37th International Conference on

Quantum Probability and Related Topics

22 - 26 August 2016

Organised by
Kulliyyah of Science,
International Islamic University Malaysia

PROGRAMME BOOK

22nd - 26th August 2016

Kulliyyah of Science,
International Islamic University Malaysia,
Kuantan, Pahang, Malaysia.

The 37-th International Conference on Quantum Probability and Related Topics (QP37) 2016

VENUE: KULLIYYAH CONFERENCE ROOM, GROUND FLOOR, KULIYYAH OF SCIENCE, IIUM KUANTAN PAHANG

This year's **The 37-th International Conference on Quantum Probability and Related Topics (QP37)** is organized by the Kulliyyah of Science (KOS) International Islamic University Malaysia. The conference is initiated by The Association for Quantum Probability and Infinite Dimensional Analysis (AQPIDA).

The 37-th International Conference on Quantum Probability and Related Topics (QP37) aims to provide an international forum for researchers to present and discuss recent advances and new findings in quantum probability and its applications. Moreover, it should accelerate the growth of mathematics and its applications and their benefits to the community at large. In this conference, leading mathematicians covering recent developments in Quantum Probability and Infinite Dimensional Analysis, with applications to Mathematical Physics, Quantum Information Theory and other related fields, and contributed talks by younger researchers reporting on their recent works.

This year's event will be held at the Kulliyyah Conference Room, Kulliyyah of Science (KOS), International Islamic University Malaysia (IIUM), Kuantan, Pahang. We are honored to welcome participants from China, India, Italy, Japan, Jordan, Korea, Malaysia, Nigeria, Taiwan, Tunisia, Turkey, UK, USA and Uzbekistan.

Enjoy the Conference!

FOREWORD BY THE DEAN, KULLIYYAH OF SCIENCE

السلام عليكم ورحمة الله وبركاته

Praise be to Allah S.W.T. for His grace and benevolence that our Kulliyyah of Science, has succeeded in organizing The 37-th International Conference on Quantum Probability and Related Topics (QP37). I wish to take this opportunity to thank the QP37 2016 committee who has contributed to making this event a reality. I would also like to express my thanks to the Kulliyyah of Science and the International Islamic University Malaysia for their support in making this conference possible.

This time around, the Kulliyyah of Science Quantum Research Unit has the pleasure to conduct this auspicious conference in collaboration with the Kulliyyah of Science Department of Computational and Theoretical Sciences. Our theme: Contemporary Mathematics, Mathematical Physics and their Applications.

In line with the missions and visions of IIUM, we hope to produce high-quality graduates, to propel research at the international level, to strengthen existing research groups, and to encourage as well as intensify research activities. The core objective of this conference is to construct and promote a network of national and international mathematicians and scientists. This conference includes mathematicians ranging from the pure to the applied ends of the mathematics spectrum, educational researchers from primary to higher education, tutors, PhD students and learning support staff. The range of papers comprising this issue exemplifies the diverse experience and knowledge of the international community.

I wish that all our delegates and participants will depart from this conference with the satisfaction of having a very fulfilling, pleasant and rewarding experience.

Thank you.

PROF. DR. KAMARUZZAMAN YUNUS
Dean, Kulliyyah of Science
International Islamic University Malaysia

A WELCOMING MESSAGE FROM THE CHAIRPERSON

السلام عليكم ورحمة الله وبركاته

and sincere greetings to all

On behalf of the organizing committee, I would like to extend a very warm welcome to the distinguished delegates and participants of The 37th International Conference on Quantum Probability and Related Topics (QP37).

The 37th International Conference on Quantum Probability and Related Topics (QP37) is initiated by The Association for Quantum Probability and Infinite Dimensional Analysis (AQPIDA). The conference is part of the traditional series of yearly conferences on quantum probability and related topics. We are honored to be given the responsibility to host the 37th International Conference on Quantum Probability and related Topics this year.

This conference aims to reflect the extent of diverse impact of the theory of quantum probability and its application to the mathematics community. This QP37 is hoped to capture the ever-challenging issues of transition and student motivation, in doing research in the area of quantum probability.

We hope this conference will be successful in its deliberations to further enhance the understanding and integration of mathematical knowledge that could contribute to the globalization of knowledge. This is indeed, in line with Malaysian government's aspirations in promoting and striving for further advancement of science and technology in Malaysia.

