Geometry and Topology Session

Monday June 21st

1.30-2.00 PM Combinatorial invariants of stratifiable spaces - Sadok Kallel

2.05-2.35 PM Extending Quasi-alternating links - Nafaa Chbili

2.40-3.10 PM On higher Yamabe problems - Mohammed Labbi

3.15-3.45 PM Break

3.50-4.20 PM Homotopy invariance of the space of metrics with positive scalar curvature on manifolds with singularities - Marc Walsh

4.25-4.55 PM Eigenvalue Estimates for the Laplacian on Manifolds with Boundary - Georges Habib

5.00-5.30 PM The Yamabe Invariant of Non-Kähler Surfaces - Michael Albanese

Session Chairs: Dr. Belkhirat and Dr. Labbi

Virtual Room 1G

Geometry and Topoloy Session

Tuesday June 22nd

1.30-2.00 PM Some Results for Compact (s,r) –Weingarten Hypersurfaces - Mohammed Abdelmalek

2.05-2.35 PM A New Proof of Masur-Wolf Theorem - Abdelhadi Belkhirat

2.40-3.10 PM Convolution of Orbital Measures on Non-compact Symmetric Spaces - Boudjemaa Anchouche

3.15-3.45 PM Break

3.50-4.20 PM An Invariant of Planar Kotoids and Finite-Type Invariants - Khaled Bataineh

4.25-4.55 PM Asymptotic behavior of Cauchy hypersurfaces in Teichmuller space - Mehdi Belraouti

Session Chairs: Dr. Belkhirat and Dr. Labbi

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Geometry and Topology Session

Abstracts

Dr. Sadok Kallel (skallel@aus.edu)
American University of Sharjah, UAE

Combinatorial invariants of stratifiable spaces

We extend the well-known construction of the Grothendieck ring of varieties to the topological category.This new ring is constructed for the category of "LC-stratifiable spaces of finite type" in Euclidean space, and thus can be viewed as a "categorification" of the Euler characteristic with compact supports.This formalism allows streamlined combinatorial derivations of Euler characteristics, be they topological or with compact supports. New results include the computation of the Grothendieck class of graph configuration spaces, of polyhedral configuration spaces and of finite subset spaces.

Dr. Nafaa Chbili (nafaachbili@uaeu.ac.ae)
United Arab Emirates University, UAE

Extending Quasi-alternating links

Quasi-alternating links represent an important class of links in the three-sphere introduced by Ozsváth and Szabó as a generalization of alternating links. While alternating links are known to have a simple diagrammatic definition, this new class of links are defined in a recursive way. In general, using the recursive definition, it is very hard to determine whether a given link is quasi-alternating. Over the past fifteen years, several obstruction criteria for quasi alternateness of links have been introduced in terms of link homology and polynomial invariants.

In this talk, we show that a link obtained by extending a quasi-alternating crossing in a quasi-alternating link diagram to an alternating tangle of same type is quasi alternating. This extends the work of Champanerkar-Kofman and permits to introduce new examples of quasi-alternating links.

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Geometry and Topology Session

Abstracts

Dr. Mohammed Labbi (mlabbi@uob.edu.bh)
University of Bahrain, Kingdom of Bahrain.

On higher Yamabe problems

We study the question of the existence of a Riemannian metric with constant Gauss-Bonnet curvature in a given conformal class. We treat some aspects of the corresponding fully nonlinear partial differential equation and we show in particular that this problem is always variational.

Dr. Mark Walsh (mark.walsh@mu.ie)
Maynooth University, Ireland

Homotopy invariance of the space of metrics with positive scalar curvature on manifolds with singularities

In this talk, we consider the space of metrics with positive scalar curvature on a manifold with fibred singularities. In particular, we show that the homotopy type of this space is invariant under certain surgeries. This is joint worth with B. Botvinnik.

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Geometry and Topology Session

Abstracts

Dr. Georges Habib (ghabib@ul.edu.lb)
Lebanese Universit, Leabanon

Eigenvalue Estimates for the Laplacian on Manifolds with Boundary

Given a compact Riemannian manifold (M^n , g) with boundary $∂M$, we give an estimate for the quotient $\frac{int_∂M f dv_g}{\int_M f dv_g}$, where f is a smooth positive function defined on M that satisfies some inequality involving the scalar Laplacian. By the mean value lemma established by A. Savo, we provide a differential inequality for f which, under some curvature assumptions, can be interpreted in terms of Bessel functions. As an application of our main result, a direct proof is given of the Faber-Krahn inequalities for Dirichlet and Robin Laplacian.

