Workshop on Noncommutative and Generalised Geometries and their Physical Applications

SEPTEMBER 13 - SEPTEMBER 21, 2026

physics.ntua.gr/corfu2026/nc.html

Scientific Programme

1 Program Summary

Monday, September 14, 2026

9:30	10:00	Castellani, Leonardo	The Group Geometric Approach to Supergravity
10:00	10:30	Cederwall, Martin	D=11 Supergravity in superspace
10:30	11:00	**Coffee Break**	
11:00	11:30	Hassler, Falk	α'-Bootstrap
11:30	12:00	Kovacik, Samuel	Accretion, Mergers, and Metastability of Fuzzy Spheres in a Three-Matrix Model
12:00	12:30	**Coffee Break**	
12:30	13:00	Asano, Yuhma	Double scaling limit of the BMN matrix model
13:00	17:00	**Lunch**	
17:00	17:30	Osten, David	Exotic brane dynamics from exceptional geometry
17:30	17:50	Murayama, Yoshua	Exact Calculation of the Three-Point Amplitude in the BFSS Matrix Model via Supersymmetric Localization
17:50	18:10	**Coffee Break**	
18:10	18:30	Dalak, Frederik	Generalized Lie Derivative of (s)pinors on Courant Algebroids
18:30	18:50	Shao, Wei-Hsiang	Hawking Radiation in Noncommutative Spacetime: Exponential Black Hole Lifetimes
19:30	23:00	**Welcome Reception**	

Tuesday, September 15, 2026

9:30	10:00	Ravera, Lucrezia	Invariant Path-Integral Quantization via Dressing, and Anomaly Cancellation
10:00	10:30	Ramgoolam, Sanjaye	Multi-matrix invariants, degeneracy graphs and determinants.
10:30	11:00	**Coffee Break**	
11:00	11:30	Schupp, Peter	Free Fall in Graded Geometry and Gravity from the Odd Sheet
11:30	12:00	Arvanitakis, Alex	Topological type-G string theory
12:00	12:30	**Coffee Break**	
12:30	13:00	Wulff, Linus	Riemann^4 correction in ten and eleven dimensions
13:00	17:00	**Lunch**	
17:00	17:30	Borowiec, Andrzej	Bicovariant Coderivations, Dualities, Vector Fields
17:30	18:00	Weber, Thomas	Noncommutative vector field calculi
18:00	18:20	**Coffee Break**	
18:20	18:50	Vysoky, Jan	Adjoint Representation in Graded Geometry
18:50	19:10	Bertozzini, Paolo	Quantization, Modular Theory and Non-commutative Space
19:10	19:30	Pollack, Christopher	A (Covariant) Noether Theorem for Poisson-Lie Symmetries

Wednesday, September 16, 2026

9:30	10:00	Fioresi, Rita	Quantum Chiral Superfields
10:00	10:30	Arzano, Michele	Entanglement and decoherence from noncommutative symmetries
10:30	11:00	**Coffee Break**	
11:00	11:30	Iseppi, Roberta	BV Theory from Spectral Triples
11:30	12:00	Martinetti, Pierre	A thermodynamical study of finite spectral triples
14:00	19:30	**Excursion**	

Thursday, September 17, 2026

9:30	10:00	Bieliavsky, Pierre	Harmonic analysis on para-Hermitean symmetric spaces and locally compact quantum groups.
10:00	10:30	Aschieri, Paolo	Noncommutative Bianchi identities
10:30	11:00	**Coffee Break**	
11:00	11:30	Nandi, Partha	Quantum Structure of Spacetime and Its Imprint on Hawking Radiation
11:30	12:00	Valach, Fridrich	On the general twist of type I supergravity
12:00	12:30	**Coffee Break**	
12:30	13:00	Krasnov, Kirill	Gauge theories for G-structures
13:00	17:00	**Lunch**	
17:00	17:30	Boffo, Eugenia	Kodaira–Spencer theory in Physics
17:30	18:00	Kurkov, Max	Action principle for k-Minkowski noncommutative U(1) gauge theory from Lie-Poisson electrodynamics
18:00	18:20	**Coffee Break**	
18:20	18:40	Swash, Alex	Double field theory and deformation quantisation
18:40	19:00	Stefas, Stelios	Gravity as a Noncommutative Gauge Theory: Fuzzy Gravity and Unification with Internal Interactions
19:30	0:30	**Greek Night**	

Friday, September 18, 2026

10:00	10:30	O' Connor, Denjoe	The Microcanonical Ensemble and Negative Heat Capacity
10:30	11:00	**Coffee Break**	
11:00	11:30	Rivasseau, Vincent	Tensor track X: Renormalization and Tensorial Complexity
11:30	12:00	Chirco, Goffredo	A Symmetric Deformation of the JT Lie-Poisson Sigma Model
12:00	12:30	**Coffee Break**	
12:30	13:00	Tekel, Juraj	Phase transitions in Dirac ensembles and corresponding geometries
13:00	16:00	**Lunch**	
16:00	16:20	Prekrat, Dragan	How Curvature Shapes Phase Structure in Noncommutative Matrix Models
16:20	16:40	Hrmo, Matej	Numerical Study of Scalar Field Theory on the Fuzzy Onion
16:40	17:00	**Coffee Break**	
17:00	17:20	Magdolenova, Katarina	Eigenvalue distribution from bootstrap estimates
17:20	17:40	Rusnak, Patrik	Spectral Geometry in Noncommutative Models
17:40	18:00	Nedelkova, Katarina	Quantum space visualisation
18:00	18:20	Moerland, Johannes	Einstein-Cartan and Palatini Gravity in Graded Geometry
19:30		**Guided Tour**	

