ISAA 2016

List of Participants
September 2016
Metepec, Atlixco, Puebla

List of Participants

1

Minicourses

1.1 Mati Abel

University of Tartu, Estonia
email: mati.abel@ut.ee
C^*-algebras and topological algebras

A brief introduction to topological algebras will be given. The pure algebraic background (ideals, invertibility, quasi-invertibility, Jacobson radical, involution, spectrum, unitization) will be given. Main classes of algebras (q-algebras, gelfand-mazur algebras, banach algebras, C^*-algebras, locally bounded algebras, locally convex algebras, locally pseudoconvex algebras) will be described and main results in there (Gelfand- Mazur theorem, Gelfand-Naimark theorem and others) will be formulated. Function algebras will be considered separately. Several open problems in topological algebras will be presented.

1.2 Luigi Accardi

Centro Vito Volterra, Università degli Studi di Roma Tor Vergata, Italy
email: accardi@volterra.uniroma2.it
Weak coupling limit type generators: non-equilibrium states of quantum systems

1.3 Jesús Adrián Espínola Rocha

UAM-Azcapotzalco
email: jaer.azc.uam.mx@gmail.com
The inverse scattering method for solving a class of partial differential equations

We know that many ordinary differential equations (linear and nonlinear) as well as some partial differential equations, PDEs, (say, the classical wave, hear and Laplace equations) can be solved in closed form and there is a systematic way to extract information and their solutions However, there is a huge range of PDEs, mainly nonlinear, which are not amenable of finding exact solutions neither a method to solve, study, or extract information out of them . In the 19th century, the Korteweg-deVries equation (a nonlinear PDE) appeared as a model to describe wave propagation in shallow water. This equation was forgotten for decades. It was not until 1967, when a group of four mathematicians in

Princeton found a method to solve it: the inverse scattering method. In this minicourse I will show how Gardner, Greene, Kruskal and Miura solved the equation. I will show some other extensions related, such as Lax pair representation, and how this allowed to solve some other nonlinear PDEs such as the nolinear Schrödinger equation. If time permits, I will talk about Hirota's method and the Bäcklund transform applied to this type of equations.

1.4 Andrea Barth

Stuttgart University, Germany
email: andrea.barth@mathematik.uni-stuttgart.de
Multilevel Monte Carlo methods

In this Lecture I will provide an introduction to Monte Carlo methods and their probabilistic foundations. After a primer on the Laws of Large Numbers, I will make a little excursion to random number generation. This will equip us with the foundations to define and study the Monte Carlo estimator. We will see that the key to improve the –at first naive– Monte Carlo approach is Variance Reduction. After a brief overview of the most common methods for the latter, I will focus on a specific one: the multilevel Monte Carlo method. I will then comment on further improvements of the multilevel Monte Carlo method and present typical applications in uncertainty quantification and stochastic (partial) differential equations.

2

Talks

2.1 Marina Haralampidou

University of Athens
email: mharalam@math.uoa.gr
On the left regular representation of complemented algebras

We study some properties of the left regular representation of certain complemented algebras. We also present the relationships between the closed ideals, the left regular representation, and the left multiplier algebra in the context of topological algebras, complemented or not.

2.2 Hugo Arizmendi Peimbert

Universidad nacional Autónoma de México
harizmendimx@yahoo.com.mx
On algebras of bounded continuous functions valued in a topological algebra

Let X be a completely regular Hausdorff space. We denote by $C(X, A)$ the locally convex algebra of all continuous functions on X valued in a locally convex algebra A with a unit e. Let $C_b(X, A)$ be its subalgebra consisting of all bounded continuous functions and endowed with the topology given by the uniform seminorms of A on X. It is clear that A can be seen as the subalgebra of the constant functions of $C_b(X, A)$, then is natural to ask which properties of A, as being a Q-algebra i.e. the set $G(A)$ of the invertible elements of A is open, or a Q-algebra with a stronger topology, can be extended to $C_b(X, A)$. We answer positively some of these questions.

2.3 Lourdes Palacios

Universidad Autónoma Metropolitana - Iztapalapa
e-mail: pafa@xanum.uam.mx
On Q-Algebras and Spectral Algebras

T. Palmer gave the definition of a spectral seminorm and some euivalent statements for the seminormed algebras to be spectral. Some of these statements have been studied in the locally m-convex

case and in the locally pseudoconvex case. In this talk we give some analogous results for locally m-pseudoconvex algebras. Joint Work with Reyna María Pérez Tiscareño and Carlos Signoret.

