. In this context, I would like to highlight the role of the choice of vacuum (pictures), how suitable indices can compute partition functions and that an action functional for the target space fields may be formulated.

Time: 16:00 – 16:30
Speaker: Platania, Alessia (Niels Bohr Institute, University of Copenhagen)
Title: Asymptotic Safety Landscapes at the intersection between Positivity Bounds and Swampland Conjectures
Abstract: I will review recent progress in computing and analyzing the ”landscape” of effective field theories stemming from an asymptotically safe ultraviolet completion of gravity. I will argue that this is an essential task in asymptotic safety, as well as in other approaches to quantum gravity, to test their consistency and to facilitate the comparison between their predictions. Concretely, I will focus on purely gravitational and gravity-photon systems, and I will discuss the intersections between the resulting asymptotic safety landscape, the string landscape identified by (some) swampland constraints, and positivity bounds.

Time: 16:30 – 17:00
Speaker: Driezen, Sibyll (ETH Zürich)
Title: Utilising the integrability of all Yang-Baxter models

Time: 17:30 – 18:00
Speaker: Kuznetsova, Zhanna Gennadyevna (Federal University of ABC)
Title: Z2*Z2-graded geometry and related physical models
Abstract: As superspace is related to Z2-graded algebras (superalgebras) one can consider Z2*Z2-graded superspace. There are two Z2*Z2-graded Lie algebraic structures: Z2^2 graded Lie algebra and Z2^2-graded Lie superalgebra. Associated coordinates in the first case (graded algebra) have bosonic properties but anticommute among themselves. In the second (superalgebra) case there are three types of coordinates: ordinary "bosonic", commuting "fermionic" and exotic "bosonic" ones which anticommute with fermionic coordinates. The introduction of such graded manifolds requires a consistent definition of derivation, integration, etc. In the talk I will give a brief introduction to Z2*Z2-graded geometries and discuss the associated physical models.

Time: 18:00 – 18:20
Speaker: Scala, Luca (University of Wrocław)
Title: Half-maximal gauged supergravities from 10d heterotic DFT
Abstract: We analyse generalised dualities for heterotic and type I strings via consistent truncations of 10d heterotic double field theory to half-maximal gauged supergravities in more than three dimensions. To do so, we impose constraints on their embedding tensors in order to reproduce all the possible geometric gaugings that allow the lower-dimensional theories to be uplifted. For all these cases we explicitly construct the generalised frames and investigate the notion of generalised T-dualities.

2.4 Saturday, September 21, 2024

Time: 9:00 – 9:30
Speaker: Krasnov, Kirill (University of Nottingham)
Title: Metric geometry and differential forms
Abstract: I will describe a seemingly exotic and not universally known construction that encodes metric geometry on a manifold into a collection of differential forms on the same manifold. The principal example is the description of metric geometry in 4D that encodes it into a triple of 2-forms satisfying a certain set of algebraic constraints. I will explain how 4D Einstein equations are described by this formalism. I will then explain why a description in terms of differential forms is possible. This goes via spinors and the squaring map. I will explain some examples of similar constructions in dimensions 6,7,8. I will conclude with remarks as to why all this may be of interest to a physicist.

Time: 9:30 – 10:00
Speaker: Jonke, Larisa (Rudjer Boskovic Institute)
Title: TBA
Abstract: TBA

Time: 10:00 – 10:30
Speaker: Valach, Fridrich (University of Hertfordshire)
Title: A toy model for supergravity
Abstract: I will present a simple toy model for the N=1 D=10 supergravity. Among other things the model has only finitely many degrees of freedom, and (in some sense) replaces the physical spacetime by a Lie algebra. Still, this approach captures some symmetries of the original supergravity theory, allows a BV (Batalin-Vilkovisky) formulation, and leads to some interesting (and potentially new) insights. This is based on a joint work with Julian Kupka and Charles Strickland-Constable.