Saturday, September 19, 2026

9:30	10:00	Krajewski, Thomas	Kitaev's quantum double model and strings in magnetic fields
10:00	10:30	**Coffee Break**	
10:30	11:00	Ikeda, Noriaki	Gauged Poisson sigma models and their geometry
11:00	11:30	Wu, Siye	Family of star products and quantisation
11:30	12:00	**Coffee Break**	
12:00	12:30	Azuma, Takehiro	Complex Langevin studies of the type IIB matrix model with deformations by "gauge-fixing" Lorentz symmetry
12:30	12:50	Valenzuela, Mauricio	Carrollian Wave Equations for Arbitrary Spin: Anyons and the Exotic Particle on the Noncommutative Plane
13:00	17:00	**Lunch**	
17:00	17:20	Hrelja, Axel	Supersymmetric Poisson Sigma Models: Geometry and Quantization
17:20	17:40	Massar, Arthur	T-Poincaré groups at the locally compact level
17:40	18:00	**Coffee Break**	
18:00	18:20	Ubonsri, Peem	Conditions on minimal twist for the Standard Model and the □ field
18:20	18:40	Kubiš, Adam	Phase structure of a Dirac-Type Random Matrix Model
18:40	19:00	Rozental, Daniel	Holographic Dark Energy from kappa Minkowski Noncommutative Spacetime: A Kinematical and Non-Perturbative Study

Sunday, September 20, 2026

9:00	13:00	Free day

2 Detailed Program with Abstracts

2.1 Monday, September 14, 2026

Time: 9:30 – 10:00
Speaker: Castellani, Leonardo (Università Piemonte Orientale and INFN - Torino)
Title: The Group Geometric Approach to Supergravity
Abstract: Supergravity, a locally supersymmetric extension of Einstein gravity, was found in 1976. A few years later a group geometric method was proposed for the construction of supergravity theories in various dimensions d and with different numbers N of supersymmetry charges. We give a conceptual overview of this method, using d=4 N=1 supergravity as a pedagogical example. Supergravities with selfdual forms are also discussed in this setting.

Time: 10:00 – 10:30
Speaker: Cederwall, Martin (Chalmers Univ.)
Title: D=11 Supergravity in superspace
Abstract: The traditional superspace treatment of supergravities in terms of super-vielbeins, super-torsion etc. has severe limitations. It does not lead action formulations, and it does not take global degrees of freedom of gauge fields into account. This is remedied by the use of pure spinor superfields. The formalism naturally becomes a Batalin-Vilkovisky theory. The cohomological framework makes it ideal for questions involving deformations. I examplify with D=11 supergravity, which allows for three different cohomological formulations, displaying to various degree the gauge symmetries of the 3-form and dual 6-form fields. I also comment of the geometrical rôle of a (Lie or L_\infty) algebra naturally appearing in the context of derivations of pure spinor superfields. The talk is based on work in progress with Fabian Hahner and Ingmar Saberi.

Time: 11:00 – 11:30
Speaker: Hassler, Falk (University of Wroclaw)
Title: α'-Bootstrap
Abstract: T-duality is more than a mere redundancy of string theory; it is a powerful predictive tool for constraining the effective action. However, constructing higher-derivative corrections, especially for non-chiral theories, such as the bosonic string, typically involves an order-by-order procedure that becomes computationally prohibitive beyond the leading orders. In this talk, we address this issue by introducing an alternative approach to the current standard method, the generalized Bergshoeff-de Roo identification. Thereby, we bypass the existing bottlenecks to reveal a much simpler way to obtain higher derivative corrections in string theory.

Time: 11:30 – 12:00
Speaker: Kovacik, Samuel (Comenius University)
Title: Accretion, Mergers, and Metastability of Fuzzy Spheres in a Three-Matrix Model
Abstract: Many matrix models have a complex vacuum structure. Also, matrix models are often not accessible to direct analytical methods, and one has to resort to numerical methods. In this talk, I'll describe our work on a class of quantised membranes/spaces models, the use of analytical, bootstrap, and numerical methods, and the new algorithms and tools we have devised that greatly improve the standard approaches.

Time: 12:30 – 13:00
Speaker: Asano, Yuhma (University of Tsukuba)
Title: Double scaling limit of the BMN matrix model
Abstract: The double scaling limit has been playing a central role in matrix models for definition of quantum gravity and string theory. Among such matrix models, The BMN matrix model is considered to describe M-theory on the plane-wave background, and in fact, the double scaling limit for realisation of five-branes have been identified through gauge/gravity duality. Although the double scaling limit is supposed to be derived only from the matrix model without referring to the dual gravity theory, there had never been found such a derivation until recently. In this talk, we show how to derive the double scaling limit for five-branes in a 1/4-BPS sector of the BMN matrix model without information on the gravity side.

Time: 17:00 – 17:30
Speaker: Osten, David (University of Wroclaw)
Title: Exotic brane dynamics from exceptional geometry
Abstract: In this talk I discuss recent developments in the duality-covariant formulation of particle and brane sigma

models. This extends known actions and phase space formulations to include the hidden exceptional duality symmetries of supergravity or the Ehlers symmetry of 4D gravity. As a main new result, this formalism predicts dynamics of general exotic branes which was not known, so far. This generalises the known gauged sigma model of the Kaluza–Klein monopole. I discuss the case of zero-branes in eleven dimensions as an illustrative example, and how are coadjoint orbits are used to make this duality structure manifest at the level of the action.

