# Invited & Contributed Talks

<table>
<thead>
<tr>
<th>Time</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 – 9:50</td>
<td>Registration</td>
<td>Tuschmann</td>
<td>Pulemotov</td>
<td>Wylie</td>
<td>Vezzoni</td>
</tr>
<tr>
<td>10:00 – 10:30</td>
<td>Registration</td>
<td>Galaz-García</td>
<td>Gilkey</td>
<td>Will</td>
<td>Jablonski</td>
</tr>
<tr>
<td>10:30 – 11:00</td>
<td>Registration</td>
<td>COFFEE</td>
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<tr>
<td>11:00 – 11:50</td>
<td>Registration</td>
<td>Wilking</td>
<td>Chiossi</td>
<td>Nikolayevsky</td>
<td>Fino</td>
</tr>
<tr>
<td>12:00 – 12:30</td>
<td>Registration</td>
<td>11:30 Böhm</td>
<td>Vittone</td>
<td>Ovando</td>
<td>Henry</td>
</tr>
<tr>
<td>12:30</td>
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</tr>
<tr>
<td>14:30 – 15:00</td>
<td>Kerr</td>
<td>Mainkar</td>
<td></td>
<td>Gornet</td>
<td></td>
</tr>
<tr>
<td>15:05 – 15:35</td>
<td>Payne</td>
<td>Deré</td>
<td></td>
<td>Sandoval</td>
<td></td>
</tr>
<tr>
<td>15:40 – 16:10</td>
<td>Sa Earp</td>
<td>de Borbón</td>
<td></td>
<td>del Barco</td>
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</tr>
<tr>
<td>16:10 – 17:00</td>
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<tr>
<td>17:00 – 17:20</td>
<td>Adelstein</td>
<td>Barros</td>
<td></td>
<td>Subils</td>
<td></td>
</tr>
<tr>
<td>17:20 – 17:40</td>
<td>Mützel</td>
<td>Wanderley</td>
<td></td>
<td>Riaño-Riaño</td>
<td></td>
</tr>
<tr>
<td>17:40 – 18:00</td>
<td>Ray</td>
<td>Origlia</td>
<td></td>
<td>Gozzi</td>
<td></td>
</tr>
<tr>
<td>18:00 – 18:20</td>
<td>Pengitore</td>
<td>Herrera</td>
<td></td>
<td>Tsartsaflis</td>
<td></td>
</tr>
<tr>
<td>18:20 – 18:40</td>
<td>Stolarski</td>
<td>Guajardo</td>
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<td>Buttsworth</td>
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## Schedule of Courses

<table>
<thead>
<tr>
<th>Time</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
</tr>
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<tbody>
<tr>
<td>9:00 – 10:30</td>
<td>Registration</td>
<td>Emilio Lauret</td>
<td>Ramiro Lafuente</td>
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<tr>
<td>10:30 – 11:00</td>
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<tr>
<td>11:00 – 12:30</td>
<td><strong>11:30 Plenary</strong></td>
<td>Silvio Reggiani</td>
<td>Emilio Lauret</td>
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<tr>
<td>12:30</td>
<td>LUNCH</td>
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<tr>
<td>14:30 – 16:00</td>
<td>Marcos Salvai</td>
<td>Guillermo Henry</td>
<td>Silvio Reggiani</td>
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<td>16:00 – 17:00</td>
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<tr>
<td>17:00 – 18:30</td>
<td>Laura Barberis</td>
<td>Marcos Salvai</td>
<td>Guillermo Henry</td>
</tr>
<tr>
<td>18:30 – 20:00</td>
<td>Ramiro Lafuente</td>
<td>Laura Barberis</td>
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Laura Barberis  
Universidad Nacional de Córdoba & CONICET  
*Introduction to Kähler geometry*

Guillermo Henry  
Universidad de Buenos Aires & CONICET  
*Scalar curvature and the Yamabe constant*