Time: 11:00 – 11:30
Speaker: Skvortsov, Evgeny (UMONS)
Title: Noncommutative geometry and higher spin gravity
Abstract: TBA

Time: 11:30 – 12:00
Speaker: Vysoky, Jan (Czech Technical University)
Title: Serre-Swan Theorem for Graded Vector Bundles
Abstract: In ordinary geometry, Serre-Swan theorem relates a geometrical definition of vector bundles to finitely generated

projective modules. This fundamental result allows one to work with vector bundles in an entirely algebraic way. Graded vector bundles over graded manifolds can be introduced wither as a particular graded manifolds, or as sheaves of modules (of their sections). It is expected that they correspond to finitely generated projective modules in a similar fashion. However, since graded vector bundles cannot be described by their fibers, one cannot use the standard arguments to prove the theorem. Basic definitions and a sketch of the proof are presented.

Time: 12:00 – 12:30
Speaker: Basile, Thomas (UMONS)
Title: Massless chiral fields in six dimensions
Abstract: Massless chiral fields of arbitrary spin in 6d, which are higher spin generalisation of self-dual 2-forms, admit a simple formulation in terms of a pair of 0- and 2- forms valued in SL(2,H) symmetric tensors. We will discuss how to construct simple interacting theories using this description, and how to generalise them to arbitrary even dimensions.

2.5 Sunday, September 22, 2024

Time: 9:00 – 9:30
Speaker: Cederwall, Martin (Chalmers U)
Title: BV actions for extended geometry
Abstract: I present a first order formulation of gravitatiional theories which is suitable for constructing their dynamics, in particular when the structure group is infinite-dimensional, and which leads to Batalin-Viilkovisky actions for extended geometry.

Time: 9:30 – 10:00
Speaker: Hassler, Falk (University of Wroclaw)
Title: The Generalized Cartan Geometry of α'-corrections
Abstract: α'-corrections appear as higher-derivative correction in the low-energy effective action of string theory and at the same time as loop-corrections in two dimensional σ-models. Despite their importance, we just start to understand their effects on integrability and dualities in string theory. While generalized geometry has been proven central to analyse both at the leading order, a full set of comparable tools is missing for α'-corrections. Currently the most advance approach is the generalized Bergshoeff-de Roo identification (gBdRi) but it is lacking a geometric interpretation which so far has been crucial to understand integrable string models and the web of dualities connecting them. I my talk I will rectify this situation by showing that the gBdRi can be derived from a suitable extension of Cartan Geometry, which unifies all generalized dualities and their underlying gauged E-models as homogeneous spaces in generalized geometry.

Time: 10:00 – 10:30
Speaker: Demulder, Saskia (Ben Gurion University)
Title: Topological R-fects in Chern-Simons theory and 3d gravity
Abstract: Topological defects defy our conventional understanding of what symmetries are. Known topological defects are however mostly confined to discrete or Abelian continuous and compact groups. We construct a new class of topological defects in the Chern Simons theory with non-Abelian, non-compact gauge groups. This new class of defects are characterised by a solution of the so-called modified-classical Yang-Baxter equation and are thus linked to Lagrangian subalgebras. This algebraic description enables us to tackle their fusion algebra both using a Lagrangian path integral and a Hamiltonian perspective. Using this construction, I will discuss applications to 3d gravity and its higher spin generalisation. This is upcoming work with A.S. Arvanitakis, L.T. Cole, and D.C. Thompson.

Time: 11:00 – 11:30
Speaker: Kurkov, Maxim (University of Naples Federico II)
Title: Lie-Poisson Electrodynamics
Abstract: Lie-Poisson electrodynamics describes the semi-classical approximation of the non-commutative U(1) gauge theory with the Lie-algebra type non-commutativity. We discuss the dynamics of gauge fields together with the dynamics of charged particles. A compact momenta space of the point-like particle naturally arises in this formalism. We illustrate our findings, by considering a super-integrable non-commutative Kepler problem for the su(2) non-commutativity. The compactness of the momenta-space yields rather unexpected physical phenomena such as bounded motion for repulsive central force, and no fall-into-the-centre for attractive Coulomb potential.