Once again, we welcome you to the conference. May Almighty God, Allah helps us achieve our novel goals. We hope you will have a fruitful and memorable time here in Malaysia.

PROF DR FARRUKH MUKHAMEDOV
CHAIRMAN, QP37 2016

CONFERENCE SCHEDULE

Day 1: Monday, 22nd August 2016
Venue: Conference Room, Ground Floor, Administration Building, Kulliyyah of Science

Time	Programme
8.30 – 9.00 am	Arrival of Participants/ Registration
9.00 – 9.15 am	Welcoming remarks
9.15 – 10.00 am	Quantum Probability, Orthogonal Polynomials and Quantum Field Theory *Luigi Accardi* (ID37)
10.00 – 10.30 am	Refreshment
10.30 – 11.15 am	Stein's Method and Hida Calculus in Normal Approximation for White Noise Functionals *Louis Chen* (ID40)
11.15 – 12.00 pm	On the Structure of Quantum Markov Semigroups of Weak Coupling Limit Type *Fagnola Franco* (ID31)
12.00 – 12.45 pm	Jacobi Sequences of Powers of Random Variables *Abdessatar Barhoumi* (ID22)
12.45 – 2.00 pm	Lunch
2.00 – 2.35 pm	Regular Representations of Completely Bounded Maps *Sumesh Kappil* (ID17)
2.35 – 3.10 pm	On the Equiconvergence of the Fourier Series and the Fourier Integral *Abdumalik Rakhimov* (ID27)
3.10 – 3.45 pm	Tea break
3.45 – 4.20 pm	On Approximations of Renormalization of Circle Diffeomorphisms with Several Break Points *Habibulla Ahadkulov* (ID19)
4.20 – 4.55 pm	The Dynamics of Ising-Potts Mapping over p-adic Field *Mohd Ali Khameini Ahmad* (ID49)

Day 2: Tuesday, 23rd August 2016

Time	**Officiating Ceremony** Venue: Main Auditorium, 1st Floor, Administration Building, Kulliyyah of Science
8.00 – 9.00 am	Arrival of guests*
9.00 – 9.10 am	Negaraku and IIUM song Doa recitation
9.10 – 9.15 am	Al Quran recitation with montage (Ayatul Quran)
9.15 – 9.30 am	Welcoming remarks Prof Dr. Kmaruzzaman Yunus Dean/Chairman of iCOS 2016
9.30 – 9.45 am	Officiating speech by Rector of IIUM Prof. Dato' Sri Dr. Zaleha Kamaruddin
9.45 – 9.55 am	Officiating ceremony gimmick iCOS2016 Montage Presentation of Souvenirs to IIUM Rector
9.55 – 10.00 am	Closing remarks by emcee and doa recitation
10.00 – 10.30 am	Refreshments
	* VVIPs and VIP will be hold at VIP holding room with breakfast

Venue: Conference Room, Ground Floor, Administration Building, Kulliyyah of Science

Time	Programme
10.30 – 11.15 am	Markov Cocycles, Local Times in Fock Space and CCR-Flows *Kalyan B. Sinha* (ID01)
11.15 – 12.00 pm	Note on Complexity for Quantum Open Systems *Noburo Watanabe* (ID32)
12.00 – 12.45 pm	Semi-Quantum Operators and Meixner Random Vectors *Aurel Stan* (ID75)
12.45 – 2.00 pm	Lunch
2.00 – 2.35 pm	Fredholm Partial Integral Equations of Second Type With Degenerate Kernel *Ramziddin Kucharov* (ID04)
2.35 – 3.10 pm	The Support Projection of State and A Quantum Extension of the Classical Lévy-Austin-Ornstein theorem *Skander Hachicha* (ID10)
3.10 – 3.45 pm	Ergodicity of Nonlinear Markov Operators on the l_1 space *Mansoor Saburov* (ID34)
3.45 – 4.20 pm	A Limit Theorem for Branching Processes with Dependent Immigration *Hurshidjon Jumaqulov* (ID12, ID13 & ID28)
4.20 – 4.50 pm	Tea break
7.00 – 10.00 pm	Dinner (Zenith Hotel)

Day 3: Wednesday, 24th August 2016
Venue: Conference Room, Ground Floor, Administration Building, Kulliyyah of Science