Ramiro Lafuente  
Westfälische Wilhelms-Universität Münster  
*Ricci solitons*

Emilio Lauret  
Universidad Nacional de Córdoba & CONICET  
*An introduction to spectral geometry*

Silvio Reggiani  
Universidad Nacional de Rosario & CONICET  
*Dynamical aspects of geodesics on the sphere*

Marcos Salvai  
Universidad Nacional de Córdoba & CONICET  
*Detecting submanifolds of minimum volume with calibrations*
Speakers

The following abstracts are presented in alphabetical order by author

Ian Adelstein
Trinity College
The G-invariant spectrum and non-orbifold singularities
20-minute talk: MONDAY 17:00 - 17:20

This work is joint with Mary Sandoval. We consider the G-invariant spectrum of the Laplacian on an orbit space M/G where M is a compact Riemannian manifold and G acts by isometries. When such an orbit space is isometric as a metric space to an orbifold we show that the respective G-invariant and orbifold spectra are equivalent. We generalize the Sunada-Pesce-Sutton technique to the G-invariant setting to produce pairs of isospectral non-isometric orbit spaces. One of these spaces is isometric to an orbifold with constant sectional curvature whereas the other admits non-orbifold singularities and therefore has unbounded sectional curvature. We conclude that constant sectional curvature and non-orbifold singularities are inaudible properties of the G-invariant spectrum.

Julio César Barros
Universidad Nacional de Río Cuarto
Level Sets of the Normal Sections on Isoparametric Hypersurfaces
20-minute talk: TUESDAY 17:00 - 17:20

The present talk is devoted to the study of the level sets of the polynomials that defines the normal sections on the homogeneous isoparametric hypersurfaces in spheres. We present some new results about homogeneous isoparametric hypersurfaces in spheres, whose number of distinct curvatures is less than or equal four. Since it is required for our study, we give also explicit expressions for these polynomials.

Christoph Böhm
Westfälische Wilhelms-Universität Münster
Immortal homogeneous Ricci flows
50-minute talk: MONDAY 11:30 - 12:20

We show that any sequence of type III blow downs of an immortal homogeneous Ricci flow solution subconverges to an expanding Ricci soliton. Applications to Einstein solvmanifolds and solvsolitons will be given. This is joint work with Ramiro Lafuente.

Timothy James Buttsworth
The University of Queensland
The Prescribed Ricci Curvature Problem on Three-Dimensional Unimodular Lie Groups
20-minute talk: THURSDAY 18:20 - 18:40

Let G be a three-dimensional unimodular Lie group, and let T be a left-invariant symmetric (0, 2)-tensor field on G. We provide the necessary and sufficient conditions on T for the existence of a pair (g, c) consisting of a left-invariant Riemannian metric g and a positive constant c such that Ric(g) = cT, where Ric(g) is the Ricci curvature of g. We also discuss the uniqueness of such pairs and show that, in almost all cases, there exists at most one positive constant c such that Ric(g) = cT is solvable for some left-invariant Riemannian metric g.
The spin formalism is a natural setting for treating many Riemannian $G$-manifolds of low dimension, $G$ being a special Lie group, for it allows to extend previous knowledge and provides a nice and uniform picture. The talk will present joint results with Salamon, Agricola-Friedrich-Hoell, and focus on the cases $G = SU(3)$ and $G_2$.

The talk is about degenerations of non-collapsed sequences of Kähler-Einstein metrics on a complex surface with cone singularities along smooth complex curves. This topic has some similarities with the well-established theory of Anderson for the case of smooth metrics on 4-manifolds. The new feature is the behavior of the metrics as the curve degenerates. I will talk about the possible tangent cones on the limit spaces, the blow-up limits and the relations to algebraic geometry.

Simple Lie algebras, their real forms, parabolic subalgebras, and nilradicals of these parabolic subalgebras have been considered by many authors as candidates to find specific geometric structures giving rise to invariant geometric structures on the corresponding Lie groups and their quotients.

