

Thursday, 13th July 2023	
9:30 – 10:20	<p>Simon Salamon (King's College London) <i>Riemannian twistor theory</i></p> <p>Twistor spaces of even-dimensional Riemannian manifolds (such as spheres and the complex projective plane) are used to understand field equations and orthogonal complex structures.</p>
10:25 – 10:55	<p>Włodzimierz Jelonek (Politechnika Krakowska) <i>Some QCH Kahler surfaces with zero scalar curvature</i></p> <p>In this talk, we prove that some well-known Kahler surfaces with zero scalar curvature are QCH Kahler surfaces. We prove that the family of generalized Taub-NUT Kahler surfaces parameterized by k in $[-1,1]$ is of orthotoric type for k in $(-1,1)$ and of Calabi type if $k=-1$ or</p>
10:55 – 11:30	Coffee break
11:30 – 12:20	<p>Anna Fino (University of Torino & Florida International University) <i>A path from Hermitian Structures to Lorentzian Geometry</i></p> <p>In the 80's of the last century A. Gray and L.M. Hervella have proposed a natural classification of almost Hermitian manifolds by studying a representation of the unitary group on the space of tensors satisfying the same identities as the covariant derivative of the fundamental form of an almost Hermitian manifold. This representation has four irreducible components, which determine sixteen classes of almost Hermitian manifolds playing an important role in Hermitian geometry. One of the classes corresponds to balanced Hermitian structures which are characterized by the co-closure of the associated fundamental form. In the first part of the talk I will review some general results about balanced metrics and the Hull-Strominger system. In the second part I will present some recent results, obtained jointly with A. Taghavi-Chabert and T. Leistner, on almost Robinson manifolds which can be considered as Lorentzian analogues of almost Hermitian manifolds.</p>
12:25 – 12:55	<p>Arman Taghavi-Chabert (University of Warsaw) <i>Perturbations of Fefferman spaces over CR three-manifolds</i></p> <p>In 1976, Charles Fefferman constructed, in a canonical way, a Lorentzian conformal structure on a circle bundle over a given strictly pseudoconvex Cauchy-Riemann (CR) manifolds of hypersurface type. It is also known, notably through the work of Sir Roger Penrose and his associates, and that of the Warsaw group led by Andrzej Trautman, that CR three-manifolds underlie Einstein Lorentzian four-manifolds whose Weyl tensors are said to be algebraically special. I will show how these two perspectives are related to each other, by presenting modifications of Fefferman's original construction, where the conformal structure is "perturbed" by some semi-basic one-form, which encodes additional data on the CR three-manifold. Our setup allows us to reinterpret previous works by Lewandowski, Nurowski, Tafel, Hill, and independently, by Mason. Metrics in such a perturbed Fefferman conformal class whose Ricci tensor satisfies certain degeneracy conditions, are only defined off sections of the Fefferman bundle, which may be viewed as "conformal infinity". The prescriptions on the Ricci tensor can then be reduced to differential constraints on the CR three-manifold in terms of a "complex density" and the CR data of the perturbation one-form. One such constraint turns out to arise from a non-linear, or gauged, analogue of a second-order differential operator on densities. A solution thereof provides a criterion for the existence of a CR function and, under certain conditions, for CR embeddability. This talk is based on arxiv:2303.07328.</p>
12:55 – 15:00	Lunch break
15:00 – 15:50	<p>Andrea Santi (University of Rome "Tor Vergata") <i>On 3-nondegenerate CR manifolds in dimension 7</i></p> <p>I will report on joint works with B. Kruglikov on CR hypersurfaces in \mathbb{C}^4 with a degenerate Levi form. I will discuss the symmetry dimension bound 8 for all the 3-nondegenerate 7-dimensional CR real-analytic structures and present the classification of the locally homogeneous ones. The bound 8 is achieved on the homogeneous model, which is locally the only homogeneous 3-nondegenerate 7-dimensional CR manifold.</p>
15:55 – 16:25	<p>David Sykes (Masaryk University) <i>Hypersurface realization methods for CR structures</i></p> <p>The talk will introduce new methodology for obtaining hypersurface realizations of 2-nondegenerate CR structures with prescribed local invariants at a point. The realizations are all cut from a universal higher-dimensional CR hypersurface by intersecting the universal hypersurface with suitable complex submanifolds, and an important feature of the methodology is that deriving defining equations for the resulting realizations is tractable. We obtain, in particular, defining equations for the recently classified 7-dimensional 2-nondegenerate modified symbol models, which are homogeneous CR structures whose symmetry algebra dimensions are maximal relative the local invariants encoded in their modified symbols. This is joint work with Jan Gregorovič.</p>
16:30 – 17:00	<p>Jan Gregorovic (TU Wien) <i>Construction of counterexamples to the 2-jet determination Chern-Moser Theorem in higher codimension</i></p> <p>I will describe of construction of Levi-nondegenerate CR submanifolds in higher codimension that admit CR symmetries depending on higher than 2nd jet and their Tanaka prolongation takes form $\mathfrak{g}_{-2} \oplus \mathfrak{g}_{-1} \oplus \dots \oplus \mathfrak{g}_{-l}$ for l of arbitrarily high order.</p>