2.4 Jorge Bolaños

Universidad Autónoma Metropolitana - Iztapalapa
e-mail: kajito@gmail.com
On some spectral properties of circulant QMS generators

The circulant structure of a matrix together with the structure of the generator Q of a continuos time reducible Markov chain (finite state space) are used to derive some properties regarding the periodicity (in a particular sense) of the spectrum of Q, and the connection with the irreducible classes of the chain. This is motivated by the study of the spectrum of circulant a QMS and, in particular, its quantum spectral gap.

2.5 Gabriel Kantún Montiel

Benemérita Universidad Autónoma de Puebla
gkantun@fcfm.buap.mx
Generalized invertibility and circularly isolated spectral sets

Several generalized inverses are naturally linked to spectral sets. For instance, the group, Drazin and Koliha-Drazin inverses are related to the spectral set $\{0\}$. In case of an (isolated) spectral set σ, we have the σ-g-Drazin inverse of Koliha and Dajic. These inverses are particular cases of the outer inverse with prescribed range and null space or, more generally, the (b, c)-inverse. In this talk we pay special attention to generalized inverses related to circularly isolated spectral sets. We discuss some applications to generalized Mbekhta decomposition.

2.6 Victor Alberto Cruz Barriguete

Universidad Autónoma Metropolitana-Azcapotzalco
vacb@azc.uam.mx
On the Dirac-Beltrami Equation

In this talk we will discuss some results about of reularity of the Dirac-Beltrami equation $\mathcal{D}f = \mu(x)\overline{\mathcal{D}}\, f + h$, where $\mathcal{D}$ is the left Dirac operator in $\mathbb{R}^{n+1}$ acting on functions in $\mathbb{R}^{n+1}$ and with values in the complex Clifford algebra $\mathcal{C}\ell_n$, $\overline{\mathcal{D}}$ is its conjugate, and μ is a $\mathcal{C}\ell_n$-valued function with compact support, with vanishing mean oscillation, satisfying $\|\mu\|_{1,\infty} = \sum \|\mu_\alpha\|_\infty < 1$, where (μ_α) are the coordinates of μ in $\mathcal{C}\ell_n$. This work is joint with Emilio Marmolejo-Olea and Salvador Perez-Esteva.

2.7 Mohamed Oudadess

École Normale Supérieure, Rabat, Morocco
pafa@xanum.uam.mx, oudadesshha@gmail.com
A characterization of the real field by a single inequality

We replace equalities, involving a norm, by inequalities in Mazur's, Aurora's and Edwards results concerning the classical fields R, C and H, as normed algebras. We point out a relation, of those inequalities, with commutativity conditions. So, we can neatly characterize each one of the three fields. We also consider similar inequalities, using the spectral and the numerical radii.

2.8 Héctor Merino Cruz

Universidad Autónoma de Guerrero
hmerinoc@gmail.com
On the ideal structure of certain algebras of holomorphic functions

We consider certain Banach algebras of holomorphic functions which is associated to holomorphic and nowhere vanishing on unit disc function G. We show conditions on G for that certain closed ideals of these algebras to be standard.

2.9 Homero G. Díaz-Marín

Universidad Michoacana
hdiaz@umich.mx
Dirichlet to Neumann operator for abelian Yang-Mills gauge fields

We consider the Dirichlet to Neumann operator for abelian Yang-Mills boundary conditions. The aim is constructing a complex structure for the symplectic space of boundary conditions of Euler-Lagrange solutions modulo gauge for space-time manifolds with smooth boundary. Thus we prepare a suitable scenario for geometric quantization within the reduced symplectic space of boundary conditions of abelian gauge fields.