The aim of this presentation is to analyze existence of nondegenerate $(0,2)$-tensors on these Lie algebras; in particular invariant symmetric and closed skew-symmetric $(0,2)$-tensors which correspond to bi-invariant metrics and left-invariant symplectic structures at the Lie group level. Among the above candidates, it is well known that semisimple Lie algebras do not admit symplectic structures [3] and Borel subalgebras admitting symplectic structures have been described in [1]. The Killing form on semisimple Lie algebras gives an invariant symmetric nondegenerate bilinear form.

In this talk we focus on the family of nilradicals of parabolic subalgebras. We introduce tools which allow us to give the explicit list of the symplectic nilradicals and those nilradicals admitting invariant metrics. As a first step we find properties which are obstructions for a Lie algebra to admit such tensors. These are cohomological in the skew symmetric case and structural in symmetric one. Afterwards, we prove that almost every nilradical satisfies these obstructions, thus obtaining only few nilradicals admitting invariant tensors. The root system of the simple Lie algebra related to the parabolic subalgebra is fundamental to prove the results.

The presentation is a summary of the results in [2] and [4].

References


In 1981, M. Gromov completed the proof that every manifold admitting an expanding map is, up to finite cover, homeomorphic to a nilmanifold. Since then it was an open question to give an algebraic characterization of the nilmanifolds admitting an expanding map. During my talk, I will start by introducing the basic notions of expanding maps and nilmanifolds. Then I explain how the existence of such an expanding map only depends on the covering Lie group and on the existence of certain gradings on the corresponding Lie algebra. One of the applications is the construction of a nilmanifold admitting an Anosov diffeomorphism but no expanding map, which is the first example of this type.

Anna Fino
Universit` a degli Studi di Torino
*Algebraic dimension of complex nilmanifolds*
50-minute talk: FRIDAY 11:00 - 11:50

Let $a(M)$ be the algebraic dimension of a complex manifold $M$ and $h(M)$ be the dimension of its space of holomorphic differentials. We show that, If $M$ is a compact complex nilmanifold, then $a(M) \leq h(M)$. We use it to determine $a(M)$ when $M$ has complex dimension 3 and also mention a relation with the Kähler rank of $M$. The talk is based on a joint paper with G. Grantcharov and M. Verbitsky.

Fernando Galaz-García
Karlsruher Institut für Technologie
*Positive Ricci curvature and cohomogeneity two torus actions*
30-minute talk: TUESDAY 10:00 - 10:30

Bazaikin and Matvienko showed that every closed, simply-connected smooth 4-manifold with an effective smooth action of the 2-torus admits an invariant metric with positive Ricci curvature. I will discuss how to extend this result to show that every closed, simply-connected smooth $(n+2)$-manifold with an effective smooth action of an $n$-torus admits an invariant metric of positive Ricci curvature.

Peter Gilkey
University of Oregon
*Moduli spaces of Type A geometries*
30-minute talk: WEDNESDAY 10:00 - 10:30

The homogeneous affine surfaces have been classified by Opozda (without torsion) and by Arias-Marco and Kowalski (with torsion); they fall into 3 families (Type $A$, $B$, and $C$). The type $A$ geometries are those where there is a coordinate atlas where the Christoffel symbols are (locally) constant.

We discuss moduli spaces related to these geometries both in the 2-dimensional and in the higher dimensional settings. This is joint work with M. Brozos-Vazquez, E. García-Rio, and J.H. Park.
The eta invariant appears regularly in index theorems but is known to be computable only in certain examples of locally symmetric spaces of compact type. For general two-step nilmanifolds, the eigenvalues of the Dirac operator are presented as eigenvalues of matrices, with Kirrilov Theory the main tool. This is analogous to the calculation of the Laplace spectrum by H. Pese. For general Heisenberg three-manifolds, the spectrum of the spin Dirac operator and the eta invariant are explicitly computed in terms of the metric, lattice, and spin structure data. There are continuous families of geometrically, spectrally different Heisenberg three-manifolds whose Dirac operators have constant eta invariant. We also show that the Dirac spectrum is symmetric about zero in Heisenberg manifolds of dimension $4m+1$, which confirms that the eta invariant is automatically zero in these dimensions.