Time: 17:30 – 17:50
Speaker: Murayama, Yoshua (University of Tsukuba)
Title: Exact Calculation of the Three-Point Amplitude in the BFSS Matrix Model via Supersymmetric Localization
Abstract: We calculate the partition function exactly in the BFSS matrix model which is conjectured to be non-perturbative formulation of M-theory. We apply the localization method developed by Pestun to the special case of matrix size N=2. Our setup describes three-point amplitude where one particle decays into two particles. Consequently we confirm our result agrees with 11D supergravity, low-energy limit of M-theory.

Time: 18:10 – 18:30
Speaker: Dalak, Frederik (Charles University Prague)
Title: Generalized Lie Derivative of (s)pinors on Courant Algebroids
Abstract: The problem of constructing the Lie derivative of spinor fields on a smooth manifold presents an interesting geometrical topic with many applications and has been previously studied in multiple works. Recently, physical applications of spinor fields on Courant algebroids led to the requirement to introduce a similar construction in generalized geometry as well. We recap the classical version of the problem and describe the modifications needed to establish the Lie derivative of spinor fields in the generalized setting on Courant algebroids.

Time: 18:30 – 18:50
Speaker: Shao, Wei-Hsiang (RIKEN iTHEMS)
Title: Hawking Radiation in Noncommutative Spacetime: Exponential Black Hole Lifetimes
Abstract: Nonperturbative quantum-gravity effects are expected to be essential for resolving the black hole information paradox. In this talk, I will discuss how spacetime noncommutativity can dramatically alter the conventional Hawking radiation. For a dynamical black hole formed by gravitational collapse, spacetime noncommutativity modifies the coupling between the radiation field and the background geometry, leading to a large deformation of the effective near-horizon geometry seen by late-time Hawking modes. As a result, Hawking radiation decays substantially after the scrambling time, yielding an evaporation time exponentially longer than the Page time. This talk is based on joint work [arXiv:2604.04774] with Pei-Ming Ho (National Taiwan University) and Takuya Yoda (Kyoto University).

2.2 Tuesday, September 15, 2026

Time: 9:30 – 10:00
Speaker: Ravera, Lucrezia (Politecnico di Torino, Italy)
Title: Invariant Path-Integral Quantization via Dressing, and Anomaly Cancellation
Abstract: I present an invariant relational path-integral quantization framework for general-relativistic gauge field theories based on the Dressing Field Method. The construction implements an automatic anomaly-cancellation mechanism that encompasses Bardeen-Wess-Zumino counterterms. Whenever anomalies encode physically significant information, it must be preserved in the invariant formulation. This occurs through an ”anomaly seesaw mechanism”, whereby anomalies of the covariant (bare) formulation give way to anomalies associated with transformations of the dressing fields, capturing physical reference frame changes. The resulting framework unifies invariant schemes across contexts ranging from electroweak theory to cosmology, and is amenable to lattice implementations, key to high-precision tests in both domains.

Time: 10:00 – 10:30
Speaker: Ramgoolam, Sanjaye (Queen Mary University of London)
Title: Multi-matrix invariants, degeneracy graphs and determinants.
Abstract: Orthogonal bases for polynomial gauge invariants of one or more matrices have applications in matrix quantum mechanics and AdS/CFT. Questions about the detection of AdS geometries dual to invariants of large degree in the CFT motivate the study of non-linear generating sets, built from conjugacy class sums, for the centres of symmetric group algebras. These non-linear generating sets allow the construction of the projector basis for the centres, via an algorithm based on degeneracy graphs, which encode the way the successive inclusion of generators resolves the degeneracies. I describe a recently found monomial basis, obtained from the degeneracy graphs, from which the projector basis is

subsequently constructed. The determinant of the invertible matrix relating the monomial basis to the projector basis is a generalisation of the Vandermonde determinant, parameterised by labelled degeneracy graphs. The construction is applicable to any commutative semisimple associative algebra, and leads to efficient eigenvalue-based algorithms for the construction of orthogonal bases of multi-matrix systems.

Time: 11:00 – 11:30
Speaker: Schupp, Peter (CU Bremen)
Title: Free Fall in Graded Geometry and Gravity from the Odd Sheet

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Time: 11:30 – 12:00
Speaker: Arvanitakis, Alex (Rudjer Boskovic Institute (IRB))
Title: Topological type-G string theory
Abstract: I shall explain new results on supersymmetric twists and localisation of the 2D (2,2) supersymmetric sigma model on Gualtieri-Hitchin generalised Kahler target spaces. Such twists "interpolate" between the topological A- and B-twists. I will also relate progress towards defining topological string theories on such geometries.

Time: 12:30 – 13:00
Speaker: Wulff, Linus (Masaryk University)
Title: Riemann^4 correction in ten and eleven dimensions
Abstract: The first correction to the maximally supersymmetric type II string effective action involves the fourth power of the Riemann tensor. A similar correction is expected in the M-theory effective action in eleven dimensions. I will discuss the form of these corrections, including terms involving fields other than the metric, at the 4-point level and verify their relationship via dimensional reduction.

