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Chiedo l'autorizzazione a richiedere un contributo di ateneo per il convegno di cui allego il programma.

Riccardo Benedetti

— Allegati: —

programma-fabrizio.pdf 63,7 kB

A conference in honour of our friend Fabrizio Broglia

November 30th, 2018 - December 1st, 2018

Aula Magna, Dipartimento di Matematica, Università di Pisa

Organizers: Francesca Acquistapace, Riccardo Benedetti, Jose Francisco Fernando, Ludovico Pernazza

Program

November 30th, 2018

14.00:	Opening
14.10 - 15.00	Talk 1
15.10 - 16.00	Talk 2
16.10 - 16.30	Coffee break
16.30 - 17.20	Talk 3
17.30 - 18.20	Talk 4
20.00	Social Dinner

December 1st, 2018

09.00 - 09.50	Talk 5
10.00 - 10.50	Talk 6
10.50 - 11.10	Coffee break
11.10 - 12.00	Talk 7
12.10 - 13.00	Talk 8
13.10 - 14.30	Lunch
14.30 - 15.20	Talk 9
15.30 - 16.20	Talk 10
16.30 - 16.50	Coffee break
16.50 - 17.40	Talk 11
17.50 - 18.30	Comments, rememberings and jokes

Speakers

Antonio Alfieri (Central European University, Budapest)

TITLE: "Link concordance and 16th Hilbert Problem".

ABSTRACT.– Hilbert in his 16th problem asked which configuration of circles in $\mathbb{RP}^2$ can arise as zero loci of (generic) real polynomials. In a recent work Gilmer and Orevkov associated to a configuration of circles in $\mathbb{RP}^2$ a link in $\mathbb{RP}^3$. They prove that if such a configuration arises as the zero locus of a degree m polynomial then the associated link bounds a genus $g = (m-1)(m-2)/2$ smooth surface inside a rational homology ball bounded by $\mathbb{RP}^3$. Based on this, one can use techniques of knot theory to attack Hilbert's problem. I will discuss Gilmer and Orevkov's paper and the possibility to use Floer theory methods to implement this strategy.

Daniele Angella (Università di Firenze)

TITLE: "Isometric immersions in locally conformally Kahler geometry"

ABSTRACT.– The celebrated Kodaira Embedding Theorem gives geometric and cohomological conditions under which analytic geometry reduces to algebraic geometry: it gives a holomorphic embedding for Hodge manifolds into some projective space. In general, such an embedding is not isometric. The problem of which real-analytic Kähler manifolds admit an isometric immersion into $\mathbb{C}P^n$, or more in general into complex space forms has been studied by Eugenio Calabi, by introducing the *diastasis function.*

Locally conformally geometry is a sort of "equivariant (homothetic) Kähler geometry" and a first specific non-Kähler setting. Despite the Kähler condition imposes strong topological obstructions, almost all known compact complex surfaces admit locally conformally Kähler structures, the only exceptions being the Inoue surfaces. In the lcK context, the analogue of the projective space is played by *Hopf manifolds*, and an analogue of the Kodaira embedding has been proven by Liviu Ornea and Misha Verbitsky.

Inspired by Eugenio Calabi's work, we would like to study isometric immersions of lcK manifolds into Hopf manifolds. This forces the lcK manifold to be Vaisman of rank 1, and asks for writing its positive potential as a sum of squares of norms of holomorphic functions. In particular, we focus on non-Kähler compact complex surfaces.

The talk is based on a joint work with Michela Zedda.

Luigi Caputi (Università di Regensburg)

TITLE: "A coarse version of Hochschild and cyclic homology."

ABSTRACT.– Bornological coarse spaces are "large scale structures" generalisations of metric spaces up to quasi-isometry. Homological invariants of such spaces are given by coarse homology theories, which are functors from the category of bornological coarse spaces to a stable complete $\infty-$category, satisfying additional axioms. Among the main examples we have a coarse version of ordinary homology, topological and algebraic $K-$theory. In the talk we define $G-$equivariant coarse versions of the classical Hochschild and cyclic homologies. In the equivariant setting, the $G-$equivariant coarse Hochschild (cyclic) homology of the discrete group G agrees with the classical Hochschild (cyclic) homology of the associated group algebra $k[G]$. Moreover the forget-control map for coarse Hochschild homology agrees with the generalized assembly map fot Hochschild homology when one considers the family of finite subgroups.