This work is joint with Ken Richardson, Texas Christian University.

Polar representations of compact connected Lie groups are orbit equivalent to symmetric space representations as proven in a seminal work by J. Dadok. The linear classification of polar representations was later completed by J. Eschenburg and E. Heintze in the irreducible case. It turns out that such representations are determined by the group and a principal isotropy subgroup, though this is no longer true in the reducible case. We show that any polar representation of a connected Lie group is determined by its history and dimension, the former term referring to the collection of isotropy subgroups that appear along a polar section. This is necessary for the reconstruction procedure of K. Grove and W. Ziller.

I’ll propose a classical approach to differential supergeometry, in the sense that the sheaf-theoretic approach replaced with concepts closer to classical differential geometry, viz. superalgebra bundles. After proving some results with this perspective I’ll explore the group objects in the appropriate categories and show results concerning these Lie supergroups.
Let \((M, g)\) be a closed Riemannian manifold of dim\((M) = n \geq 3\). We say that \(u \in C^\infty(M)\) is a solution of the Yamabe equation if there exists \(\lambda \in \mathbb{R}\) such that \(u\) satisfies
\[
a_n \Delta_g u + s_g u = c |u|^{\frac{4}{n-2}} u
\]
where \(a_n = 4(\frac{n-1}{n-2})\) and \(s_g\) is the scalar curvature of \((M, g)\). If \(u\) is a positive solution of the Yamabe equation, then \(u^{\frac{4}{n-2}} g\) is a Riemannian metric of constant scalar curvature \(c\). It is well know that there exists a positive solution of (1) if \(\lambda\) and the Yamabe constant of \((M, g)\) have the same sign. A nodal solution of Yamabe equation is a solution of (1) which changes sign. The second Yamabe constant is defined by
\[
Y^2(M, g) := \inf_{h \in [g]} \lambda_2(L_h) vol(M, h) \frac{2}{n}
\]
where \([g]\) is the conformal class of \(g\) and \(\lambda_2(L_h)\) is the second eigenvalue of the conformal Laplacian of \(L_h\). This constant is related with nodal solutions of the Yamabe equation (see [1]).

In this talk we are going to discuss some results about the asymptotic behaviour of the second Yamabe constant of a Riemannian product \((W \times N, g + th)\) \((t > 0)\). As a consequence, we are going to prove the existence of nodal solutions for \((W \times N, g + th)\) \((provided \(t\) large enough). Also, we will discuss the existence of \(G\)-invariant nodal solutions, where \(G\) is a compact subgroup of the isometry group. The equivariant results are part of a work in progress joint with Farid Madani.

References
Megan Kerr
Wellesley College
Submanifolds of Einstein solvmanifolds
30-minute talk: MONDAY 14:30 - 15:00

In a 2011 paper, H. Tamaru finds new examples of Einstein solvmanifolds, as submanifolds of noncompact symmetric spaces. His method uses parabolic subalgebras of semisimple Lie algebras to build solvable subalgebras by restricting to a subset $\Lambda'$ of the set $\Lambda$ of simple roots in order to generate a subalgebra. The corresponding submanifold, with the inherited inner product, is called an attached solvmanifold. Tamaru proves that the Ricci curvature is inherited, unchanged. Thus whenever the original solvmanifold is Einstein, the attached subsolvmanifold is also Einstein.

We explore the criteria needed in order for Tamaru’s method to be extended to more general Einstein solvmanifolds. (Joint work with T. Payne.)