Time: 17:00 – 17:30
Speaker: Borowiec, Andrzej (Wroclaw)
Title: Bicovariant Coderivations, Dualities, Vector Fields

Time: 17:30 – 18:00
Speaker: Weber, Thomas (Charles University in Prague)
Title: Noncommutative vector field calculi
Abstract: We discuss noncommutative differential geometry from a vector field centric point of view. This is based on the notion of first order vector field calculus (FOVC), which has been previously introduced by Borowiec under the name Cartan pair. We define the universal FOVC and construct an adjunction between the categories of FOVC and that of first order differential calculi, showing that the vector field approach is dual, though not equivalent, to the differential form one. This correspondence is then extended to covariant vector field and differential calculi. On Hopf algebras, (bi)covariant FOVC are in bijection with (bicovariant) quantum tangent spaces. For Hopf–Galois extensions, quantum tangent spaces give rise to vertical vector fields and in this setup we further describe base vector fields and horizontal vector fields and show that they are related via a noncommutative Atiyah sequence. Multiple examples, based on braided derivations, finite groups and the quantum Hopf fibration, are given. This talk is based on joint work with Rita Fioresi and Emanuele Latini.

Time: 18:20 – 18:50
Speaker: Vysoky, Jan (Czech Technical University)
Title: Adjoint Representation in Graded Geometry
Abstract: A structural link between quantum theory and a "thermal-doubled" non-commutative Born geometry is uncovered via Tomita-Takesaki first-quantized modular theory for complexified and polarized ortho-symplectic spaces. Implications for the modular algebraic quantum gravity program (arXiv:1007.4094v1) hint at further deep modifications of the notions of space and geometry (thermal quantum space-time hypothesis) waiting to be further explored. Speculative suggestions in the direction of Boyle-Turok CPT-mirror cosmologies will be mentioned, among others.

Time: 18:50 – 19:10
Speaker: Bertozzini, Paolo (Independent Researcher)
Title: Quantization, Modular Theory and Non-commutative Space
Abstract: A fundamental link between quantization and non-commutative geometry is uncovered via a careful usage of modular theory: a non-commutative double Born geometry is naturally obtained by quantization via Tomita-Takesaki

modular theory for complexified ortho-symplectic spaces. Implications for the "modular algebraic quantum gravity" program (arXiv:1007.4094v1), hinting at further deep modifications of the notions of space and geometry, waiting to be further explored, and some speculative links with Boyle-Turok CPT-mirror cosmology will be highlighted.

Time: 19:10 – 19:30
Speaker: Pollack, Christopher (Perimeter Institute)
Title: A (Covariant) Noether Theorem for Poisson-Lie Symmetries
Abstract: Poisson-Lie group symmetries are the classical analog of quantum group symmetries; the latter naturally arise as the symmetries of quantum geometry and in field theories on quantum spacetimes. However, techniques for identifying or anticipating such symmetries from the classical action of a field theory (i.e., before quantization) are limited. In this talk we detail a novel generalization of Noether's theorem that allows one to identify the Poisson-Lie symmetries of a field theory directly from the classical action, and thereby the classical structures underpinning the corresponding quantum group symmetries. This approach is fully covariant and recovers the usual Noether symmetry framework in the appropriate limit. We then illustrate this proposed framework by elucidating the Poisson-Lie symmetries of 2D dilaton gravity. We find that the allowed dilaton potentials are classified in correspondence with Lie bialgebra structures on sl(2,R), and that each such model possesses a Poisson-Lie symmetry that freely shifts the value of the gauge Casimir (mass). Time permitting we close with comments on the quantization of these symmetries and derive the corresponding path integral Ward identity.

2.3 Wednesday, September 16, 2026

Time: 9:30 – 10:00
Speaker: Fioresi, Rita (University of Bologna)
Title: Quantum Chiral Superfields
Abstract: We define the ordinary Minkowski space inside the conformal space according to Penrose and Manin as homogeneous spaces for the Poincaré and conformal group respectively. We realize the supersymmetric (SUSY) generalizations of such homogeneous spaces over the complex and the real fields. We finally investigate chiral (antichiral) superfields, which are superfields on the super Grassmannian, Gr(2|1, 4|1), respectively on Gr(2|0, 4|1). They ultimately give the twistor coordinates necessary to describe the conformal superspace as the flag Fl(2|0, 2|1; 4|1).

Time: 10:00 – 10:30
Speaker: Arzano, Michele (University of Naples "Federico II")
Title: Entanglement and decoherence from noncommutative symmetries
Abstract: Hopf-algebra deformations of symmetries modify their action on composite systems and can affect some of the basic structures of quantum mechanics. Such deformations arise naturally in models of noncommutative spacetime, where ordinary spacetime symmetries are replaced by quantum-group symmetries. I will explore the effects of these deformations in a qubit model. First, I will ask whether the Hopf adjoint action can define a fundamental deformation of quantum time evolution, possibly leading to Lindblad-type decoherence. Hermiticity and positivity select instead, at leading order, ordinary von Neumann evolution with an effective Hamiltonian. I will then show how the deformation in the coproduct of the Hamiltonian for two qubits produces nonfactorizing dynamics and periodic operator entanglement. These results point to composition and subsystem observables as promising places to look for physical effects of noncommutative symmetries.