Estibalitz Durand (Departamento de Matemática Aplicada, ETSI Industriales. UNED)

TITLE: "Self-contracted curves: recent developments and applications."

ABSTRACT.– Self-contracted curves were introduced to provide a unified framework for the study of convex and quasiconvex gradient dynamical systems in the euclidean setting. However, the definition of self-contractedness is purely metric and does not require any regularity neither on the space, nor on the curve. In this expository talk we will recall motivations, main ideas and results concerning this notion, presenting the current state of the art for future developments.

José F. Fernando (Universidad Complutense Madrid)

TITLE: "On the set of local extrema of a subanalytic function"

ABSTRACT.– Let $\mathfrak{F}$ be a category of subanalytic subsets of real analytic manifolds that is closed under basic set-theoretical operations (locally finite unions, difference and products) and basic topological operations (taking connected components and closures). Let M be a real analytic manifold and denote $\mathfrak{F}(M)$ the family of the subsets of M that belong to the category $\mathfrak{F}$. Let $f : X \to \mathbb{R}$ be a subanalytic function on a subset $X \in \mathfrak{F}(M)$ such that the inverse image under f of each interval of $\mathbb{R}$ belongs to $\mathfrak{F}(M)$. Let $\mathrm{Max}(f)$ be the set of local maxima of f and consider its level sets $\mathrm{Max}_\lambda(f) := \mathrm{Max}(f) \cap \{f = \lambda\} = \{f = \lambda\} \setminus \mathrm{Cl}(\{f > \lambda\})$ for each $\lambda \in \mathbb{R}$. In this work we show that if f is continuous, then $\mathrm{Max}(f) = \bigsqcup_{\lambda\in\mathbb{R}} \mathrm{Max}_\lambda(f) \in \mathfrak{F}(M)$ if and only if the family $\{\mathrm{Max}_\lambda(f)\}_{\lambda\in\mathbb{R}}$ is locally finite in M. If we erase continuity condition, there exist subanalytic functions $f : X \to M$ such that $\mathrm{Max}(f) \in \mathfrak{F}(M)$, but the family $\{\mathrm{Max}_\lambda(f)\}_{\lambda\in\mathbb{R}}$ is not locally finite in M or such that $\mathrm{Max}(f)$ is connected but it is not even subanalytic. We show in addition that if $\mathfrak{F}$ is the category of subanalytic sets and $f : X \to \mathbb{R}$ is a (non-necessarily continuous) subanalytic map f that maps relatively compact subsets of M contained in X to bounded subsets of $\mathbb{R}$, then $\mathrm{Max}(f) \in \mathfrak{F}(M)$ and the family $\{\mathrm{Max}_\lambda(f)\}_{\lambda\in\mathbb{R}}$ is locally finite in M. An example of this type of functions are continuous subanalytic functions on closed subanalytic subsets of M. The previous results imply that if $\mathfrak{F}$ is either the category of semianalytic sets or the category of C-semianalytic sets and f is the restriction to an $\mathfrak{F}$-subset of M of an analytic function on M, then the family $\{\mathrm{Max}_\lambda(f)\}_{\lambda\in\mathbb{R}}$ is locally finite in M and $\mathrm{Max}(f) = \bigsqcup_{\lambda\in\mathbb{R}} \mathrm{Max}_\lambda(f) \in \mathfrak{F}(M)$. We also show that if the category $\mathfrak{F}$ contains the intersections of algebraic sets with real analytic submanifolds and $X \in \mathfrak{F}(M)$ is not closed in M, then there exists a continuous subanalytic function $f : X \to \mathbb{R}$ with graph belonging to $\mathfrak{F}(M \times \mathbb{R})$ such that inverse images under f of the intervals of $\mathbb{R}$ belong to $\mathfrak{F}(M)$ but $\mathrm{Max}(f)$ does not belong to $\mathfrak{F}(M)$.

As subanalytic sets are locally connected, the set of non-openness points of a continuous subanalytic function $f : X \to \mathbb{R}$ coincides with the set of local extrema $\mathrm{Extr}(f) := \mathrm{Max}(f) \cup \mathrm{Min}(f)$. This means that if $f : X \to \mathbb{R}$ is a continuous subanalytic function defined on a closed set $X \in \mathfrak{F}(M)$ such that the inverse image under f of each interval of $\mathbb{R}$ belongs to $\mathfrak{F}(M)$, then the set $\mathrm{Op}(f)$ of openness points of f belongs to $\mathfrak{F}(M)$. Again the closedness of X in M is crucial to guarantee that $\mathrm{Op}(f)$ belongs to $\mathfrak{F}(M)$.