Time: 11:30 – 11:50
Speaker: Gitsis, Achilleas (University of Wroclaw)
Title: Higher-derivative corrections from the deformed Polacek-Siegel construction
Abstract: Understanding quantum corrections to generalized dualities and integrable deformations is a major research effort these days. For a non-linear σ-model, describing the worldsheet of a string, they arise as α'-corrections to the target space geometry. Already without any corrections, such geometries are usually complicated. Tools from generalized geometry have proven useful to recast them in an elegant way and thereby facilitate their study. A prominent example is the Polacek-Siegel construction (PSc) that unifies all known generalized T-dualities. We present a modification of this construction to capture higher-derivative terms. This gives a new geometric perspective on the corrections and suggests new applications in the context of integrable models, their dualities and deformations.

Time: 11:50 – 12:10
Speaker: Ivanisevic, Ilija (Institute of Physics Belgrade)
Title: Courant bracket twisted simultaneously by a 2-form B and a bi-vector θ
Abstract: We begin by considering the standard Courant bracket, obtained from the Poisson bracket algebra of the symmetry generators governing general coordinate transformations and local gauge transformations in the case of a closed bosonic string. It is well known that this bracket can be twisted by various transformations, resulting in different string fluxes. We introduce a transformation that simultaneously twists by a 2-form B and a bi-vector θ. When these objects are interpreted as string fields, namely the Kalb-Ramond field and the non-commutativity parameter, the transformation is manifestly self-T-dual. The resulting twisted Courant bracket contains all fluxes.

Time: 12:10 – 12:30
Speaker: Stefas, Stelios (National Tech U Athens)
Title: Developments in Fuzzy Gravity
Abstract: TBA

Time: 16:00 – 16:30
Speaker: Ramgoolam, Sanjaye (Queen Mary University of London)
Title: State counting and negative specific heat capacity in matrix and tensor quantum mechanics.
Abstract: Polynomial functions of matrix variables, invariant under appropriate symmetry groups, play a central role in matrix models and their applications to AdS/CFT and beyond. I describe recent work exploiting the properties of polynomial functions of matrix variables of size N, invariant under conjugation by the symmetric group S_N of all permutations of N objects. The counting of these functions for polynomial degree k less than N/2 has a super-exponential growth as a function of k, which changes qualitatively at degree k comparable to (N \log N)/2. These properties of the counting have striking implications in the thermodynamics of gauged permutation invariant matrix quantum harmonic oscillators. These include negative specific heat capacities in the micro-canonical ensemble. There is an in-equivalence between the micro-canonical and canonical ensembles at temperatures below a Hagedorn-like transition. These thermodynamic features are also shown to exist in in multi-matrix models and tensor models with U(N) gauge symmetries.

Time: 16:30 – 17:00
Speaker: Wulff, Linus (Masaryk University)
Title: TBA
Abstract: TBA

Time: 17:30 – 18:00
Speaker: Osten, David (IFT, University of Wroclaw)
Title: Exceptional generalised geometry as a symmetry principle for sigma models
Abstract: U-duality, which is geometrised in exceptional field theory, has its uses in supergravity, for example as a solution generating technique. In this talk I will demonstrate that exceptional field theory can be applied to the world-volume point as well. I present the construction of half-BPS brane sigma-models in string and M-theory. When employing exceptional field thoery these sigma models take a universal form in their Hamiltonian version which is expected to extend also to the so far enigmatic (from the world-volume point of view) exotic branes. based on 2402.10269

Time: 18:00 – 18:20
Speaker: Bogdanovic, Djordje (University of Belgrade)
Title: Homotopy Algebra Techniques for Noncommutative Quantum Field Theories

Abstract: During this talk, some homotopy algebra techniques that are used for the analysis of field theories, especially in quantization of noncommutative versions of theories, will be motivated and presented. The notion of braided L∞ algebras will be introduced through an example of Phi^3 scalar field theory. Homological perturbation theory leads to correlation functions and Schwinger-Dayson equations and results, both general and on an example of Phi^3 will be presented. Noncomutativity in the braided settings is introduced via Drinfel'd twist formalism and results coming from two different types of noncommutativity, Moyal-Wayl and rho-Minkowski, will be presented.