Meera G. Mainkar
Central Michigan University
Metric 2-step Nilpotent Lie Algebras associated with Graphs
30-minute talk: TUESDAY 14:30 - 15:00

We consider a class of metric 2-step nilpotent Lie algebras associated with simple graphs. First we classify singularity properties of the Lie algebra in terms of the corresponding graph. We then give a necessary and sufficient condition on the graph for the associated Lie algebra to be Heisenberg-like. The density of closed geodesics property has been studied previously for different classes of 2-step nilpotent Lie algebras. In this talk, we will discuss conditions on the graph and on a lattice of the 2-step nilpotent Lie group associated with the graph for which the nilmanifold has a dense set of smoothly closed geodesics.

This work is joint with Rachelle DeCoste and Lisa DeMeyer

Björn Mützel
Dartmouth College
The Jacobian variety of Riemann surfaces with short simple closed geodesics
20-minute talk: MONDAY 17:20 - 17:40

To any compact Riemann surface of genus $g > 1$ one may assign a principally polarized abelian variety of dimension $g$, the Jacobian of the Riemann surface. The Jacobian is a complex torus and we call a Gram matrix of the lattice of a Jacobian a period Gram matrix. We give explicit estimates for the entries of the period Gram matrix with respect to a suitable homology basis, if the Riemann surface contains a short simple closed geodesic $\gamma$ and study this matrix, if the geodesic is pinched.

Yuri Nikolayevsky
La Trobe University
Rank one Einstein extensions of Riemannian manifolds
50-minute talk: THURSDAY 11:00 - 11:50

Given a Riemannian space $N$ of dimension $n$ and a field $D$ of symmetric operators on $N$, we define the extension $M$ of $N$ by $D$ to be the Riemannian manifold of dimension $n + 1$ obtained from $N$ by a construction similar to extending a Lie group by a derivation of its Lie algebra. We find the conditions on $N$ and $D$ which imply that the extension $M$ is Einstein. In particular, we show that $D$ has constant eigenvalues, and the set of eigenvalues satisfies the restrictions similar to those in the homogeneous case. We give a characterisation of Einstein extension for particular eigenvalue types of $D$, and a complete classification of Einstein extensions of dimension four – all of them are Einstein solvmanifolds. We study the case when $N$ is a Lie group and under some additional assumptions show that if the extension $M$ is Einstein, it is a solvmanifold.

This is a joint work with D. Alekseevsky
Marcos Miguel ORGLIA
Universidad Nacional de Córdoba

*Construction of locally conformal geometric structures on solvmanifolds*

20-minute talk: TUESDAY 17:40 - 18:00

In this talk we study left invariant locally conformal symplectic (LCS) and locally conformal Khler (LCK) structures on solvable Lie groups. Beginning with an LCS (or LCK) Lie algebra and a suitable representation, we give a construction of an LCS (or LCK) structure in the semidirect product of the Lie algebra with the representation space. Finally we study the existence of lattices in the associated simply connected Lie group in order to obtain a solvmanifold equipped with these geometric structures.

Gabriela Ovando
Universidad Nacional de Rosario & CONICET

*Isometries on pseudo-Riemannian nilmanifolds*

30-minute talk: WEDNESDAY 12:00 - 12:30

We study the isometry group of a 2-step nilpotent Lie group equipped with a pseudo-Riemannian metric which is invariant by translations on the left. As in the Riemannian situation the key is to understand the group of isometries fixing the identity element. It was proved that this group could be different to the group of orthogonal automorphisms, even for non-degenerate center. We investigate such group and propose a description in low dimensions.

Tracy Payne
Idaho State University

*The Ricci Flow for Homogeneous Spaces from the Perspective of Evolutionary Game Theory*

30-minute talk: MONDAY 15:05 - 15:35

We use evolutionary game theory to analyze the Ricci flow for homogeneous spaces. We start with a brief review of evolutionary game theory. We show that the Ricci flow for homogeneous spaces is the replicator dynamic for a linear or quadratic game. We relate game-theoretic notions to geometric notions; for example, soliton metrics correspond to Nash equilibria. We generalize a well-known formula for computing soliton metrics for homogeneous spaces. We propose using other game dynamics beside the replicator dynamic to define geometric evolution equations. The Ricci flows for several specific classes of homogeneous spaces are analyzed using these methods.