Time	Programme
8.30 – 9.15 am	On the Equivalence Of Separability and Extendability of Quantum States *B V Rajarama Bhat* (ID16)
9.15 – 10.00 am	Displacement Operator and Generalization of Cameron-Martin-Girsanov Transformation. *Un Cig Ji* (ID58)
10.00 – 10.30 am	Refreshment
10.30 – 11.05 am	Quantum Markov Chains Associated with Open Quantum Random Walks *Farrukh Mukhamedov* (ID05)
11.05 – 11.40 am	A New Class of Quantum Markov Fields on Graphs *Abdessatar Souissi* (ID08)
11.40 – 12.15 pm	Functional Central Limit Theorems and $P(\phi)_1$-Processes for the Classical and Relativistic Nelson Models *Achref Majid* (ID38)
12.15 – 2.00 pm	Lunch
2.00 – 6.00 pm	Excursion – Sungai Pandan Waterfall

Day 4: Thursday, 25th August 2016
Venue: Conference Room, Ground Floor, Administration Building, Kulliyyah of Science

Time	Programme
8.30 – 9.05 am	On the Existence of Strong Solutions of Quantum Stochastic Differential Inclusions *Dauda Dikko* (ID33)
9.05 – 9.40 am	Ising Model on Trees: (k_0)-Periodic Gibbs Measures. *Muzaffar Rahmatullaev* (ID26)
9.40 – 10.15 am	Quasi-Free Stochastic Processes From Quantum Random Walks *Zhong Ping* (ID46)
10.15 – 10.45 am	Refreshment
10.45 – 11.20 am	Entropic Uncertainty Relations - The Measurement Case *Matteo Gregoratti* (ID53)
11.20 – 11.55 am	The Almost Everywhere Convergence of the Wavelet Expansions *Anvarjon Ahmedov* (ID42)
11.55 – 12.30 pm	On Classification of n-dimensional Algebras *Ural Bekbaev* (ID11)
12.30 – 2.00 pm	Lunch
2.00 – 2.35 pm	Evolution and Genetic Algebras *Izzat Qaraaleh* (ID43)
2.35 – 3.10 pm	On Infinite Dimensional Orthogonality Preserving Quadratic Stochastic Operators *Ahmad Fadillah Embong* (ID36)
3.10 – 3.25 pm	The Singularity Exponents of Some One-Dimensional Maps *Shuxrat Djalilov* (ID52)
3.25 – 3.40 pm	Singularity Indexes of Invariant Measures of Critical Maps of The Circle *Gulnora Poshoxodjayeva* (ID54)
3.40 – 4.10 pm	Tea break
4.40 – 5.40 pm	AQPIDA Meeting

Day 5: Friday, 26th August 2016
Venue: Conference Room, Ground Floor, Administration Building, Kulliyyah of Science

Time	Programme
8.30 – 9.00 am	Nonlinear functionals of space noise *Chang Yun Ching* (ID25)
9.00 – 9.30 am	Scattering of A Flat-Top Soliton of Cubic – Quintic Nonlinear Shrödinger Equation by Delta Potential *Bakhram Umarov* (ID41)
9.30 – 10.00 am	Refreshment
10.00 – 10.30 am	Gaussian Quantum Quadratic Stochastic Operators *Nasir Ganikhodjaev* (ID57)
10.30 – 11.00 am	Analysis of the Multipole Mixture Coefficients (E2/M1) in Isotopes 158,160Gd *Abdurahim Okhunov* (ID55)
11.00 – 11.30 am	The Multistage Homotopy Perturbation Method for Solving Hyperchaotic System of Ordinary Differential Equations *Md Sazzad Hossien Chowdary* (ID62)
11.30 – 12.00 pm	Dynamic Modelling Of The Quadriceps Muscle Of Knee Joint Using Neural Network Time Series Models: Part 3 *Saadi Ahmad Kamaruddin* (ID45)
12.00 – 1.00 pm	Lunch

POSTER SESSIONS:

