Second Congress of Greek Mathematicians
SCGM–2022

Θεματική Συνεδρία «Γεωμετρία & Τοπολογία

July 4 – 8, 2022
Athens, Greece
Hellenic Mathematical Society

Θεματική Συνεδρία «Γεωμετρία & Τοπολογία»
(στο πλαίσιο του 2ου Συνεδρίου των Απανταχού Ελλήνων Μαθηματικών, 4-8 Ιουλίου 2022)

Προσοχή: Η Συνεδρία θα διεξαχθεί στις Αίθουσες Πολυμέσων ΕΜΠ (υπόγειο Κτ. Βιβλιοθήκης ΕΜΠ)
Συγκεκριμένα:

Στις 04, 05 και 06 /07/2022 στην Αίθουσα Τηλεκπαίδευσης

Στις 07 και 08 /07/2022 στο Αμφιθέατρο Πολυμέσων

ΣΧΕΔΙΟ ΠΡΟΓΡΑΜΜΑΤΟΣ

Δευτέρα

…
16:30-17:10 ομιλία [40] Andreas Savas-Halilaj
17:20-18:00 ομιλία [40] Panagiotis Gianniotis

18:00-18:30 Break

18:30-19:10 ομιλία [40] Andreas Arvanitogeorgos
19:20-19:40 ομιλία [20] Christos-Raent Onti
19:40-20:00 ομιλία [20] Kleanthis Polymerakis

Τρίτη

9:30-10:10 ομιλία [40] Christoforos Neofytidis
10:20-11:00 ομιλία [40] Stephan Klaus

…
16:30-17:10 ομιλία [40] Georgios Raptis
17:20-18:00 ομιλία [40] Stratos Prassidis

18:00-18:30 Break

18:30-19:10 ομιλία [40] Dimitrios Georgiou
19:20-19:40 ομιλία [20] Fotini Sereti

Τετάρτη

9:30-10:10 ομιλία [40] Georgios Kydonakis
10:20-11:00 ομιλία [40] Christos Mantoulidis
…

16:30-17:10 ομιλία [40] Charalampos Charitos
17:20-18:00 ομιλία [40] Panagiotis Batakidis

18:00-18:30 Break

18:30-19:10 ομιλία [40] Georgios Tsapogas
19:20-19:40 ομιλία [20] Nikolaos Eptaminitakis

Πέμπτη

9:30-10:10 ομιλία [40] Evangelia Samiou
10:20-11:00 ομιλία [40] Aristides Kontogeorgis

…

16:30-17:10 ομιλία [40] Ioannis Diamantis
17:20-18:00 ομιλία [40] Eleni Panagiotou

18:00-18:30 Break

18:30-19:10 ομιλία [40] Boštjan Gabrovšek
19:20-20:00 ομιλία [40] Dimitrios Kodokostas

Παρασκευή

9:30-10:10 ομιλία [40] Maria Paratriantafillou
10:20-11:00 ομιλία [40] Manousos Maridakis

…

15:00-15:20 ομιλία [20] Athanasios Chatzikaleas
15:20-15:40 ομιλία [20] Polyxeni Spilioti

TOTAL: 6x20’ + 21x40’

Second Congress of Greek Mathematicians SCGM-2022 Geometry and Topology Session

List of Abstracts of Talks

1. **Andreas Arvanitoyeorgos** (Department of Mathematics, University of Patras, arvanito@math.upatras.gr)

   Progress on compact homogeneous Einstein manifolds

   A Riemannian manifold (M, g) is called Einstein if the Ricci tensor satisfies $\mathrm{Ric}(g) = cg$ for some $c \in \mathbb{R}$. The problem is quite difficult in this generality so we normally impose some symmetry conditions on the space. For a Riemannian homogeneous space $(M = G/H, g)$, where G is a Lie group and H a closed subgroup of G, the problem is to classify all G-invariant Einstein metrics. The cases that M is compact and non compact require different approaches. In the present talk I will give an update on compact homogeneous Einstein manifolds, based on a logical separation whether the isotropy representation of $M = G/H$ decomposes into irreducible, non equivalent or equivalent summands (subrepresentations). Time permitting, I will also present some recent progress on left-invariant Einstein metrics on compact Lie groups, which are not naturally reductive.