Dr. Michael Albanese (michael.albanese@cirget.ca)
Quebec University, Canada

The Yamabe Invariant of Non-Kähler Surfaces

The Yamabe invariant is a real-valued diffeomorphism invariant coming from Riemannian geometry. Using Seiberg-Witten theory, LeBrun showed that the sign of the Yamabe invariant of a Kähler surface is determined by its Kodaira dimension. We consider the extent to which this remains true when the Kähler hypothesis is removed.

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Geometry and Topology Session

Abstracts

Dr. Mohammed Abdelmalek (abdelmalekmhd@gmail.com)
Aboubekr Belkaid University, Algeria

Some Results for Compact (s,r)–Weingarten Hypersurfaces

In this work we prove the Alexandrov sphere theorem for (s,r) Weingarten hypersurfaces embedded in the Euclidean space, the hyperbolic space or the open half sphere. This result generalizes the case of higher order mean curvature hypersurfaces and linear Weingarten hypersurfaces embedded in the Euclidean space.

Dr. Abdelhadi Belkhirat (abelkhirat@uob.edu.bh)
University of Bahrain, Kingdom of Bahrain

A New Proof of Masur-Wolf Theorem

The objective of this work is to present a short proof of a result, proved first by Masur-Wolf, which asserts that the Teichmuller space of hyperbolic surface is not Gromov hyperbolic. The proof presented here uses the same ingredients but differs from the original one by using an analytical argument developed by Lipman Bers. There are other different proofs of Masur-Wolf's theorem using different techniques. Two were published by MacCarthy-Papadopolous and another very short one by Ivanov.

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Geometry and Topology Session

Abstracts

Dr. Boudjemaa Anchouche (boudjemaa.anchouche@ku.edu.kw)
Kuwait University, Kuwait

Convolution of Orbital Measures on Non-compact Symmetric Spaces

We study the question of the existence of a Riemannian metric with constant Gauss-Bonnet curvature in a given conformal class.

Let $M = G/K$ be a non-compact irreducible symmetric space, and let a_j, $j = 1, \ldots, r$ be points in $G \backslash N_G(K)$, where $N_G(K)$ is the normalizer of K in G. We consider the functionals

$$I_{a_j}(f) = \int_K \int_K f(k_1 a_j k_2) d\mu_K(k_1) d\mu_K(k_2), \qquad f \in C(G).\ j = 1, \ldots, n.$$

where μ_K is the normalized Haar measure on K and C(G) is the set of continuous functions on G. Denote by ν_{a_j} the singular measure corresponding to the positive functional I_{a_j}. It is known that there exists a constant $C(G,K)$, depending on the geometry of the symmetric space G/K, such that for $r \geq C(G,K)$ the convolution $\nu_{a_1} * \nu_{a_2} * \ldots * \nu_{a_r}$ is absolutely continuous with respect to a left Haar measure μ_G on G. Denote by $\rho_{a_1,\ldots a_r}$ the Radon-Nikodym derivative of the measure $\nu_{a_1} * \nu_{a_2} * \ldots * \nu_{a_r}$ with respect to μ_G. The aim of this talk is to give an overview of some results obtained recently on the regularity of the density function $\rho_{a_1,\ldots a_r}$.

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Geometry and Topology Session

Abstracts

Dr. Khaled Bataineh (khaledb@just.edu.jo)
Jordan University of Science and Technology, Jordan

An Invariant of Planar Kotoids and Finite-Type Invariants

In this paper we introduce a new polynomial invariant of planar (but not spherical) knotoids, which we call the winding signed sum polynomial. This Laurent polynomial invariant of planar knotoids is a type-one Vassiliev invariant. This invariant might tell whether a planar knotoid is a knot-type or proper knotoid. It also might distinguish between a planar knotoid and its inverse, while the affine index polynomial (that is also a type-one Vassiliev invariant) cannot distinguish between a planar knotoid and its inverse. We also define some geometric invariants of planar knotoids, and give lower bounds for these invariants using the winding signed sum polynomial, which helps in computing these geometric invariants that are easy to define, but hard to calculate.

Dr. Mehdi Belraouti (mehdi.belraouti@gmail.com)
USTHB University, Algeria

Asymptotic behavior of Cauchy hypersurfaces in Teichmuller space

In this talk we consider a geometric time function T defined on a non-elementary 2 + 1 maximal globally hyperbolic spatially compact space-times M = S X R of constant curvature. Such a function defines naturally a one-parameter family of Riemannian metrics g_t on S. Considering the conformal classes of these Riemannian metrics, we obtain a curve $[g_t]$, parameterized by time T, in the Teichmuller space Teich(S). Our goal is to study the asymptotic behavior of this curve with respect to the time T, when this last goes to zero and to infinity. We are particularly interested in the curves associated with CMC time and the K time.

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