List of plenary talks and abstracts.

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Properties of certain sets of functions having special properties

`Abstract.` We discuss work with Vladimir Gurariy and Juan Seoane, in which it is shown that the set of everywhere differentiable, nowhere monotone functions $f : \mathcal{R} \to \mathcal{R}$ contains an infinite dimensional vector space. We also hope to discuss recent work (by others) involving the set of entire functions $f : \mathcal{C} \to \mathcal{C}$ such that the set $\{f(z), f(z+a), \ldots, f(z+na), \ldots\}$ is dense in $H(\mathcal{C})$.

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Nonexpansive Metric Projections in Spaces of Continuous Functions

`Abstract.` Let K be a subset of a Banach space E. We discuss the existence of a retraction $\varphi : E \to K$ which is simultaneously nonexpansive and a nearest point map. (We shall then say that K is a proximinal nonexpansive retract of E.)

Among other results we characterize subspaces of codimension one in spaces $C(S)$ of continuous functions which are proximinal nonexpansive retracts of $C(S)$ as well as the proximinal nonexpansive retracts in l_∞^n.

This is joint work with Rafael Espínola and Genaro López.

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On the range of the derivative of a Gateaux-smooth mapping between Banach spaces

`Abstract.` We consider the following problem : Given two separable real Banach spaces X and Y, does there exist a Lipschitz continuous and bounded mapping from X to Y such that f is Gateaux differentiable at each point of X, and, for each $x, y \in X$ we have $||f'(x) - f'(y)|| > 1$ whenever x is different from y ? We show that this is not always possible (for instance this is not possible if $dim(Y) = 1$), but there are Banach spaces X and Y where this construction can be performed, for instance when $X = Y$ is the separable Hilbert space, or when $X = \ell^1$ and $dim(Y) = 2$. This answers a question of Gilles Godefroy raised during the seventh edition of the International Conference on Infinite Dimensional Analysis held in Madrid in 2001.

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Weakly compactly generated spaces and their relatives

`Abstract.` A Banach space is called WCG it contains a weakly compact linearly dense subset. For instance, reflexive spaces or $C(K)$, with K Eberlein compact, are such. The WCG spaces form an important subclass of nonseparable Banach spaces, with many nice properties. Their relatives are subspaces of WCG spaces, Vašák (i.e. WCD) spaces, weakly Lindelöf determined spaces, Hilbert generated spaces, subspaces of Hilbert generated spaces, ... We shall characterize each of these classes in terms of the presence of a total set therein with some extra properties. Other characterizations can be expressed via an equivalent norm with some kind of differentiability. A sample result: X is a subspace of a WCG space if and only if it admits a linearly dense set $\Gamma \subset X$ and subsets $\Gamma_n^\varepsilon \subset \Gamma,\ \varepsilon > 0,\ n \in \mathbb{N}$, such that $\bigcup_{n\in\mathbb{N}} \Gamma_n^\varepsilon = \Gamma$ and for every $x^* \in X^*$, every $\varepsilon > 0$, and every $n \in \mathbb{N}$ the set $\big\{\gamma \in \Gamma_n^\varepsilon;\ x^*(\gamma) > \varepsilon\big\}$ is finite. As a consequence we get a functional-analytic proof of a well known fact that a continuous image of a (uniform) Eberlein compact is such. Our technique also reproves Farmaki's result on sitting (uniform) Eberlein compacta in $\Sigma(\Gamma)$.

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Composition Operators on Uniform Algebras

`Abstract.` The talk will focus on composition operators on uniform algebras and the existence of attracting cycles for the corresponding self-map of the spectrum of the uniform algebra. The pseudohyperbolic metric on the spectrum and hyperbolically bounded sets will play a decisive role.