ID 06: A 2x2 block operator matrix with purely essential spectrum *Rustam G'aybullayev*
ID 09: Jacobi sequences of squares of random variables *Mohamed Rhaima*
ID 11: The Fundamental Basis Theorem of Geometry From an Algebraic Point Of View *Ural Bekbaev*
ID 15: The ”Zero-Two” Law For Positive Contractions in The Orlicz-Kantorovich Spaces *Dilmurod Bekbaev*
ID 23: Some Cardinal and Topological Properties the Space of The Complete Linked Systems *Farkhod Mukhamadiev*
ID 35: Anti-Continuum Numerical Solutions for Bright Solitons in Discrete Media with Cubic-Quintic Nonlinearity *Lukhman Abdul Taib*
ID 39: Mathematical Formulation of Laminated Composite Thick Conical Shells *Muhammad Zannon*
ID 44: On the Lebesgue Constants Of Fourier-Laplace Series by Riesz Means *Ahmad Fadly Nurullah Rasedee*
ID 47: Uniform Ergodicities of Lotz-Raebiger’s Nets of Markov Operators on Ordered Banach Spaces *Nazife Erkursun Ozcan & Farrukh Mukhamedov*
ID 48: Square Root and Cube Root Functions over Qp *Muhammad Jundullah Ismail*

ID 50: The Ganikhodjaev Model of ABO Blood Groups
Mohd Saipuddin Arshat

ID 56: Anti-Continuum Approach on Stability Analysis of Nonlinear Localized Modes in Dipolar Bose-Einstein Condensates in Optical Lattice
Muhammad Hanis Badaruddin

ID 59: The Soliton Interaction in Weakly Nonlocal Nonlinear Media on the External Potentials
Nor Amirah Busul Aklan

ID 60: Group Theoretical Properties of Certain Bilinear Combinations of the Non-Commutative Ladder Operators
Nurisya Mohd Shah

ID 61: Quantum Bound States for Modular Group
Chan Kar Tim

ID 63: On (3,3)-Gaussian Quadratic Stochastic Operator
Nur Zatul Akmar Hamzah

ID 64: *C*haracterizing Three-Qubit Entanglement Classes by Higher Order Singular Value Decomposition
Choong Pak Shen

ID 65: On Ground States and Phase Transitions of Lambda Model on Cayley Tree
Mohd Hakim Jamil

ID 68: Bipartite Graph Associated with Isomorphism Classes of Non-Lie Filiform Leibniz Algebras
Ayu Ameliatul Shahilah Ahmad Jamri

ID 69: Bornological Group Actions
Anwar Imran

ID 72: Invariance Group for Some Contingency Tables *Nadia F. Mohammed*
ID 73: Empirical Estimation of Risk-Neutral Density from Option Prices. *Hafizah Bahaludin*
ID 74: Boundary Layer Flow of a Dusty Fluid on a Stretching Sheet Of Another Quiescent Fluid *Nurul Farahain Mohammad*
ID 76: Technology Exposure of Mathematics Learning in a Partially Technology Incorporated Environment *Azrul Fazwan Kharuddin*
ID 77: Constant & Time-Varying Hedge Ratio for FBMKLCI Stock Index *Mohd. Aminul Islam*

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ABSTRACTS BOOK

22nd - 26th August 2016

Kulliyyah of Science,
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Kuantan, Pahang, Malaysia.

1. Title: *Jacobi Sequences of Powers of Random Variables*
Abdessatar Barhoumi
University of Carthage.

We express the Jacobi sequences of the powers of a real valued random variable with all moments, not necessarily symmetric, as functions of the corresponding sequences of the random variable itself. For the power 2, in the symmetric case, the result is known and, with our approach we give a short purely algebraic proof of it. In particular, for the square of the Gamma distribution, i.e. the 4-th power of the standard Gaussian, the result confirms the conjecture that Γ^2 belongs to the polynomial class, but its principal Jacobi sequence grows like n^6, not n^4 as expected. Joint work with Luigi Accardi and Mohamed Rhaima.

2. Title: *A New Class of Quantum Markov Fields on Graphs.*
Abdessatar Souissi
University of Tunis EL Manar, Tunisia.

One of the basic open problem in quantum probability is the construction of a theory of quantum Markov fields, that a theory of quantum Markov process with multi-dimensional index set. In this work we propose a new construction of quantum Markov fields on arbitrary connected graph, namely we illustrate it by an Ising type model on the Cayley tree.

3. Title: *On the Equiconvergence of the Fourier Series and the Fourier Integral*.
Abdumalik Rakhimov
International Islamic University Malaysia.

An equiconvergence relation between index of the Bochner-Riesz means of the expansions and power of the singularity is proved.

4. Title: *Analysis of the Multipole Mixture Coefficients (E2/M1) in Isotopes 158,160Gd*.
Abdurahim Okhunov
International Islamic University Malaysia.

