CIMA UAEH

A y F-M 2018

ANÁLISIS Y FÍSICA-MATEMÁTICA 2018

Del 15 al 17 de enero de 2018

Aula de Usos Múltiples del Edificio MF2

Ciudad del Conocimiento, Pachuca, Hidalgo.

	lunes	martes	miércoles
Hora / Día	enero 15	enero 16	enero 17
9:50-10:00	Inaguración		
10:00-10:55	Ng (1)	Ng (2)	Ng (3)
11:00-11:25	Café	Café	Café
11:30-12:25	Santiago (1)	Santiago (2)	Santiago (2)
12:30-13:25	Arizmendi O. (1)	Arizmendi O. (2)	Arizmendi O. (3)
16:00-16:55	Palacios	Kantun	Torres
17:00-17:25	Café	Café	Café
17:30-18:25	Vallejo (1)	Vallejo (2)	Vallejo (3)
18:30			Clausura

RESÚMENES

Octavio Arizmendi, CIMAT.

◇ "An introduction to free probability".

Abstract.

In this talk we will give an introduction to the theory of free probability. We will start motivation and definition of free independence and other notions of non-commutative independence. Afterwards we will derive limit theorems and present the combinatorial approach to free probability. Finally, we will explain relations with random matrix theory.

Gabriel Kantún-Montiel, BUAP.

◇ "Kato type decompositions".

Abstract. We say that an operator T on a Hilbert space H admits a Generalized Kato Decomposition if there exist two closed T-invariant subspaces $M, N \subset H$ such that $X = M \oplus N$, $T|_M$ is semi-regular and $T|_N$ is quasinilpotent. If T admits a Generalized Kato Decomposition with $T|_N$ nilpotent, we say that T admits a Kato decomposition. This decomposition is named after Tosio Kato, who proved that semi-Fredholm operators admit a Kato decomposition with N finite dimensional. B-Fredholm operators of M. Berkani admit a Kato decomposition, while Quasi-Fredholm operators of J.P. Labrousse are precisely those admitting a Kato decomposition. Operators that admit a generalized Kato decomposition were called pseudo Fredholm by M. Mbekhta. In this talk we review several Kato type decompositions and discuss some relations with Fredholm theory.

Ping W. Ng, LSU

◇ "Purely infinite corona algebras, extensions and double commutants"

Abstract. Motivated by the goal of classifying essentially normal operators using Fredholm indices, Brown–Douglas–Fillmore (BDF) classified all extensions of the form

$$0 \to \mathcal{K} \to \mathcal{E} \to C(X) \to 0$$

where X is a compact subset of the complex plane. Their beautiful work led to many developments, including the powerful Kasparov KK theory.

Perhaps one reason for the success of the BDF Theory is that, in the BDF context, the multiplier algebra $\mathbb{B}(l_2)$ and the corona algebra $\mathbb{B}(l_2)/\mathcal{K}$ have particularly nice structure. For example, in the original BDF approach, the uniqueness of the neutral element was essentially given by the Weyl–von Neumann–Berg theorem – which, to a younger generation of specialists, implies real rank zero.

We have sought out more general multiplier algebras and corona algebras with nice properties in order to generalize BDF Theory. The first talk sums up our results in this direction.

Since time is limited, the second and third talks will focus on one of our foundational techniques: The Elliott–Kucerovsky noncommutative Weyl–von Neumann theorem, and some of its proof techniques. This important result is a culmination of the classical theory of absorbing extensions, generalizing the work of multiple authors, including BDF, Voiculescu, Kasparov and Lin.

Francisco Torres, FC-UNAM.

◇ "A decomposition for the conditionally free additive convolution of probability measures"

Abstract.

In the frame of non-commutative probability spaces, we present the notions of conditionally free independence (c.f. independence for short) and the c.f. additive convolution of probability measures. Then we explain, briefly, how this independence interpolate the free, boolean and monotone independence. Lastly we present a formula that decomposes the c.f. additive convolution in terms of the free, boolean and monotone convolutions.