2. **Panagiotis Batakidis** (Department of Mathematics, Aristotle University of Thessaloniki, batakidis@math.auth.gr)

   Curvature in Courant algebroids and Graded Geometry

   In the first part of the talk we will cover some basic constructions in Graded Geometry and the way in which known structures (symplectic, complex, foliations and etc) as well as objects (de Rham cohomology, curvatures and etc) can be obtained through a unified description. In the second part we will equip a graded manifold with a symplectic structure and then explain the geometric objects corresponding to each degree of this structure. In the last part we focus on the case of Courant algebroids and discuss the problems defining an appropriate curvature map along with applications. Parts of this talk refer to joint works with Fani Petalidou and Yannick Voglaire.

3. **Charalampos Charitos** (Department of Natural Resources Development & Agricultural Engineering, Agricultural University of Athens, bakis@aua.gr)

Morse foliations of codimension one on the sphere S^3

Morse foliations of codimension one on the sphere S^3 are studied and the existence of special components for these foliations is derived. As a corollary the instability of Morse foliations of S^3 can be proven provided that all the leaves are not simply connected.

4. **Athanasios Chatzicaleas** (Department of Mathematics, University of Muenster, achatzik@uni-muenster.de)

   (in-)Stability of the Anti-de Sitter spacetime and time-periodic solutions

   Motivated by the conjectured instability of the Anti-de Sitter solution to the Einstein equations by Dafermos-Holzegel, as well as by the rigorous instability results of Moschidis, we construct families of arbitrary small time-periodic solutions to several toy models. These models capture certain dynamical properties related to Anti-de Sitter and include the conformal cubic wave equation and the spherically-symmetric Yang-Mills equations on the Einstein cylinder. Our proof relies on a suitable modification of a theorem of Bambusi-Paleari for which the main assumption is the existence of a seed solution, given by a non-degenerate zero of a non-linear operator associated with the resonant system.

5. **Ioannis Diamantis** (Department of Data Analytics and Digitalisation, School of Business and Economics, Maastricht University, The Netherlands, i.diamantis@maastrichtuniversity.nl, ioannis.diamantis@hotmail.com)

   Kauffman bracket skein modules: A braid theoretic approach

   Skein modules were introduced independently by Przytycki and Turaev as generalizations of knot polynomials in S^3 to knot polynomials in arbitrary 3-manifolds. They are quotients of free modules over isotopy classes of links in 3-manifolds by properly chosen local (skein) relations. The Kauffman bracket skein module of a 3-manifold M, KBSM(M), is equivalent to the independent Jones polynomials for links in M up to regular isotopy. Skein modules have become very important algebraic tools in the study of 3-manifolds, since they detect geometric and topological properties of them, as for example the presence of non-separating 2-spheres and tori. The algebraic counterpart construction of the classical Kauffman bracket is the Temperley-Lieb algebra together with a unique Markov trace. Through the pioneering work of V.F.R. Jones, this algebra related knot theory to statistical mechanics, topological quantum field theories and the construction of quantum invariants for 3-manifolds (works of Witten, Reshetikhin-Turaev, Lickorish, etc). However, computing the KBSM of a 3-manifold is known to be very hard. In this talk we develop a braid theoretic approach for computing KBSM of c.c.o. 3-manifolds and we focus on the case of the lens spaces $L(p, q)$, via the *generalized Temperley-Lieb algebra of type* $B, TL_{1,n}$.