Time: 11:00 – 11:30
Speaker: Iseppi, Roberta (U Genoa)
Title: BV Theory from Spectral Triples
Abstract: Can the BV formalism be read directly from noncommutative-geometric data? We show that, for a broad class of finite spectral triples, the answer is yes. We first characterize BV-irreducibility in terms of the Dirac operator of the spectral triple. We then construct a generalized BV-spectral triple whose Hilbert space contains fields, ghosts and antifields, while its field-dependent Dirac operator encodes the BV action. This extends our previous construction for spectral triple over one matrix algebra to general finite spectral triples with multiplicity-one representations. The construction offers a unified noncommutative-geometric description of gauge symmetry and its BV extension.

Time: 11:30 – 12:00
Speaker: Martinetti, Pierre (U Genoa and INFN)
Title: A thermodynamical study of finite spectral triples
Abstract: Elaborating on the relation between the spectral action and the entropy pointed out by Connes and al in 2018,

we investigate the entropy of finite dimensional spectral triples. In particular we identify the chemical potential as the trace of the part fo the Dirac operator that commutes with the algebra. This a variation on the formula recently proposed by Khalkhali and al.

2.4 Thursday, September 17, 2026

Time: 9:30 – 10:00
Speaker: Bieliavsky, Pierre (Universite Catholique de Louvain)
Title: Harmonic analysis on para-Hermitean symmetric spaces and locally compact quantum groups.
Abstract: In this talk, I will focus on the special example of the Lie group G of affine transformations of the real plane. I will show how the differential geometry of a certain symplectic symmetric space and its associated unitary irreducible representations (via parabolic induction and orbit method) explicitly determine a quantization of G as a locally compact quantum group in the sense of Kustermans and Vaes, i.e., a family of von Neumann bialgebras equipped with Haar weights deforming the group von Neumann algebra of G. If time permits, I will then argue on how this example generalizes to quantizing Dergachev-Kirillov' seaweeds (biparabolic) Lie groups of Frobenius type as locally compact quantum groups by applying analogous techniques to Kaneyuki's para-Hermitean symmetric spaces.

Time: 10:00 – 10:30
Speaker: Aschieri, Paolo (U. Piemonte Orientale)
Title: Noncommutative Bianchi identities

Time: 11:00 – 11:30
Speaker: Nandi, Partha (National Institute for Theoretical and Computational Sciences (NITheCS), Stellenbosch University)
Title: Quantum Structure of Spacetime and Its Imprint on Hawking Radiation
Abstract: Hawking radiation reveals a profound interplay between gravity, quantum theory, and thermodynamics. While the standard semiclassical description treats spacetime as classical, quantum gravity effects may modify this picture at short distances. In this talk, I investigate how quantum spacetime structure influences Hawking radiation using the quantum Hamilton–Jacobi tunneling approach. I show that quantum corrections generate logarithmic modifications to black hole entropy, with the correction coefficient determined by the trace anomaly of the quantum stress tensor. Extending the analysis to noncommutative black hole geometries, I further demonstrate that spacetime noncommutativity modifies the curvature invariants entering the anomaly and consequently alters the entropy correction itself. These results suggest that signatures of quantum spacetime may be encoded in black hole radiation and black hole thermodynamics. This work forms part of an ongoing research program connected to our recent accepted work in Class. Quantum Grav. (2026), DOI: 10.1088/1361-6382/ae62ef.

Time: 11:30 – 12:00
Speaker: Valach, Fridrich (Charles University)
Title: On the general twist of type I supergravity
Abstract: We extend Costello and Li's conjectural description of the twist of N=1 supergravity on a Calabi-Yau 5-fold by constructing a candidate BCOV-type theory for an arbitrary supergravity background with flux.

Time: 12:30 – 13:00
Speaker: Krasnov, Kirill (University of Nottingham)
Title: Gauge theories for G-structures
Abstract: I will review the classical differential geometry of G-structures, invented by Cartan as generalisations of Riemannian geometry. In many examples, a G-structure can be viewed as metric plus additional geometric structure of some type. The main question my talk addresses if there is a natural (and ideally unique) action functional whose Euler-Lagrange equations produce second-order PDE's for a G-structure. I will explain how action functionals for G-structures can be built in a gauge-theoretic way, and give examples. I will also explain how these ideas lead to a very simple description of the Riemannian version of the 4D Einstein equations.

Time: 17:00 – 17:30
Speaker: Boffo, Eugenia (Charles University Prague)
Title: Kodaira–Spencer theory in Physics

Abstract: Kodaira–Spencer or BCOV (after the authors Bershadski-Cecotti-Ooguri-Vafa) is the field theory of Calabi-Yau deformations. It is interesting for several applications: mirror symmetry, computation of invariants, or the recent reformulation in terms of Courant algebroids. In this talk, based on SciPost Phys. 20, 152 (2026) with Hulík and Sachs, I will discuss a derivation from a worldline model, a classical action functional that repairs to the lack of a non-local kinetic term, and highlight relations to supergeometry.

Time: 17:30 – 18:00
Speaker: Kurkov, Max (University of Naples Federico II)
Title: Action principle for k-Minkowski noncommutative U(1) gauge theory from Lie-Poisson electrodynamics
Abstract: Lie-Poisson electrodynamics describes a semiclassical approximation of noncommutative U(1) gauge theories with Lie-algebra-type noncommutativities. We obtain a gauge-invariant local classical action with the correct commutative limit for a generic Lie-Poisson gauge model, and present the corresponding deformed Maxwell equations. At the semiclassical level, our results provide a relatively simple solution to the old problem of constructing an admissible Lagrangian formulation for the U(1) gauge theory on the four-dimensional k-Minkowski space-time. On the one hand, we derive an explicit expression for the classical action which yields the deformed Maxwell equations previously proposed in JHEP 11 (2023) 200 for this noncommutativity on general grounds. On the other hand, according to our analysis, these Maxwell equations follow from the action proposed in the present paper as the Euler-Lagrange equations for any Lie-algebra-type noncommutativity.