Lourdes Palacios, UAM.

◇ "A characterization of C*-normed algebras via positive functionals".

Abstract.

A functional f on an involutive algebra E is positive if $f(xx^*) \geq 0$ for all $x \in E$. It is known that C*-algebras always have a large supply of positive functionals. There is even the following result: Let $(E, \|\cdot\|)$ be a unital C*-algebra. Then, for every $z \in E$, there is a positive functional f such that $f(e) = 1$ and $f(zz^*) = \|z\|$.

In this talk we note that in fact this is a property that characterizes C*-algebras in the frame of involutive Banach algebras; moreover, the same situation is examined in some normed and non normed topological algebras. This is done through the existence of enough specific positive functionals.

José Antonio Vallejo, UASLP

◇(1) "How to design a quantum electronic nanodevice".

Abstract.

Nanoelectronic devices operate with extremely low intensity currents. Under these circumstances, it is desirable to have at our disposal mechanisms to produce and control electronic currents with high precision. Electronic beams are relatively easy to produce, but their filtering to obtain nanocurrents with specified properties is much more difficult. A widely used approach consists in directing the beam on a sequence of quantum barriers with an externally adjustable bias voltage applied throughout the device. One expects to be able to control the response of the device in the form of a current whose intensity depends, say, linearly on the applied bias. This setting naturally leads to an optimal design problem: What must be the width and height of the layers composing the barriers, supposed fixed in number, in order to achieve this linear response?

I will describe a new approach to this problem. It has two distinguishing features: First, the transmission coefficient is determined using a semi-classical approximation, so we can explicitly compute the gradient of the objective function. Second, in contrast with earlier treatments, manufacturing uncertainties are incorporated in the model through random variables, the optimal design problem is formulated in a probabilistic setting, and then solved using a stochastic collocation method. As a measure of robustness, a weighted sum of the expectation and the variance of a least-squares performance metric is considered. Several simulations illustrate the proposed technique, which shows an improvement in accuracy over 69 % with respect to brute-force, Monte-Carlo–based methods.

◇(2) "Symplectic connections, classical and super".

Abstract. In the mid 90s, B. Fedosov gave an algorithm for explicitly constructing the deformation quantization of a symplectic manifold, in which he made heavy use of symplectic connections. In many aspects, symplectic geometry (being determined by a 2−covariant tenso field) is similar to Riemannian geometry: there are distinguished connections (torsionless and compatible with w or g), a Riemann curvatuire tensor can be introduced in both cases, and even a Ricci tensor can be constructed by contracting the Riemann curvature with either w or g. But this seems to be the end of the parallelism: a further contraction of the Ricci tensor, that would lead to the symplectic scalar curvature, gives 0 in the symplectic case due to symmetry reasons.

One way to escape from this restriction is provided by supermanifolds. In the super category, there are even and odd symplectic supermanifolds, having opposite symmetries in their defining symplectic superforms. Thus, for odd symplectic supermanifolds it is possible to define the notion of odd scalar symplectic curvature. However, its explicit computation is extremely complicated. I will show a class of classical manifolds (Weyl manifolds) for which this can be done, and I will comment on their physical meaning (related to the Higgs field).

◇(3) "Matemáticas con tu smartphone (criptografía básica)".

Abstract.

La criptografía elemental es una de las aplicaciones más conocidas de las matemáticas (y de las mas antigüas). No se requiere de unas matemáticas muy avanzadas y lo mejor de todo es que se puede implementar en cualquier celular moderno que disponga del sistema operativo Android. En la platica mostrare como usar el Sistema de Álgebra Computacional (CAS) Maxima para dar los primeros pasos en el mundillo de la criptografía. Seria deseable que los asistentes se descargaran el programa MaximaOnAndroid (https://play.google.com/store/apps/details?id=jp.yhonda&hl=en) en sus celulares para poder ejecutar personalmente algunos ejemplos.

Luis Santiago, Lakehead

◇"TBA".

Abstract. TBA