6. **Nikolaos Eptaminitakis** (Department of Mathematics, Purdue University, neptamin@purdue.edu)

Inverse Problems for the X-ray Transform on Asymptotically Hyperbolic Manifolds

Given a Riemannian manifold and a function f on it, the geodesic X-ray transform of f is a function on the space of geodesics which is defined as the integral of f over each of them. Typically the function f is unknown and one is interested in obtaining information about it from its geodesic X-ray transform; for example, one would like to understand whether f is uniquely determined by the transform or whether an inverse can be computed. Such problems have been studied extensively in various settings, starting with J. Radon's 1917 paper, where inversion formulas for the transform were derived in the Euclidean plane. The topic of the talk will be the geodesic X-ray transform in the setting of asymptotically hyperbolic manifolds. Those are a class of non-compact, complete manifolds whose behavior near infinity resembles in many ways that of hyperbolic space, and which have attracted the interest of the physics community due to their relevance to the AdS/CFT correspondence. In part due to the behavior of geodesics, the fact that they have infinite length, and the fact that asymptotically hyperbolic spaces have infinite volume, the study of the geodesic X-ray transform becomes particularly interesting and challenging in this setting. We will focus specifically on the problems of injectivity and stability of the X-ray transform, and discuss how techniques from microlocal analysis suitably adapted to this setting can be used to address them.

7. **Boštjan Gabrovšek** (Mathematics Research Group, Faculty of Mechanical Engineering, University of Ljubljana, bostjan.gabrovsek@fs.uni-lj.si)

   Invariants of multi-linkoids and bondoids

   The theory of knotoids has recently gained much attention in the topological analysis of proteins, as knotoids have been identified as objects that naturally encode the topological structure (knotted type) of a protein backbone when projected to a plane (Benedetti, Dorier, Goundaroulis, Gügümcü, Kauffman, Lambropoulou, Stasiak). We can extend this theory to the theory of linkoids if we consider several mutually entangled polypeptide chains. If we also include protein bonds (non-local interactions between the amino acids, such as disulphide bridges and salt bridges) into the topological structure, we can describe the obtained structure as a bondoid (Goundaroulis, Gügümcü, Lambropoulou, Dorier, Stasiak, Kauffman). Bondoids, in this context, will be viewed as multi-linkoids together with a set of properly embedded arcs. We will extend the theory of skein modules (introduced by Przytycki and Turaev) to the Kauffman bracket skein module of planar multi-linkoids and bondoids, and see that from this theory we obtain invariants of (bonded) multi-linkoids, when they are evaluated in the basis of the module. In addition, we will introduce a colored version of Kauffman's T invariant for spatial graphs and show that it can be used to define invariants for both multi-linkoids and multi-braidoids. Joint work with N. Gügümcü.

8. **Dimitrios Georgiou** (Department of Mathematics, University of Patras, georgiou@math.upatras.gr)

   A report on the Dimension Theory in Topology and the dimension Dind of A. V. Arhangelskii for finite T_0-topological spaces

   In this talk, a report on the first steps of the birth and development of Dimension Theory in Topology is provided. Moreover, results for the dimension Dind of A. V. Arhangelskii for finite T_0-topological spaces are presented. Results of this talk are presented in the paper titled "The dimension Dind of Finite Topological T_0-spaces" written by D. N. Georgiou, Y. Hattori, A. C. Megaritis and F. Sereti. Recently, this paper has been accepted for publication to the scientific journal Mathematica Slovaca.

9. **Panagiotis Gianniotis** (Department of Mathematics, National and Kapodistrian University of Athens, pgianniotis@math.uoa.gr)

   An isometric flow of G_2 structures

   A G_2 structure on a 7 manifold is a three form that determines, in a non linear way, a Riemannian metric. Our interest in such structures comes from the fact that when they are parallel with respect to the associated Levi-Civita connection then the metric is automatically Ricci flat with holonomy contained in the Lie group G_2. Parallel G_2 structures can be considered as the optimal such structures on a given smooth manifold, however there may not exist since there are several obstructions. Unfortunately, despite the construction of many examples of parallel G_2 structures, there is at the moment no conjecture regarding which smooth 7 manifolds admit holonomy G_2 metrics. On the other hand, any Riemannian metric on a manifold admitting G_2 structures is induced by many -isometric- G_2 structures, and a natural question is to find whether there exists an optimal representative in a given isometric class. In this talk I will discuss a geometric flow approach to this problem, initially proposed by Grigorian, and present joint work with Dwivedi and Karigiannis in which we develop the foundational theory for this flow.