Time: 18:20 – 18:40
Speaker: Swash, Alex (University of Wrocław)
Title: Double field theory and deformation quantisation
Abstract: Double field theory (DFT) manifests T-duality by doubling spacetime coordinates. While Courant algebroids and QP manifolds describe the metric and B-field, they struggle to capture the dilaton. We show that by deforming the exterior algebra of the QP manifold into a Clifford algebra via a graded star product, the dilaton naturally emerges. This deformation quantisation elegantly generates the DFT tensor hierarchy and provides a natural algebraic framework to formulate the DFT action.

Time: 18:40 – 19:00
Speaker: Stefas, Stelios (NTUA)
Title: Gravity as a Noncommutative Gauge Theory: Fuzzy Gravity and Unification with Internal Interactions

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2.5 Friday, September 18, 2026

Time: 10:00 – 10:30
Speaker: O' Connor, Denjoe (Dublin IAS)
Title: The Microcanonical Ensemble and Negative Heat Capacity

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Time: 11:00 – 11:30
Speaker: Rivasseau, Vincent (Paris-Saclay University)
Title: Tensor track X: Renormalization and Tensorial Complexity
Abstract: I should expose the basics of renormalization à la Wetterich. Next, I will present the results of two of my former students, Vincent Lahoche and Parham Radpay.

Time: 11:30 – 12:00
Speaker: Chirco, Goffredo (Università di Napoli Federico II & INFN Napoli)
Title: A Symmetric Deformation of the JT Lie-Poisson Sigma Model
Abstract: I will discuss a metric deformation of the Poisson Sigma Model (PSM) as a controlled departure from its purely topological dynamics. Focusing on the SL(2, R) PSM formulation of Jackiw–Teitelboim gravity, I will show how a symmetric, metric-dependent deformation modifies the first-order theory while preserving a close connection with the underlying AdS_2 geometry. Distinguished field-dependent sectors provide a simple setting in which departures from the standard JT description can be characterized geometrically. I will discuss the possible interpretation of this construction as an effective framework for coarse-grained or quantum-gravitational corrections to near-AdS_2 dynamics, as well as its implications for the boundary description of near-extremal horizons.

Time: 12:30 – 13:00
Speaker: Tekel, Juraj (Comenius University, Bratislava)
Title: Phase transitions in Dirac ensembles and corresponding geometries
Abstract: Dirac ensembles are examples of finite dimensional spectral triples, which are described by models of random matrices. As such, they can be analyzed by numerical and to some extent also analytical methods. In this framework the geometry is not rigid and fixed, but only given probabilistically. The exciting possibility is to interpret this setup as a toy model of quantum gravity with a well defined path integral over geometries. We will review this approach and present some results for the properties of the random matrix ensembles and the underlying geometry in the few simplest cases.

Time: 16:00 – 16:20
Speaker: Prekrat, Dragan (Department of Physics and Mathematics, University of Belgrade - Faculty of Pharmacy)
Title: How Curvature Shapes Phase Structure in Noncommutative Matrix Models
Abstract: We study the impact of curvature on the phase structure of noncommutative matrix models. Analytical and numerical results show that a curvature term suppresses the stripe phase associated with UV/IR mixing and shifts the triple point, indicating improved consistency of the model. We also present evidence for additional structure, including possible multicut phases, and discuss extensions to gauge-type matrix models, where phases with vacuum expectation values proportional to the noncommutative coordinates are expected to emerge.

Time: 16:20 – 16:40
Speaker: Hrmo, Matej (Comenius University in Bratislava)
Title: Numerical Study of Scalar Field Theory on the Fuzzy Onion
Abstract: We study the behaviour of the scalar field theory on the fuzzy onion model - a three-dimensional matrix model consisting of concentric fuzzy spheres of gradually increasing radii. We use a numerical method of Hamiltonian Monte Carlo simulations to study the phase structure of this theory. We identify the field phases, investigate and describe a phenomenon of dynamical phase transitions and attempt to reconstruct phase transition lines. We compare the results with the well-studied phase structure of the fuzzy sphere. Finally, we identify two boundaries on the phase transitions of the theory, a uniform phase boundary and a critical boundary between the disordered and non-uniform phase.

Time: 17:00 – 17:20
Speaker: Magdolenova, Katarina (Comenius University, Bratislava)
Title: Eigenvalue distribution from bootstrap estimates
Abstract: The bootstrap method has proven useful for studying a wide range of matrix models. In this work, we use moments obtained from bootstrap constraints to reconstruct the underlying eigenvalue probability distribution. This provides a new approach to determining eigenvalue distributions in models where direct analytical methods may be difficult to apply. The reconstructed distributions further allow for the computation of thermodynamic quantities, including the free energy, and the identification of physically relevant phases. Our results demonstrate that bootstrap reconstruction can serve as a powerful tool for exploring the phase structure of matrix models and related systems.