The type of results stated above are straightforward if $\mathfrak{F}$ is an o-minimal structure of subanalytic sets. However, the proof of the previous results requires further work for a category $\mathfrak{F}$ of subanalytic sets that does not constitute an o-minimal structure.

Alessandro Malusà (Saskatoon University)

TITLE: "The Hitchin connection and Chern-Simons theory."

ABSTRACT.– Given a topological surface S and a Lie group G (either $SU(n)$ or $SL(n, C)$ in this presentation), one can consider the variety M of isomorphism classes of $G-$representations of the fundamental group, or equivalently the moduli space of flat $G-$connections over the surface, which has an interpretation as the space of classical solutions for the Chern-Simons theory. The choice of a Riemann-surface structure on S defines a space of special sections of a certain line bundle L over M, which in turn defines a vector bundle H over the Teichmüller space. While the fibres of H are substantially different, they all take the meaning of the Hilbert space of quantum Chern-Simons theory, and for this reason it is natural to try to identify them. It is to this end that Hitchin, Witten and many more have studied the problem of defining a (projectively) flat connection on H and studying its properties.

Erica Pieroni (Università di Roma La Sapienza)

TITLE: "Minimal entropy in a 3 manifold".

ABSTRACT.– In this talk we shall compute the minimal entropy of every closed, orientable 3-manifold. In particular, we will show that the minimal entropy is additive both with respect to the prime decomposition and to the JSJ decomposition of every irreducible prime summand.

Alessandra Pluda (Università di Regensburg)

TITLE: "Motion by curvature of networks."

ABSTRACT.– We will present the state-of-the-art of the problem of the motion by curvature of a network of curves in the plane,discussing existence, uniqueness, singularity formation and asymptotic behavior of the flow.

Carlos Ueno (Matematika Munkaközösség, Pécsi Kodály Zoltán Gimnázium, Dobó István utca 35-37, 7629 PÉCS (HUNGARY))

TITLE: "The Open Quadrant Problem."

ABSTRACT.– In 2003 it was proved by J.F. Fernando and J.M. Gamboa that the open quadrant x¿0,y¿0 is a polynomial image of the plane. We will provide a history of the problem, including its evolution in time and its influence on related problems. We will also give some recent updates which improve on previous results.

María Pilar Velez (Universisad Antonio de Nebrija)

TITLE: "About truth in automated reasoning in geometry trough computer algebra methods."

ABSTRACT.– The community of mathematicians and computer scientist has been working on automated reasoning in geometry along the past 50 years, with a variety of approachs, outcomes and popularisation results (cf. the pioneer work of Gelertner of 1959 in the A.I. context, or the algebraic geometry framework to automated reasoning in geometry disseminated by the book of Chou (1988).

Our approach to automated reasoning is to provide algorithms, using computer algebra methods, for confirming (or refuting) the truth of some given geometric statement. More precisely, the goal is to decide if a given statement is generally true or not, i.e. true except for some degenerate cases, to be described by the algorithm. In this context, there are statements which happen to be, simustaneusly, not generally true and not generally false,

i.e. statements that are true just on some component.

the aim of my talk is pointing out the subtle, involved, issues deriving from the quirky algebraic behaviour described in some of the examples, as well as exhibiting a way of testing if a statement is true, false or true and false, by just detecting if some elimination ideals are zero or not. This test has been implemented in the dynamic geometry software GeoGebra and some illustrative examples can be found in https://www.geogebra.org/m/zpDq7taB .

List of participants

- Francesca Acquistapace
- Antonio Alfieri
- Carlos Andradas
- Daniele Angella
- Riccardo Benedetti
- Angelica Benito
- Fabrizio Broglia
- Luigi Caputi
- Michel Coste
- Fausto Desalvo
- Sabino Di Trani
- Estibalitz Durand
- José F. Fernando
- Giulia Fidanza
- Ana García Lecuona
- Alessandro Malusà
- Erica Pieroni
- Federica Pieroni
- Alexandra Pluda
- Jasmin Raissy
- Marie Francoiçe Roy
- Carlos Ueno
- María Pilar Velez