10. **Stephan Klaus** (Department of Mathematics, University of Mainz and Mathematisches Forschungsinstitut Oberwolfach, klaus@mfo.de).

    On the forgotten definition of homology of a space via configuration space of charged particles

    The Dold-Thom Theorem (1958) states that integral homology of a space X is isomorphic to the homotopy groups of its infinite symmetric product $SP^\infty(X)$. The monograph "Algebraic Topology from a Homotopical Viewpoint" (2002) of Aguilar, Gitler and Prieto develops homology theory from this point of view. But infinite symmetric products have a technical drawback which makes proofs difficult and clumsy: They convert cofibrations to quasi-fibrations only. This can be cured by a generalized approach of McCord (1969) who defined a space RX for any abelian monoid R which can be interpreted as the configuration space of R-charged particles in X. The simplest case $R = \mathbb{N}$ gives the symmetric product and for R a group, it holds $\pi_n(RX) = H_n(X; R)$. Moreover, the functor RX turns cofibrations to fibrations and allows very quick proofs of many standard constructions and results in algebraic topology. We recall this miraculous theory of McCord and give also new applications and new proofs in more advanced situations.

11. **Dimitrios Kodokostas** (Division of Mathematics, School of Applied Mathematical and Physical Sciences, National Technical University of Athens, dkodokostas@math.ntua.gr)

    Rail knotoid invariants

    We derive invariants for rail knotoids in space and we discuss some connections with other mathematical objects. Rail knotoids are non-selfintersecting arcs in the usual 3-space with their endpoints on two parallel lines (the rails) and lying otherwise in the complement of these lines. Any two rail knotoids with common endpoints and no other intersections form a usual knot inside a handlebody of genus 2 whose axes are the rails. Rail knotoids admit diagrammatical representations similar to the ones for knots, and the multitude of the diagrammatical representations of any given rail knotoid calls for invariants calculated from any one of its representations. We derive such invariants after we attach to each rail knotoid diagram a couple of accompanying loops which we call as its over- and under-companion loops.

12. **Aristides Kontogeorgis** (Department of Mathematics, National and Kapodistrian University of Athens, kontogar@math.uoa.gr)

    Framed Thomson Groups

    The Thompson group was introduced by R. Thompson in 1965 and is a widely studied group in the literature of group theory. In a series of articles V.F.R. Jones developed a method in order to produce all knots and links from elements of the Thompson group. In our talk we will follow Jones' categorical approach in order to define the notion of the framed Thompson group. This group is interesting in itself and can be seen as a categorification of the ordinary Thompson group. We will show that every framed link can be obtained by an element of the Thompson group and we will introduce the notion of multiple framizations. This is a joint work with Sofia Lambropoulou.

13. **Georgios Kydonakis** (Department of Mathematics, University of Heidelberg, gkydonakis@mathi.uni-heidelberg.de, kydonakisgeorgios@gmail.com)

    Nonabelian Hodge theory on noncompact curves: from parabolic to parahoric structures

    Nonabelian Hodge theory is concerned with the study of the first cohomologies (Dolbeault, de Rham, Betti) of a complex algebraic variety X with nonabelian coefficients. These cohomologies are stacks in general and a central feature involves the correspondence between the relevant algebraic objects in those, namely, stable HIggs bundles, stable D_X-modules and irreducible fundamental group representations. When X is a non-compact curve and the group of coefficients is $\mathrm{GL}(n, \mathbb{C})$, a 1-1 correspondence is established by additionally equipping the algebraic objects with an appropriate weighted filtration, usually called a parabolic structure. Establishing a full correspondence beyond the $\mathrm{GL}(n, \mathbb{C})$-case has proven out to be a significantly more subtle problem, the main reason being the inadequacy of this parabolic structure to describe all conjugacy classes of the monodromies in the relative character variety (Betti space). The problem involving a general complex reductive group G can be solved in the realm of parahoric group schemes in the sense of Bruhat-Tits. We shall give a brief overview of this description in the talk.