Time: 17:20 – 17:40
Speaker: Rusnak, Patrik (Comenius University Bratislava)
Title: Spectral Geometry in Noncommutative Models
Abstract: This talk explores how geometric information can be studied through spectral data in noncommutative geometry. I will begin with the general idea that the spectrum of a Dirac operator can encode geometric features such as dimension. I will then discuss an example from ongoing work on noncommutative spaces related to R3-lambda, where one tries to construct suitable Dirac-type operators and understand what geometry they describe. The aim is to present both the general motivation and a concrete model where these questions become visible.

Time: 17:40 – 18:00
Speaker: Nedelkova, Katarina (Comenius University, Bratislava)
Title: Quantum space visualisation
Abstract: We investigate the reconstruction of emergent geometry within the framework of quantum geometry of data introduced by Abanov et al. .The approach represents geometric spaces through finite-dimensional matrices interpreted as quantised embedding coordinates. We have developed a numerical program capable of learning the matrix configuration of emergent geometry from raw data. We tested it on the case of a fuzzy sphere, reproducing the expected SO(3) symmetry. Preliminary results for the torus indicate that the approach can be extended to more general geometries.

Time: 18:00 – 18:20
Speaker: Moerland, Johannes (Constructor University Bremen)
Title: Einstein-Cartan and Palatini Gravity in Graded Geometry
Abstract: Graded geometry is a useful tool in the study of BV-BRST resolutions of gauge theories. Already at the level of classical field theories, graded geometry allows for a concise formulation of action functionals and field equations. Tensors may be interpreted as functions on appropriate graded manifolds, and linear operators can be understood as differential operators on these spaces. While it is known how to deal with graded extensions of affine spaces such as Minkowski space, the extension to curved spaces is generally non-trivial. In this talk, we will show how graded geometric structures may be formulated when the underlying smooth manifold is curved. Using these constructions, we showcase how the Einstein-Cartan formulation of general relativity may be cast concisely in terms of graded geometry on the double tangent bundle. Apart from streamlining computations, the graded geometric setup allows for a compact incorporation of BV extensions of the theory.

2.6 Saturday, September 19, 2026

Time: 9:30 – 10:00
Speaker: Krajewski, Thomas (CPT, Aix-Marseille University 🇫🇷)
Title: Kitaev's quantum double model and strings in magnetic fields
Abstract: Topological quantum computing is a promising way to conceive quantum computers robust against perturbation by errors, as initially proposed by Kitaev. In this talk, we present a deformation of Kitaev's quantum double model, inspired by strings in a 3 form background. A key role is played by the twisted Drinfel'd double, based on a 3-cocycle on a finite group G (joint work with Medi-Bara Ziane).

Time: 10:30 – 11:00
Speaker: Ikeda, Noriaki (Ritsumeikan University)
Title: Gauged Poisson sigma models and their geometry
Abstract: We propose a new class of sigma models by gauging of Poisson sigma models. Analysis is based on graded manifold structures called Q-manifolds. By introducing additional gauge symmetries, associated to a Lie groupoid (Lie algebroid) on the target space, Poisson sigma models are extended to gauged sigma models of generalized AKSZ type. The consistency of the theory is ensured by geometric conditions on Lie algebroids such as curvatures and torsions. We also present analysis of models in the presence of boundaries. The talk is based on arXiv:2309.10996 [math.DG] and 2604.23496 [math-ph].

Time: 11:00 – 11:30
Speaker: Wu, Siye (National Tsing Hua University, Hsinchu, Taiwan)
Title: Family of star products and quantisation
Abstract: It is well known that quantum Hilbert spaces in geometric quantisation depend on choices of polarisations on the phase space, which can be given by compatible complex structures. This results in a projectively flat family of Hilbert spaces in certain cases such as for linear phase spaces. In this talk, we explore a flat family of star product algebras in deformation quantisation which act on the quantum Hilbert spaces in such a way that the connections of the (projectively) flat connections are respected.

Time: 12:00 – 12:30
Speaker: Azuma, Takehiro (Setsunan University)
Title: Complex Langevin studies of the type IIB matrix model with deformations by "gauge-fixing" Lorentz symmetry
Abstract: The type IIB matrix model has been proposed as a non-perturbative formulation of string theory. Its partition function is divergent due to the non-compactness of the Lorentz group. This has led to a new definition of the type IIB matrix model with the Lorentz symmetry fixed by the Faddeev-Popov procedure in a non-perturbative manner. We study this model using the complex Langevin method, and explore the possible scenario of the dynamical generation of the (3+1)-dimensional spacetime.

Time: 12:30 – 12:50
Speaker: Valenzuela, Mauricio (Centro de Estudios Científicos CECs-USS.)
Title: Carrollian Wave Equations for Arbitrary Spin: Anyons and the Exotic Particle on the Noncommutative Plane
Abstract: We construct Carrollian wave equations for arbitrary spin by contracting the relativistic Cortés–Plyushchay anyon system in 2+1 dimensions. A level-dependent similarity transformation preserves the internal spin tower as the

speed of light goes to infinity at fixed rest energy. The resulting first-order equations provide a Lévy–Leblond-type square root of the massive Carroll equation, with two momentum-independent energy branches. At integer and half-integer spin, they truncate to finite-component Carrollian bosons, fermions, and higher-spin fields. An exotic large-spin limit yields a wave-equation realisation of the exotic Carroll algebra. The scaled spin becomes its second central charge, momentum states acquire coherent-state dressing, and the observable coordinates span a noncommutative plane. We also contrast the complementary Carrollian and Galilean descendants of the relativistic anyon. Based on https://arxiv.org/abs/2608.29931