Mark Andrew Pengitore
Purdue University

*Effective separability of lattices in nilpotent Lie groups*

20-minute talk: MONDAY 18:00 - 18:20

We give the precise asymptotic behavior of residual finiteness for cocompact lattices in connected, simply connected nilpotent Lie groups.

Artem Pulemotov
University of Queensland

*The Ricci iteration on homogeneous spaces*

50-minute talk: WEDNESDAY 9:00 - 9:50

The Ricci iteration is a discrete analogue of the Ricci flow. Introduced in 2007, it has been studied extensively on Kähler manifolds, providing a new approach to uniformisation. In the talk, we will define the Ricci iteration on compact homogeneous spaces and discuss a number of existence, convergence and relative compactness results. This is largely based on joint work with Yanir Rubinstein (The University of Maryland).
Allie D. Ray  
Trinity College  
*The Steklov Spectrum on Orbifolds*  
20-minute talk: MONDAY 17:40 - 18:00

We begin by discussing some classical results about geometric properties of manifolds determined by the Laplace and Steklov spectrum. After introducing the concept of an orbifold, we will then look at how these results transfer (or fail to transfer) to the orbifold setting, specifically to the setting of compact 2-dimensional orbifolds.

Richar Fernando Riaño-Riaño  
Universidad de los Andes  
*Submanifolds and Holonomy*  
20-minute talk: THURSDAY 17:20 - 17:40

In 1994 was formulated the following conjecture, like a possible generalization of the rank rigidity theorem for homogeneous submanifolds: An irreducible and full homogeneous submanifolds of the sphere, different from a curve, such that the normal holonomy group is not transitive must be an orbit of an $s$-representation, motivated by that we do a brief introduction to the submanifolds and the relation with the normal holonomy group, and the most recent advances in this geometrical conjecture.

Henrique Nogueira de Sá Earp  
Universidade Estadual de Campinas  
*G$_2$ instantons over quintic Milnor links*  
30-minute talk: MONDAY 15:40 - 16:10

Every quintic Milnor link $K$ on a real 9-sphere is a nontrivial Sasakian circle fibration over a Calabi-Yau 3-fold. It admits a canonical co-closed $G_2$-structure reflecting locally the Calabi-Yau geometry, which induces a natural Yang-Mills theory with many important features of the torsion-free case, such as a Chern-Simons formalism, topological energy bounds and a deformation theory of index 0. In particular, we obtain $G_2$-instantons on bundles over $K$ from Hermitian Yang-Mills connections over the quintic Calabi-Yau, thus relating in a concrete example the well-known Donaldson-Thomas invariant with a conjectural $G_2$-instanton count.

Mary R. Sandoval  
Trinity College  
*Leaf Spaces of Singular Riemannian Foliations and Applications to Spectral Geometry*  
30-minute talk: THURSDAY 15:05 - 15:35

In this talk, we examine the leaf spaces of singular Riemannian foliations and their isometries. In particular, we will review recent results from the literature on smooth isometries of the leaf spaces of singular Riemannian foliations. These leaf spaces include many familiar settings for spectral problems, including manifolds, orbifolds, orbit spaces of G-manifolds, the transverse space of regular Riemannian foliations, as well as more general settings. We also present new results showing that these leaf space isometries preserve the spectrum of the Laplacian on functions on the leaf space, and give insight into the spectral theory of orbifolds, and other leaf spaces of wider interest.