14. **Christos Mantoulidis** (Department of Mathematics, Rice University, christos.mantoulidis@rice.edu)

    A nonlinear spectrum on closed manifolds

    The p-widths of a closed Riemannian manifold are a nonlinear analog of the spectrum of its Laplace–Beltrami operator, which was defined by Gromov in the 1980s and correspond to areas of a certain min-max sequence of hypersurfaces. By a recent theorem of Liokumovich–Marques–Neves, the p-widths obey a Weyl law, just like eigenvalues do. However, even though eigenvalues are explicitly computable for many manifolds, there had previously not been any ≥ 2-dimensional manifold for which all the p-widths are known. In recent joint work with Otis Chodosh, we found all p-widths on the round 2-sphere and thus the previously unknown Liokumovich–Marques–Neves Weyl law constant in dimension 2.

15. **Manousos Maridakis** (mmaridaki1@gmail.com)

    Spinor pairs and the concentration principle for Dirac operators

    We study perturbed Dirac operators of the form $D_s = D + sA \colon \Gamma(E) \to \Gamma(F)$ over a compact Riemannian manifold (X, g) with symbol c and special bundle maps $A \colon E \to F$ for $s >> 0$. Under a simple algebraic criterion on the pair (c, A), solutions of $D_s\psi = 0$ concentrate as $s \to \infty$ around the singular set $Z_A \subset X$ of A. We give many examples, the most interesting ones arising from a general "spinor pair" construction

16. **Christoforos Neofytidis** (Department of Mathematics, The Ohio State University, neofytidis.1@osu.edu)

    Realising sets of integers as mapping degree sets

    A long-standing topic in the study of manifolds is the computation of all possible degrees of maps between two given closed manifolds. To this end, significant tools have been developed, including coarse geometric methods (negative curvature and harmonic mappings), global analytic concepts

(Gromov's simplicial volume), as well as algebraic techniques (fundamental group and cohomology structures). In this talk, we initiate the opposite direction, relating number theoretic notions to topological data: Which subsets of the integers are realisable as mapping degree sets? On the one hand, we explain that arbitrary infinite sets are quite often not realisable, and, on the other hand, we show how to realise large classes of finite sets, including all arithmetic and positive geometric progressions. Joint work with S. Wang and Z. Wang.

17. **Christos-Raent Onti** (Department of Mathematics and Statistics, University of Cyprus, onti.christos-raent@ucy.ac.cy)

    A class of Einstein submanifolds of Euclidean space

    The knowledge on the subject of Euclidean Einstein submanifolds, except those with constant sectional curvature, is quite limited. In fact, as far as we know, until now the only classification result available under purely intrinsic assumptions is in the case of hypersurfaces, due to an observation by Cartan communicated by Thomas in 1937 and the work of Fialkow from 1938. In the talk, I will discuss the characterization of a class of Einstein manifolds isometrically immersed into Euclidean space as rotational submanifolds. The highlight is for submanifolds in codimension two since in this case our assumptions are purely intrinsic. This is a joint work with Marcos Dajczer (IMPA) and Theodoros Vlachos (University of Ioannina).