Time: 17:00 – 17:20
Speaker: Hrelja, Axel (Institute Ruđer Bošković)
Title: Supersymmetric Poisson Sigma Models: Geometry and Quantization
Abstract: The Poisson sigma model provides the field theoretic origin of deformation quantization and admits a natural supersymmetric extension formulated on Poisson supermanifolds. The gauge symmetries and supersymmetries of this model are generated by compatible homological vector fields Q and Q_s respectively. The homological vector field Q encodes the super Poisson structure, while Q_s encodes a representation up to homotopy of a Lie algebroid. Current work focuses on the perturbative quantization of these models, motivated by the role of the ordinary Poisson sigma model in deformation quantization. At the same time, a better understanding of the geometry underlying the super Poisson structures appears to be relevant for this problem. Particularly, the Jacobi identities from the super Poisson manifold seem to encode geometric structures possibly connected with representations up to homotopy and related higher structures.

Time: 17:20 – 17:40
Speaker: Massar, Arthur (UCLouvain)
Title: T-Poincaré groups at the locally compact level
Abstract: Quantizations of the Poincaré group have interested physicists for a long time for applications on quantum gravity, with the kappa-Poincaré as the most famous example. So far, most models are presented as algebraic quantum groups, that is, as deformations of the Poincaré Lie algebra. One might therefore be interested in quantizating the Poincaré group globally, as opposed to its Lie algebra. In this talk we present a construction of the T-Poincaré models of Mercati in the framework of locally compact quantum groups. We obtain an explicit star-product in integral form on the Minkowski spacetime which quantizes the expected Poisson structure, as well as quantized finite Poincaré symmetries. This includes among others the rho-Poincaré and the light-like kappa-Poincaré groups.

Time: 18:00 – 18:20
Speaker: Ubonsri, Peem (University of Genova)
Title: Conditions on minimal twist for the Standard Model and the field
Abstract: Minimal twist of the spectral triple of the Standard Model is one way to get an extra scalar field which stabilises the electroweak vacuum and to make the computation of Higgs mass compatible with the experiment. A general procedure to obtain minimal twist uses a twisting operator to enlarge the algebra while leaving Hilbert space and the Dirac operator untouched. We investigate the conditions of such twisting operator that produces an extra scalar field. The result also shows that an extra scalar field and the twisted first-order condition cannot be obtained at the same time.

Time: 18:20 – 18:40
Speaker: Kubiš, Adam (Comenius University Bratislava)
Title: Phase structure of a Dirac-Type Random Matrix Model
Abstract: Every Riemannian manifold is naturally associated with a Dirac operator, whose spectral properties encode geometric information about the underlying space. An interesting situation arises when the Dirac operator is not fixed, but instead allowed to vary, with a probability weight assigned to each configuration. This leads to the definition of a statistical ensemble of Dirac operators. In the framework of noncommutative geometry, the Dirac operator can be represented by a finite-dimensional matrix. From this perspective, the problem can be reformulated as a random matrix model. In this work, we consider the simplest examples of Dirac-type operators and introduce an action functional that determines the probability distribution over configurations. Using numerical methods inspired by random matrix theory, we study the resulting phase structure and construct phase diagrams for these models.

Time: 18:40 – 19:00
Speaker: Rozental, Daniel (Bar Ilan University)
Title: Holographic Dark Energy from kappa Minkowski Noncommutative Spacetime: A Kinematical and Non-Perturbative Study
Abstract: The cosmological constant problem remains one of theoretical physics' most persistent puzzles: naive QFT vacuum-energy estimates exceed observation by some 120 orders of magnitude. In this talk, I present recent theoretical and phenomenological results in kappa Minkowski noncommutative spacetime showing how this discrepancy is resolved

dynamically, reproducing the Cohen Kaplan Nelson (CKN) holographic vacuum energy from first principles. This builds on earlier work on kappa-deformed General Relativity [CQG, PRD] and introduces new results. We begin kinematically: spacetime operator uncertainty in κ-Minkowski implies that the observed frequency of an oscillatory system acquires an uncertainty scaling with both its intrinsic frequency and the observation distance, echoing the Relative Locality framework. Extending this to semiclassical and stochastic gravity, we show that a source couples coherently to gravity only below a critical frequency omega_coherence \sim (l_p/R_Causal)^(1/2) omega_p; above it, decoherence suppresses the gravitational contribution by (l_p/R_Causal)^2. Applied to QFT zero-point fluctuations, this truncates the vacuum energy density contributing to cosmological gravity at omega_coherence[R_universe], yielding \rho_eff \sim (M_p/R_universe)^2— matching both the observed dark energy scale and the CKN holographic form. We then derive this result rigorously and non-perturbatively from κ-General Relativity and kappa-Electromagnetism. Evaluating linear metric perturbations sourced by the kappa-EM vacuum two-point function, we find that although the deformed vacuum still generates a Planckian energy density, the gravitational response is modulated by a spatial interference factor sinc[omega R_universe (e^(omega/omega_p)-1)]. Integrated over the frequency spectrum for a macroscopic universe, this forces the UV divergences to cancel, yielding a linearized de Sitter metric with residual vacuum energy strictly proportional to (M_p/R_universe)^2. This dynamical calculation confirms the kinematic decoherence argument and provides a rare, exact macroscopic prediction of kappa-General Relativity. This talk reflects work with O.Birnholtz & O.S.Sasson

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2.7 Sunday, September 20, 2026