Maxwell Edward Stolarski  
The University of Texas at Austin  
*Steady Ricci Solitons on Complex Line Bundles*  
20-minute talk: MONDAY 18:20 - 18:40

I’ll provide a brief survey of examples of Ricci solitons and then outline the construction of new steady Ricci solitons on the total space of complex line bundles over a Fano Kahler-Einstein base with first Chern class proportional to that of the base. The construction produces cohomogeneity one solitons when the base manifold is homogeneous. These soliton metrics are typically non-Kähler except in the case of the canonical line bundle.
Mauro Subils  
Universidad Nacional de Rosario & CONICET  
Parabolic geometries and H-type Lie algebras  
20-minute talk: THURSDAY 17:00 - 17:20

We classify the Lie algebras of Heisenberg type that are nilradicals of parabolics subalgebras of semisimple Lie algebras, deduce that every simple non-compact Lie Group determines a unique parabolic geometry of that type, and study some of its properties.

Ioannis Tsartsaflis  
La trobe University  
On the cohomology of filiform Lie algebras over $\mathbb{Z}_2$  
20-minute talk: THURSDAY 18:00 - 18:20

We will talk about filiform Lie algebras over fields of characteristic two and we will calculate the cohomology with trivial coefficients of the infinite dimensional Lie algebra $\mathfrak{m}_0$: $[e_i, e_i] = e_{i+1}$ for $2 \leq i$ over $\mathbb{Z}_2$.

Wilderich Tuschmann  
Karlsruher Institut für Technologie  
Spaces and moduli spaces of metrics with lower curvature bounds  
50-minute talk: TUESDAY 9:00 - 9:50

I will discuss connected and non-connectedness properties of spaces and moduli spaces of Riemannian metrics with nonnegative sectional and/or positive Ricci curvature on closed and open manifolds, and, in particular, the following result which is joint work with A. Dessai and St. Klaus:

In each dimension $4n + 3$, $n \geq 1$, there exist infinite sequences of closed smooth simply connected manifolds $M$ of pairwise distinct homotopy type for which the moduli space of Riemannian metrics with nonnegative sectional curvature has infinitely many path components.

Luigi Vezzoni  
Università degli Studi di Torino  
The Calabi-Yau problem on fibrations and generalized Monge-Ampère equations  
50-minute talk: FRIDAY 9:00 - 9:50

The Calabi-Yau equation is a PDEs system whose study goes back to the celebrated Calabi conjecture. Recently, Donaldson has described how the equation could be generalized in a natural way to the setting of 2-forms on 4-manifolds. Donaldson’s program, if carried out, would lead to many new and important results in symplectic geometry. Given a 4-dimensional compact symplectic manifold $(M, \Omega)$ together an $\Omega$–compatible almost-complex structure $J$, the Calabi-Yau equation consists in

$$(\Omega + d\alpha)^2 = e^F \Omega^2, \quad Jd\alpha = d\alpha$$

where $F \in C^\infty(M)$ is given and $\alpha$ is a unknown 1-form. In contrast to the Kähler case, it is not known if the equation in the almost-complex setting has always a solution.

The talk focuses on the study of the Calabi-Yau equation in torus fibrations, when the initial datum $F$ is invariant by the action of the fiber. It will be showed that in this case the equation reduces to a generalized Monge-Ampère equation on the basis having always a solution.

The last part of the talk will be about some resent advances on the problem in the Kodaira-Thurston manifold.

References


L. Vezzoni, On the Calabi-Yau equation in the Kodaira-Thurston manifold, preprint.

Francisco Vittone
Universidad Nacional de Rosario & CONICET

*Submanifolds and Holonomy in Complex Space Forms*
30-minute talk: TUESDAY 12:00 - 12:30

The Normal Holonomy Theorem, proved by Olmos in [Ol90], asserts that the action of the restricted normal holonomy group on any normal space $\nu_p M$ of a submanifold $M$ of a (real) space form is the holonomy representation of a Riemannian symmetric space. It has many important applications to the study of submanifolds of spaces with constant sectional curvature, specially in the theory of isoparametric submanifolds (see [BCO03]).