18. **Eleni Panagiotou** (Department of Mathematics, Leader of the Advanced Modeling and Simulation Thrust, Simcenter University of Tennessee at Chattanooga, eleni-panagiotou@utc.edu)

    Knotting and entanglement complexity of open curves in 3-space

    A novel framework in knot theory will be introduced that can characterize the complexity of open knots and open curves in 3-space in general. In particular, it will be shown how the Jones polynomial, a traditional topological invariant in knot theory, is a special case of a general Jones polynomial that applies to both open and closed curves in 3-space. Similarly, Vassiliev measures will be generalized to characterize the knotting of open and closed curves. When applied to open curves, these are continuous functions of the curve coordinates instead of topological invariants. Using the second Vassiliev measure, the knotting complexity of open random walks in confinement is studied for the first time without any closure scheme and it is proved that it grows as $O(n^2)$ with the length of the walk. A major problem in Applied Knot Theory is the computational cost of such functions in practice. It will be shown that preliminary theoretical results suggest the existence of closed formulas for the computation of the second Vassiliev measure, which would enable a dramatic improvement in the computational methods for identifying complexity or knotting of open or closed curves in applications. We will apply our methods to proteins and show that these enable us to create a new framework for understanding protein folding, which is validated by experimental data. These methods can thus help us understand biopolymer function and biological material properties in many contexts with the goal of their prediction and design.

19. **Maria Papatriantafillou** (Department of Mathematics, National and Kapodistrian University of Athens, mpapatr@math.uoa.gr)

    Differential structures on topological spaces. A categorical approach

    We consider differential structures, alias differential triads, in the framework of Abstract Differential Geometry. These structures form a category in which there exist various limits, absent in the category of smooth manifolds. Using these limits, for any topological space X and any fixed family F of continuous functions on X, we define a differential structure on X making all the functions in F differentiable, and satisfying a universal condition.

20. **Kleanthis Polymerakis** (Department of Mathematics, Aristotle University of Thessaloniki, polymerakis@math.auth.gr, kleanthispol@gmail.com)

    On the Bonnet Problem for Surfaces in 4-Dimensional Space Forms

    A basic problem in surface theory is to understand the role and the importance of the mean curvature. In 1867, Bonnet raised the problem to what extent a surface in a complete simply-connected 3-dimensional space form is determined (up to congruence) by the metric and the mean curvature. Several aspects of the Bonnet problem have been studied by many mathematicians and the results can be distinguished in two categories, according to whether the mean curvature function is constant or not. A well-known global result of Lawson-Tribuzy states that a compact surface of non-constant mean curvature admits at most one Bonnet mate. In this talk, we will present results on the Bonnet problem for surfaces in 4-dimensional space forms. Two isometric surfaces in a 4-dimensional space form have the same mean curvature if there exists a parallel vector bundle isometry between their normal bundles that preserves the mean curvature vector fields. We will see that if both Gauss lifts of a compact surface to the twistor bundle are not vertically harmonic, then the surface admits at most three Bonnet mates. Surfaces with a vertically harmonic Gauss lift turn out to be the higher codimensional analogues of constant mean curvature surfaces. Such surfaces allow locally a one-parameter family of isometric deformations with the same mean curvature, which is trivial only if the surface is superconformal. We will also present a new conformally invariant property related to the problem, called isotropic isothermicity, that extends the usual concept of isothermicity for surfaces in 3-dimensional space forms, to surfaces in 4-dimensional space forms with not necessarily flat normal bundle.

21. **Stratos Prasidis** (Department of Mathematics, University of the Aegean, prasside@aegean.gr)

Topological Rigidity of Quoric Manifolds

Toric varieties are structures that connect algebraic geometric properties to combinatorial calculations. The corresponding topological objects are quasitoric manifolds that are manifolds with the topological structure of a non-singular algebraic variety. They admit locally standard torus actions and the quotient is a polytope. We will present the analogues of these objects where the group that acts is $Q^n = (S^3)^n$. They are called quoric manifolds and the quotient is again a polytope. The main result is that quoric manifolds are topologically, equivariantly rigid i.e. every manifold that is Q^n-homotopy equivalent to a quoric manifold in Q^n-homeomorphic to it. The tools for proving the result are based on the methods used in the quasitoric case.