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Schauder Bases for Symmetric Tensor Products

`Abstract.` For a Banach space E with Schauder basis, we prove that the n fold symmetric tensor product $\hat{\otimes}^n_{\mu,\, s}E$ has a Schauder basis for all symmetric uniform crossnorms μ. This is done by modifying the square ordering on $\mathbb{N}^n$ and showing that the new ordering gives tensor product bases in both $\hat{\otimes}^n_{\mu}E$ and $\hat{\otimes}^n_{\mu,\, s}E$.

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Holomorphic Functions on Domains in Operator Spaces

`Abstract.` This talk will give an overview of facts and unsolved problems about bounded symmetric domains, Siegel domains of genus 2 and unbounded homogeneous domains in spaces of operators.

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Polynomial Topologies on a Banach Space

`Abstract.` Let X be a real Banach space. The *weak polynomial* topology w_P on X is defined as the weakest topology for which every polynomial on X is continuous. Then w_P is given by a family of translation-invariant semi-metrics, but in general it is not linear. Canonically related to w_P, we introduce the so called *locally convex polynomial* topology τ_P on X. We prove that τ_P is the finest locally convex topology which is coarser than w_P. Several properties of the seminorms defining τ_P are also studied. Finally, the convergence of sequences for w_P and τ_P is compared.

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KAM theory in Infinite Dimensional Spaces

`Abstract.` KAM theory is one of the two major theories in Dynamical Systems developped during the XXth Century. Its scope reaches other fields as Riemannian Geometry, PDE and Functional Analisis. For example, it did motivate Hamilton Local Inversion Theorem in Good Frechet spaces. Our purpose is to describe recent developments of KAM theory to Hamiltonian systems in Infinite Dimensional spaces.

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Polynomials on Banach Spaces with Unconditional Schauder Bases

`Abstract.` Let X be a Banach space with an unconditional Schauder basis. We consider the problem of representing a homogeneous polynomial on a X by an unconditionally convergent monomial expansion. A recent result of Defant and Kalton shows that, in infinite dimensions, the space of n-homogeneous polynomials does not have an unconditional basis. However, it may be possible to represent a homogeneous polynomial by a monomial expansion that is pointwise unconditionally convergent. For example, when $X = \ell_1$, every homogeneous polynomial has this property. Matos isolated the spaces of n-homogeneous polynomials that have pointwise unconditionally convergent monomial expansions and defined a complete norm for these spaces. We explore some properties of the Matos spaces, including a connection with absolutely summing operators.

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Integral Representation of Holomorphic Functions on Banach Spaces

`Abstract.` The Cauchy integral formula has no true analogue in infinite-dimensional holomorphy. The usual generalisation, though quite useful, is essentially the one-dimensional formula in each direction: for each x, and $|z| < r$,

$$f(zx) = \frac{1}{2\pi i} \int_{|\lambda|=r} \frac{f(\lambda x)}{\lambda - z} d\lambda.$$

However, integral expressions valid for some homogeneous polynomials and some holomorphic functions have been proposed. All of them involve integration over E' rather than E. An integral k-homogeneous polynomial over E is

$$P(x) = \int_{B_{E'}} \gamma(x)^k d\mu(\gamma),$$

and an integral holomorphic function $f : B_E^\circ \longrightarrow C$ is

$$f(x) = \int_{B_{E'}} \frac{1}{1 - \gamma(x)} d\mu(\gamma).$$

In these expressions, the measure μ is said to represent the polynomial P or the function f, but there are many such representing μ's, and little has been said in the way of expressing these measures in terms of the functions and a universal measure G, i.e.: $d\mu(\gamma) = \tilde{f}(\gamma) dG(\gamma)$.

In this talk we discuss this problem for a class of entire functions of exponential type over a Banach space E with separable dual. We obtain integral representations of the form

$$f(x) = \int_{E'} e^{\gamma(x)} \tilde{f}(\gamma) dG(\gamma)$$

where G is a Gaussian measure on E' and $\tilde{f}$ is a transformation of f involving the covariance operator of G.