The main tool in its proof is the Ricci identity, making it almost impossible to adapt it to more general ambient spaces. In this talk we will summarize some recent results concerning the normal holonomy of submanifolds of complex space forms, comparing and contrasting the properties of the action of the normal holonomy group in real and complex geometry. We shall show that the Normal Holonomy Theorem holds in an important large class of submanifolds, namely the so called CR-submanifolds (cf. [DV1]). Finally we will present a Berger-type holonomy theorem which allows us to classify all the complex submanifolds of $\mathbb{C}^n$ or $\mathbb{C}P^n$ with non transitive normal holonomy that generalizes the results presented in [CDO11] (cf. [DV2]).

References


Gabriela Albuquerque Wanderley
Universidade Federal da Paraíba

*A half-space theorem for graphs of constant mean curvature $0 < H < 1/2$ in $\mathbb{H}^2 \times \mathbb{R}$*
20-minute talk: TUESDAY 17:20 - 17:40

We study a half-space problem related to graphs in $\mathbb{H}^2 \times \mathbb{R}$, where $\mathbb{H}^2$ is the hyperbolic plane, having constant mean curvature $H$ defined over unbounded domains in $\mathbb{H}^2 \times \mathbb{R}$. 

12
Burkhard Wilking  
Westfälische Wilhelms-Universität Münster  
Manifolds with almost nonnegative curvature operator  
50-minute talk: TUESDAY 11:00 - 11:50

We show that $n$-manifolds with a lower volume bound $v$ and upper diameter bound $D$ whose curvature operator is bounded below by $-\varepsilon(n, v, D)$ also admit metrics with nonnegative curvature operator. The proof relies on heat kernel estimates for the Ricci flow and shows that various smoothing properties of the Ricci flow remain valid if an upper curvature bound is replaced by a lower volume bound nonnegative curvature operator.

Cynthia Will  
Universidad Nacional de Córdoba & CONICET  
Negative Ricci curvature on Lie groups with a compact Levi factor  
30-minute talk: THURSDAY 10:00 - 10:30

The question of when a differentiable manifold admits a Riemannian metric with a particular sign of the curvature is a very natural one. For homogeneous Riemannian manifolds, the case of sectional curvature is quite restrictive and well understood. Concerning negative Ricci curvature, although a great progress has been made lately, specially in the solvable case, the general case seems to be far from being completely understood. In this talk, we will begin by introducing the known results on negative Ricci curvature in the homogeneous case, and then we will show some unexpected examples of Lie groups with compact Levi factor that admits a metric with negative Ricci curvature.

Joseph Wolf  
University of California, Berkeley  
Homogeneity for Riemannian Quotient Manifolds  
30-minute talk: FRIDAY 12:00 - 12:30

Let $M$ be a simply connected Riemannian homogeneous space and $N = \Gamma \backslash M$ a Riemannian quotient manifold. The Homogeneity Conjecture says that $N$ is homogeneous if and only if all the elements of $\Gamma$ are isometries of constant displacement. This conjecture is proved when $M$ is Riemannian (or even Finsler) symmetric, in a number of settings where $M$ has enough negative curvature to force bounded isometries to be trivial, and in several settings where $M$ is a Riemannian normal homogeneous space. I’ll describe some new results proving the conjecture for a class of homogeneous spaces that includes twistor spaces, and time permitting I’ll summarize the current state of the conjecture.

William Wylie  
Syracuse University  
Manifolds with positive weighted curvature and symmetry  
50-minute talk: THURSDAY 9:00 - 9:50

We give a new approach to the study of the geometry of Riemannian manifolds with smooth measure that takes a natural torsion free connection as the fundamental object of study. The connection defines notions of Ricci and sectional curvature bounds which are slightly different than ones previously considered. Many obstructions to metrics of positive curvature can be extended to these weighted curvatures. In this talk we’ll focus on presenting the following result: A compact locally homogeneous manifold admits a measure with non-negative weighted Ricci curvature if and only if it admits a locally homogeneous metric of non-negative sectional curvature. The talk includes joint works with D. Yeroshkin and L. Kennard.