2.10 Lino Feliciano Reséndis Ocampo

Universidad Autónoma Metropolitana - Azcapotzalco
e-mail: lfro@correo.azc.uam.mx
Quasi-Möbius invariant quaternionic spaces

Let $\mathbb{H}(B)$ denotes the $\mathbb{H}-$right module of quaternion valued functions defined in the unit ball B of $\mathbb{R}^4$ and consider linear operators $L : \widetilde{\mathbb{H}}(B) \to \mathcal{H}(B)$ where $\widetilde{\mathbb{H}}(B)$, is a right submodule of $\mathbb{H}(B)$ and $\mathcal{H}(B)$ is also a right submodule of $\mathbb{H}(B)$ whose components are harmonic. In this talk we will show that for different choosings of $\widetilde{\mathbb{H}}(B)$ and L we can obtain for instance, the Bergman space of monogenic or harmonic functions, the $F(p, q, s)$ space of hyperholomorphic functions or the $F(p, q, s)$ Bergman space. We explore in particular their quasi-Möbius invariant property. This is a

joint work with Jorge Pérez H. and Luis M. Tovar S. Universidad Autónoma Metropolitana, Campus Azcapotzalco - México

2.11 Fernando Bernal-Vílchis

Facultad de Ciencias, Universidad Autónoma del Estado de México
email: correoacademico2015@gmail.com
On the Solutions for a Pseudodifferential Schrödinger type Equation on a Half line

We study an Initial and Boundary Value Problem for a Nonlinear Pseudodifferential Schrödinger type Equation. Initially, we consider the associated linear problem posing a Riemann-Hilbert problem and constructing a Green function for solving it. Then we comment about the treatment of the nonlinear problem analising a contraction mapping, and a variant of Duhamelt's principle. We comment briefly about assymptotics estimates used here.

2.12 Shirley Bromberg

Departamento de Matemáticas, Universidad Autonoma Metropolitana Unidad Iztapalapa
stbs@xanum.uam.mx
Fefferman's work on Whitney Extension Theorem

In 1934, H. Whitney published two articles addressing the problem of characterizing the restrictions of C^r functions to a closed set. He gave a complete answer for closed sets of the real line. The answer in general was, in some sense, a partial one. Many efforts were made to find a complete answer in general, both from an analytical and a geometrical point of view. In 2005 Charles Fefferman gave such a characterization. We will discuss the solutions he gave both analytical and geometrical, the relation with interpolation problems, and we present some open related questions.

2.13 Jesús Chargoy

Universidad Autonoma Metropolitana Unidad Iztapalapa
cacj@xanum.uam.mx
Involved volatility in the Black-Sholes equation

By means of a change of variables we give a parametrization for the Involved volatility in the Black-Sholes equation.

2.14 Franco Fagnola

Politécnico de Milán, Italy
TBA

2.15 Roberto Quezada

Depto. de Matematicas, UAM-Iztapalapa
email: roqb@xanum.uam.mx
TBA

2.16 Fernando Guerrero Poblete

UAM-Iztapalapa
poblete22@hotmail.com
On the interaction operator of the weak coupling limit type qms

In this talk, we show the relationship between the interactión graph associaterd whit a Markov generator and the structure of the interaction operator.

2.17 Jorge Esquivel-Ávila

Universidad Autonoma Metropolitana Unidad Azcapotzalco
jaea72@gmail.com
Partial results of the dynamics of an evolution equation

We consider a second order in time evolution equation in a Banach space. We study some qualitative properties such as globality, blow up and asymptotic behavior, characterized by the initial conditions. To this end, we employ invariant sets.

2.18 Marco Antonio Cruz de la Rosa

Universidad Autonoma Metropolitana Unidad Iztapalapa
marko@xanum.uam.mx
Non-equilibrium steady states of a Markov generator of weak coupling limit type modeling absorption-emission of m and n photons

We study detailed balance and non-equilibrium steady states of a Marvok generator of weak coupling limit type, modeling absorption and simultaneous emission of m and n photons. In the case $n = 4$ and $m = 2$, under natural constrains on the absorption and emission rates, there exist infinitely many non-equilibrium steady states wich are convex linear combination of even and odd states.

2.19 Santiago Moreno–Bromberg

University of Zurich, Department of Banking and Finance, Plattenstrasse 32, 8032 Zurich, Switzerland
santo.moreno@gmail.com
Divestment and Growth under Agency Conflicts

It is not uncommon to observe that, over their lifetime, firms contract and expand. There are different mechanisms at work when this happens. In this talk, based on ongoing research with Guillaume Roger (University of Sydney), I will present a continuous-time model of the aforementioned situation(s), where financial frictions correspond to agency conflicts. I will study a dynamic contracting problem in which the size of the firm is one of the state variables. To boost performance, the firm's manager may take on excessive risk that enhances current gains but exposes the financiers to large, infrequent losses. So as to preserve incentive compatibility, the optimal contract uses size as an instrument: the financiers downsize the firm when the manager can no longer be provided incentives to avoid excessive risk taking at a given scale, i.e. when her continuation utility (the second state variable) is small. On the other side of the spectrum, when the manager's continuation utility is large enough, the firm may be expanded without jeopardizing the provision of incentives. Given that the aforementioned continuation utility evolves randomly, the divestment and growth processes coexist, which generates rich firm-size dynamics. I will use stochastic-control techniques to characterize the financiers' value function, as well as the structure of the optimal contract and, as a consequence, the divestment-growth cycle.