Time: 18:20 – 18:40
Speaker: Vacchiano, Lucio (Università degli Studi di Napoli Federico II, INFN)
Title: The so(2, 2) Poisson Sigma Model, a Yang-Mills extension of JT-Gravity
Abstract: In this talk I will discuss the so□(2, 2) Poisson Sigma Model on a manifold with boundary, where the action functional at the boundary is given by Casimir functions. I will discuss the interpretation of the model as a Yang-Mills extension of the Jackiw-Tietelboim dilaton-gravity model and the role of boundary conditions relatively to the asymptotic symmetries. I'll show that, under a suitable choice of boundary conditions, the boundary action functional can be understood in terms of coadjoint orbist of the Virasoro/Kac-Moody group.

2.6 Monday, September 23, 2024

Time: 9:30 – 10:00
Speaker: Penati, Silvia (University of Milano-Bicocca)
Title: Conformal defects and RG flows
Abstract: Quantum field theories with defects play a ubiquitous role in theoretical physics, both for their potential applications and for the role played in the general classification of QFTs. Fixed points in the space of QFTs are represented by Conformal Field Theories with conformal defects. In this talk I will introduce a large plethora of one-dimensional defect CFTs in D=3 and study RG flows connecting them. Peculiar aspects like the existence of enriched flows and anomaly driven flows will be largely discussed.

Time: 10:00 – 10:30
Speaker: Fiore, Gaetano (Universita' di Napoli "Federico II", and INFN, Sezione di Napoli)
Title: Quantum groups and quantum reference frames: the twisted Poincaré case
Abstract: TBA

Time: 11:00 – 11:30
Speaker: Toppan, Francesco (CBPF)
Title: On braided Majorana qubits and Volichenko algebras
Abstract: The connection between the multi-particle quantization of braided Majorana qubits and the Volichenko algebras introduced in 1990 by Leites-Serganova is discussed. The "mixed brackets" which interpolate commutators/anticommutators induce the braided qubits parastatistics. A general framework which applies to both braid group parastatistics, as well as the Rittenberg-Wyler color Lie (super)algebra parastatistics (whose detectable paraparticles close the permutation group in any space dimensions) is presented. The talk is based on Nucl. Phys. B 980 (2022) 115834, SciPost Phys. Proc. 14 (2023) 046 and a paper in progress; the part on Rittenberg-Wyler parastatistics is based on J. Phys. A: Math. Theor. 54 (2021) 115203, J. Phys. A: Math. Theor. 54 (2021) 355202 and (in collaboration with M. M. Balbino, I.P. de Freitas, R.G. Rana) arXiv:2309.00965.

Time: 11:30 – 11:50
Speaker: Davgadorj, Ariunzul (Masaryk University)
Title: Five-dimensional supersymmetric non-Abelian Chern-Simons theory in Projective superspace
Abstract: I will discuss the five-dimensional N=1 Chern-Simons and Yang-Mills theory in terms of Projective superspace. In the recent paper 2405.03532, we have driven the actions for the above mentioned theories using a powerful projective superspace technique described in 2306.10399, where the Lagrangians and the field strengths are expressed compactly in terms of gauge prepotentials, which in turn depend holomorphically on the auxiliary CP^1 coordinate.

Time: 11:50 – 12:10
Speaker: Dordevic, Dusan (University of Belgrade)
Title: Holography and first-order gravity formalism

Abstract: In this talk, we will present some recent results concerning the first-order formulation of gravity (possibly with torsion) and holographic duality. Our focus will be on AdS/BCFT correspondence. We will also comment on possible extensions of holographic duality where bulk is given by a noncommutative spacetime.

Time: 12:10 – 12:30
Speaker: Athithamoole, Naveena Kumara (Ruder Boskovic Institute)
Title: Noncommutative gravity and spacetime perturbations
Abstract: In this talk, I will discuss the dynamics of gravitational perturbations within the theoretical frameworks of Hopf algebra and noncommutative differential geometry. By employing a semi-Killing Drinfeld twist and introducing a novel noncommutative Einstein equation, we investigate the polar perturbations in a noncommutative Schwarzschild background. The main result focuses on the effect of noncommutativity on quasi-normal modes and the breaking of isospectrality, which can be interpreted as signatures of quantum gravity.