22. **Georgios Raptis** (Department of Mathematics, University of Regensburg, Georgios.Raptis@mathematik.uni-regensburg.de)

    Simplicial volumes and Euler characteristics of (aspherical) manifolds

    The simplicial volume and the Euler characteristic are two fundamental homotopy invariants of closed (oriented) manifolds which generally have very different properties. A well-known open question of Gromov asks whether the vanishing of the simplicial volume of an aspherical manifold implies the vanishing of its Euler characteristic. In this talk, after a quick review of the properties of the simplicial volume, I will discuss several approaches to relate these two fundamental invariants and then present some recent partial results in connection with Gromov's question. (This is based on joint work with C. Löh and M. Moraschini.)

23. **Evangelia Samiou** (Department of Mathematics and Statistics, University of Cyprus, samiou@ucy.ac.cy)

    The Linking Number and Biot-Savart Operators in Negatively Curved Symmetric Spaces

    In Euclidean space the linking number of two closed oriented submanifolds of complementary dimension is, in Maxwell's words, "the number of turns that one embraces the other in the same direction". It is the primary obstruction to disentangling them and can be computed from Gauss' famous integral formula, as a mapping degree. The linking number can also be defined via deRham theory, in terms of Poincare-duals of the submanifolds and a fundamental solution of the magnetostatic Maxwell equation, the "Biot-Savart Law". We show that the second approach can be extended to negatively curved symmetric spaces.

24. **Andreas Savas-Halilaj** (Department of Mathematics, University of Ioannina, ansavas@uoi.gr)

    Mean curvature flow and homotopy classes of maps between spheres

    Many fundamental results in geometry and topology have been established through developments of geometric evolution equations. In this talk, we will describe how one can use the mean curvature flow to investigate the homotopy class of a map between Riemannian manifolds. The results that we will present are joint with K. Smoczyk and R. Assimos.

25. **Foteini Sereti** (Department of Mathematics, University of Western Macedonia, seretifot@gmail.com)

    On local density and local weak density of the hyperspace of sets with finitely many components

    This talk is devoted to the investigation of cardinal invariants such as the local density, the local weak density and the relation between the tightness of the space of closed sets with finitely many components and the density of a topological space itself. Moreover, criterias for locally separability and locally weakly separability of compact spaces are obtained. Results of this talk are presented in the paper titled "On local density and local weak density of the hyperspace of sets with finitely many components" written by R. B. Beshimov, D. N. Georgiou, N. K. Mamadaliev and F. Sereti. This paper has been submitted to a scientific journal for a possible publication.

26. **Polyxeni Spilioti** (Department of Mathematics, Aarhus University, spilioti@math.au.dk)

    On the spectrum of twisted Laplacians and the Teichmüller representation

    In this talk, we will present some recent results concerning the spectrum of Laplacians with non unitary twists acting on sections of flat vector bundles over compact hyperbolic surfaces. These non self-adjoint Laplacians have discrete spectrum inside a parabola in the complex plane. For representations of the fundamental group of the base surface which are of Teichmüller type, we investigate the high energy limit and give a precise description of the bulk of the spectrum where Weyl's law is satisfied in terms of critical exponents of the representations which are completely determined by the Manhattan curve associated to the Teichmüller deformation. This is joint work with Frédéric Naud.

27. **Georgios Tsapogas** (Department of Natural Resources Development & Agricultural Engineering, Agricultural University of Athens, get@aua.gr)

    A specific model of Hilbert geometry on the open unit disc

    A quick survey on Hilbert geometry will be presented along with classical results which fit under Hilbert's 4th problem research activity. A new metric on the open unit disk will be defined making it a complete geodesic metric space whose geodesic lines are precisely the Euclidean straight lines. The unit disk with this new metric is not isometric to any hyperbolic model of constant negative curvature, nor to any convex domain in Euclidean space equipped with its Hilbert metric.