The structure of excited states and non-adiabatic effects manifested in the energies and probabilities of electromagnetic transitions are studied in the framework of phenomenological model taking into account the Coriolis mixing of the low – lying states of positive parity in rotational bands. Energies and the structure of wave functions of excited states are calculated. The calculated energies are in satisfactory agreement with experimental data. The mixing effect is demonstrated to play an important role in the wave functions of vibrational states. The probabilities of E2 and M1 transitions are calculated and multipole mixing coefficients of transitions from the first and second β and γ vibrational bands are compared with the available experimental data.

5. Title: *On Genetic Volterra Algebras.*
Abror Pirnapasov
National University of Uzbekistan, Uzbekistan.

The present talk, we first give a simple characterization of Volterra QSO in terms of absolutely continuity of discrete measures. Further, we introduce a notion of orthogonal preserving QSO, and describe such kind of operators defined on two dimensional simplex. It turns out that orthogonal preserving QSOs are permutations of Volterra QSO and we study associativity of genetic algebras generated by orthogonal preserving QSO.

6. Title: *Functional Central Limit Theorems and $P(\phi)_1$-Processes for the Classical and Relativistic Nelson Models*
Achref Majid
Linnaeus University, Sweden.

We construct $P(\phi)_1$-processes indexed by the full time-line, separately derived from the functional integral representations of the classical Nelson model and relativistic Nelson model in quantum field theory. Associated with these processes we define amartingale which, under proper scaling, allows to obtain a central limit theorem for additive functionals of the two processes. We show a number of examples by choosing specific functionals related to particle-field operators.

7. Title: *On Infinite Dimensional Orthogonality Preserving Quadratic Stochastic Operators*.
Ahmad Fadillah bin Embong
International Islamic University Malaysia.

In the present paper, we consider a notion of orthogonal preserving nonlinear operators defined on infinite dimensional setting. Here, we limited the study to the simplest nonlinear case which is quadratic one. Note that, each Orthogonal Preserving Quadratic Stochastic Operators (OPQSOs) are always associated with the basis in the simplex.Here, we provide a description of OPQSOs in general setting and also its full description with some conditions. Next, it is given also several crucial examples of OPQSOs associated with the basis $\{(\mathbb{F})_k\}$ such that the support of $(\mathbb{F})_k$ for any $k \in (\mathbb{N})$ has the cardinality of finite and countable.

8. Title: *On The Lebesgue Constants of Fourier-Laplace Series by Riesz Means.*
Ahmad Fadly Nurullah Rasedee
International Islamic University Malaysia.

The following research provide asymptotics for the Lesbegue constant of Fourier-Laplace series which is denoted by L_n^{α} for $n \in N$, $\alpha \in R$. Estimation for the Lebesgue constant is obtained by method of Riesz means.

9. Title: *Renormalizations of Circle Maps.*
Akhtam Dzhalilov
Turin Polytechnic University in Tashkent.

The method of Renormalization Group (RG) was first used in the theory of dynamical systems by M. Feigenbaum . Later the method of RG applied to many problems of circle dynamics: regularity of invariant measures for diffeomorphisms, Herman rigidity theory, smoothness of conjugacy for critical circle maps etc. We'll discuss our new results concerning Rathy-Veech and Henon renormalizations of circle homeomorphisms with finite number of break points.

10. Title: *The Almost Everywhere Convergence of the Wavelet Expansions*
Anvarjon Ahmedov
Universiti Malaysia Pahang.

In this work we investigate the problems on the convergence of the wavelet expansions.

11. Title: *Bornological Group Action.*
Anwar Imran
Universiti Putra Malaysia.

Our main goal in this work is to introduce and study a new class of group actions called bornlogical group actions (BGA). We give examples and prove some important properties of the BGA. As one of such examples we consider left (right) transalation on a group. The concept of homogeneity is introduced. It is introduced various modification of bornological actions and verified them to be homogeneous. As well as, the main results that is a bornological group act on a bornological set by isomorphism. Also, we prove that the boundedness of a bornological action can be deduced from its boundedness at the identity.

12. Title: *On the Brabches of the Essential Spectrum of Three-Particle Discrete Model Schr\"{o}dinger Operator: 1D Case.*
Askar Rahmonov
Bukhara State University, Uzbekistan.

We consider a three-particle discrete model Schr\"{o}dinger operator on one-dimensional tours. We describe the essential spectrum of H consists the union of at most 3 bounded closed intervals. We estimate the lower and upper bounds of the essential spectrum of H .