2.20 Milan Tvrdý

Institute of Mathematics of the Academy of Sciences of the Czech Republic
tvrdy@math.cas.cz
Singular Nonlinear Periodic Problems

Our aim is to present a survey of existence results achieved for singular periodic problems of the form

$$u'' = f(t, u, u'), \quad u(0) = u(T), \quad u'(0) = u'(T),$$

where $0 < T < \infty$, f satisfies the Carathéodory conditions on $[0, T] \times (0, \infty) \times \mathbb{R}$ and can have

a space singularity at $x = 0$. This means that

$$\limsup_{x \to 0+} |f(t, x, y)| = \infty \quad \text{for a.e. } t \in [0, T] \text{ and some } y \in \mathbb{R}$$

may happen.

According to physicists f has an *attractive* singularity at $x = 0$ if

$$\liminf_{x \to 0+} f(t, x, y) = -\infty \quad \text{for a.e. } t \in [0, T] \text{ and some } y \in \mathbb{R}.$$

Alternatively, f is said to have a *repulsive* singularity at $x = 0$ if

$$\limsup_{x \to 0+} f(t, x, y) = \infty \quad \text{for a.e. } t \in [0, T] \text{ and some } y \in \mathbb{R}$$

holds. Mainly, we will consider the more difficult case of the repulsive singularity.

Typical models of the problems discussed are e.g. Brillouin electron beam focusing system or the Ermakov-Pinney equation. Second order nonlinear differential equations or systems with singularities appear naturally in the description of particles submitted to Newtonian type forces or to forces caused by compressed gases. Equations modelling such problems are usually called the Liénard-Forbat equations. We will also pay a special attention to the problem modelling the Liebau valveless pumping phenomenon.

2.21 María Guadalupe Morales Macías

Universidad Nacional Autónoma de México
lupittah@hotmail.com
A Factorization Theorem in the space of Henstock-Kurzweil integrable functions

In this work we extend the factorization theorem of Rudin and Cohen to $HK(\mathbb{R})$, the space of Henstock-Kurzweil integrable functions. We also study in this context the Banach algebra of functions $HK(\mathbb{R}) \cap BV(\mathbb{R})$, which is also a dense subspace of $L^2(\mathbb{R})$.

2.22 Francisco Javier Mendoza-Torres

Facultad de Cs. Físico Matemáticas, Benemérita Universidad Autónoma de Puebla
jmendoza@fcfm.buap.mx
The Fourier-Plnacherel transform for bounded variation functions

We prove the Plancherel's theorem for functions within a subset of bounded variation functions. On this subset, the Fourier transform has a pointwise expression, this is important because this subset is dense in some Lp's spaces.

2.23 Juan Héctor Arredondo

Universidad Autonoma Metropolitana Unidad Iztapalapa
iva@xanum.uam.mx
Loss of uniqueness to Evolution Equations Solutions

Uniqueness is not required; only upper semi-continuity with respect to initial conditions is assumed. The time scale is an ordered Abelian semigroup. All concepts are defined as relations between quasifilters. As an example, a system in infinite-dimensional spaces of coupled diffusion equations with Dirichlet and Neumann boundary conditions is analyzed.

3

Posters

3.1 Alfredo Reyes Vazquez

Universidad Autonoma Metropolitana Unidad Iztapalapa
alfreduamizt@gmail.com
Some Aspects of Interpolation Theory and Integration

We shall discuss the basic concepts of interpolation theory such as intermediate space for a given couple of Banach Spaces. We present the classical interpolation theorem of Riesz-Thorin for L^p-spaces and a description for interpolation spaces. Finally we will give a result for dual spaces among interpolation and some examples involving the Henstock-Kurzweil integral.

