Friday, 14th July 2023	
9:30 – 10:20	Igor Zelenko (Texas A&M University) *On rank 2 distributions in 6-dimensional manifolds with vanishing Wilczynski invariants* Wilczynski invariants are fundamental invariants of nondegenerate curves in projective space introduced by Ernest Wilczynski in 1905. Applying the symplectification procedure of Doubrov and myself (2009) , one can use them in order to construct n-4 invariants of rank 2 distributions on manifolds of any dimension n greater or equal than 5 , called the generalized Wilczynski invariants. If n=5 there is only one Wilczynski invariant, and it coincides with the E. Cartan covariant binary biquadratic form . E. Cartan showed that, if this invariant vanishes, the distribution is locally equivalent to the most symmetric distribution with small growth vector (2,3,5). In the talk we will discuss similar question regarding rank 2 distributions with vanishing generalized Wilczynski invariants for n=6.
10:25 – 10:55	Michail Zhitomirskii (Technion) *Characteristic matrices of (2,3,5) distributions and endowed 5-dim Lie algebras* *I will explain what are these matrices and how they can be used for calculating Cartan tensor (a very simple algorithm) and classification of homogeneous distributions over $\mathbb{C}$ and $\mathbb{R}$.*
10:55 – 11:30	Coffee break
11:30 – 12:20	Tohru Morimoto (Institut Kiyoshi Oka de Mathématiques, Nara Women's University) *The curvature of a subriemannian structure and that of a pseudosubriemannian structure* In 1854 Riemann introduced the notion of riemannian metric and defined its curvature. I do not know exactly when subriemannian geometry started, but it is a generalization of Riemannian geometry and a natural metrical version of nilpotent geometry. The curvature (=the invariants) of a subriemannian structure, which seems far reaching directly even with geometric insight, can be defined in a clear way by virtue of the Cartan method for the equivalence problem in nilpotent geometry developed by Tanaka, Morimoto and others. In this talk I will show how to define the curvature of a subriemannian structure; firstly, according to Morimoto [2008 DGA] when the metric is positive definite and secondly, according to Hong-Morimoto [2022 Arxiv] when it is indefinite. In the positive definite case one can construct a Cartan connection associated with a subriemannian structure and the curvature of the structure is defined to be the that of the associated Cartan connection. In the indefinite case one can in general no more construct Cartan connection, but a " pseudo" Cartan connection (i.e., a step- wise principal fibre bundle with an absolute parallelism) which well serves again to define the curvature. As application I will discuss some classification problems in subriemannian contact geometry (in progress jointly with Iida, Markina, The and Yatsui).
12:25 – 12:55	Aleksandra Borówka (Jagiellonian University) *Feix-Kaledin constructions and c-map* Feix–Kaledin construction and rigid c-map are two constructions that produce hyperkahler metrics on the cotangent bundle of a real analytic Kahler manifold (in Feix–Kaledin case it is given in a neighbourhood of the zero section only). The Feix–Kaledin construction is implicit (uses twistor methods), while the rigid c-map is explicit but needs additional assumptions on the Kahler manifold. In the talk we will discuss similarities and differences between the two constructions as well as their twisted and non-metric variants.
12:55 – 15:00	Lunch break
15:00 – 15:50	Daniel An (SUNY Maritime College) *A Probabilistic Intersection Operation and Its Application in Fluid Dynamics* We introduce a new kind of intersection operation on chains and discuss its properties. A finite system of ODEs that describe the incompressible fluid motion using the intersection operator will be introduced. Numerical simulations of the ODE will be presented.
15:55 – 16:25	Samuel Blitz (Masaryk University) *Dirichlet-to-Neumann tensors for Poincare-Einstein manifolds* I provide an explicit conformally-invariant formula for the so-called 'Dirichlet-to-Neumann tensor' that completes the Fefferman–Graham asymptotic expansion of a given (even-dimensional) Poincare–Einstein filling. We also consider the odd case.
16:25 – 16:45	Coffee break
16:45 – 17:35	Rod Gover (University of Auckland) *Conformal Killing tensors and their Killing scales* Killing tensors are important as they yield first integrals for the geodesic equation, symmetries for the Laplacian, and have a host of other applications. Second rank Killing tensors have been particularly important for their role in separation of variables for equations involving the Laplacian. Conformal Killing tensors satisfy a weaker (conformally invariant) equation. We address several questions including, and in particular, the problem of how to characterise when a rank two conformal Killing tensor is the trace-free part of a Killing tensor for a metric in the conformal class. Our approach is via differential prolongation using conformally invariant tractor calculus. First, we show that there is a useful partial prolongation of the conformal Killing equation to a simplified equation for sections of some tractor bundle. We then use this partial prolongation to provide such an invariant characterisation. This captures invariantly the relevant Bertrand-Darboux equation. In addition, on conformally flat manifolds, we give the full prolongation of the conformally Killing equation to a conformally invariant connection on a tractor bundle and by doing so provide a characterisation by a purely algebraic equation. For completeness and to introduce the main ideas, we also study, from this point of view, the analogous questions for conformal Killing vectors. This is joint work with Thomas Leistner and Jonathan Kress.
17:40 – 18:30	George Sparling (University of Pittsburgh) *Penrose limits, an avenue for merging quantum mechanics and general relativity, via twistor theory* The speaker will report on joint work with Jonathan Holland: the focus will be on the plane waves for spacetime that arise in the theory of Penrose limits; some remarkable properties of such spacetimes will be exhibited; the overall aim will be to establish a connection between the C-star algebras of quantum mechanics and the geometry of the null cone in general relativity.