3.2 Gildardo Barientos

Universidad Autonoma Metropolitana Unidad Cuajimalpa
GILDARDO.BARRIENTOS@gmail.com
Difussion equations on curved surfaces

The study of dynamic of a particle on a curved medium is not new but it is a problem of such interest due the applications to Physics. For example, the difussion process in Biophisics in the study of a partile's motion over a cell membrane. In bigger scales, pattern formation as found in animals skin, being different according to the part of the subject. Hence, it is important the tools of Differential Geometry to study the consequences of the curvature of the medium over the process of such fenomena.

3.3 Pavel Ramos

Universidad Nacional Autonoma de México
email: pavelrmg@gmail.com
Some properties in m-convex algebras and their space of non zero multiplicative linear functionals

In this poster we consider an algebra A m-convex, commutative with unit e, present some properties of the algebra related to maximal ideals, finitely generated ideals, joint spectrum, continuous spectrum and study the relation between them also we use the hk-topology in the maximal ideal space

considered by Mati Abel and Krzysztof Jarosz, and we prove that this topology is weaker than the weak topology in the space of non zero multiplicative linear functionals, finally we use this results to study the space non zero multiplicative linear functionals defined on A.

3.4 Rubén Becerril Borja

Universidad Autonoma Metropolitana Unidad Iztapalapa
pavelrmg@gmail.com
Equilibria in sequential games with finite horizon and incomplete information in the turn order

Game theory is a branch of mathematics that models situations where two or more individuals interact with each other. One possible situation that can be modelled occurs when the information that each person has is incomplete, that is, not every aspect of the game is known for certain. When dealng with sequential games, models assume that the order of turns is given and known by every player from the beginning of the game. In this poster we'll show a model with incomplete information in the order of turns in which decisions are to be made, therefore each player models that uncertainty as a random variable. Our model also includes the possibility of changing the sets of strategies in each turn for each player, changing the probabilities that model the turn selection process, including the fact that those probabilities may depend on decisions made in previous turns. For this model we'll show the results obtained that assure the existence of equilibria for finite strategy sets and infinite compact strategy sets, as well as the characterizations for these equilibria.

3.5 Yuliana de Jesús Zárate Rodríguez

Universidad Autonoma Metropolitana Unidad Iztapalapa
zayuri_zarate_01@hotmail.com
On Q and TQ topological algebra

The Q**-property** was defined by I. Kaplansky back in 1947 and it was formulated in the context of topological rings. It states that the set of quasi-invertible elements in a topological ring (or topological algebra) is an open set. The name of the property seems to be connected with the initial letter of the word **quasi**. A topological algebra A is a Q**-algebra** if it satisfies the Q-property. Q-algebras plays an important role in topological algebras theory, sharing several significant properties of Banach algebras; just to mention a few of them, they have equicontinuous Gelfand transform, every character is continuous, every maximal regular ideal is closed, every element has a compact spectrum.

As a very convenient generalization of invertibility and the Q-property, A. Najmi and, independently, H. Arizmendi, A. Carrillo and L. Palacios, studied the notion of Topologically Q-algebra defining that a topological algebra is a TQ**-algebra** if the set of all its topologically quasi-invertible elements (topologically invertible elements if A possesses a unit) is an open set, where $x \in A$ is **topologically quasi-invertible** (**topologically invertible**) if there exists a net $\{x_\lambda\}_{\lambda\in\Lambda}$ in A such that $x \circ x_\lambda \to 0$ and $x_\lambda \circ x \to 0$ ($x \cdot x_\lambda \to e$ and $x_\lambda \cdot x \to e$).

A. Najmi distinguished the above class of TQ-algebras and prove that they possess most of the important properties of Q-algebras. It should be noted here that the set of topologically quasi-invertible elements have also been considered by Mati Abel in 2001, from another point of view.

Although this notion is a generalization of the Q-property, it is usually stated in the unitary case and often in the context of a commutative algebra . In this poster we study several properties of TQ-

algebras without any extra assumption regarding neither having unit element nor commutativity; so we will be dealing with left, right and two-sided topological quasi-invertibility and notions related, such as spectrum and spectral radius.

We are devoted to the study of the notion of **topological functional spectrum** in Gelfand Mazur and in m-convex commutative algebras. We provide sufficient conditions for a TQ-algebra to be a Q-algebra; this is accomplished via spectral properties and Ideal Theory. is devoted to the study of q and qt-topological ideals and their relation with advertibility.