13. Title: *Semi-Quantum Operators and Meixner Random Vectors.*

Aurel Stan
Ohio State University.

Given a probability measure, having finite moments of all orders, we can define its semi-quantum operators by splitting its preservation operators in two halves, and adding one half to the corresponding creation operator and the other to the annihilation operator. Using double commutators, of the semi-quantum operators, a nice characterization of the Meixner class of random variables can be given. We can use this characterization to define the Meixner random vectors in the multi-dimensional case. The class of Meixner random vectors can be written as a countable union of families of random vectors, that we call n-Meixner random vectors, where n represents the number of nested commutators used, for all n ≥ 1. We describe the classes of two dimensional 1-Meixner and 2-Meixner random vectors.

14. Title: *Bipartite Graph Associated with Isomorphism Classes of Non-Lie Filiform Leibniz Algebras.*

Ayu Ameliatul Shahilah Ahmad Jamri
Institute for Mathematical Research.

This talk is deals with the graphical representation of non-Lie filiform Leibniz algebras. We gives some properties of non-Lie filiform Leibniz algebras in terms of some condition for the graphs. It is well-known that this class is divided into three subclasses called first, second, and third class denoted, in dimension \$n\$ over a field K, by denoted as $FLb_n(K)$, $SLb_n(K)$, and $TLb_n(K)$, respectively. In each dimension, there have their own isomorphism classes. In this talk, we focus more on the weighted bipartite graph associated with isomorphism classes of $FLb_n(K)$ and $SLb_n(K)$ in low-dimensionals.

15. Title: *Technology Exposure of Mathematics Learning in a Partially Technology Incorporated Environment*

Azrul Fazwan Kharuddin
International Islamic University Malaysia.

This paper relates a study that embarks on the technology exposure claiming that human action is mediated by technological setting. Situated in a traditional classroom setting where there is more teaching and less hands-on, it reports foundation students' acceptance of technology-in-mathematics interaction in a typical course enriched with graphing calculator (GC) deliberated in the worksheets with printed GC commands alongside each question. The results may enlighten mathematics practitioners about the feasibility of taking full advantage of technology to teach mathematics in a partially technology incorporated mathematics course.

16. Title: *On The Equivalence of Separability and Extendability of Quantum States*

B V Rajarama Bhat
Indian Statistical Institute, Bangalore, India.

Motivated by the prevalent notions of k-extendability and complete extendability of states offinite level quantum systems, we introduce parallel definitions in the context of Gaussianstates and using only properties of their covariance matrices derive necessary and sufficient conditions for their complete extendability. It turns out that the complete extendability property is equivalent to the separability property of a bipartite Gaussian state. Following the proof of quantum de Finetti theorem as outlined by Hudson and Moody, we show that separability is equivalent to complete extendability for a normal state in a bipartite Hilbert space where at least one of which is of dimension greater than 2. This, in particular, extends aresult of Fannes, Lewis, and Verbeure, to the algebra of all bounded operators on an infinite dimensional Hilbert space. This is a joint work with K R Parthasarathy and RitabrataSengupta.

17. Title: *Scattering of a Flat-Top Soliton of Cubic – Quintic Nonlinear Shrödinger Equation by Delta Potential*.

Bakhram Umarov
International Islamic University Malaysia.

The flat top soliton is a localized solution of cubic – quintic Nonlinear Shrödinger equation (C-Q NLSE) that can propagate preserving its shape. In this work we consider the interaction of soliton with weak external localized potential. It is shown that depending on an initial velocity the soliton may be reflected or transmitted by potential. The approximate analytical results based on varational approach confirmed by numerical simulations.

18. Title: *Quantum Bound States for Modular group*.

[*]Chan Kar Tim[a,b] , Hishamuddin Z. [a,b] and Nurisya Mohd Shah[a,b]
[a]Dept. of Physics, Faculty of Science, Universiti Putra Malaysia
[b]Laboratory of Computational Sciences & Mathematical Physics, INSPEM, Universiti Putra Malaysia.

A quantum mechanical system on a punctured surface modeled on hyperbolic space is governed by the Schrödinger equation. The solution to this equation is called the Maass waveforms which are eigenfunctions of the hyperbolic Laplace-Beltrami operator. A numerical method based on Hejhal and Then algorithm is implemented in GridMathematica to compute Maass Cusp Forms (MCF) or the quantum bound states. We report here the computational results of the eigenvalues for the punctured surface at interval [9, 30.4]. We also visualize the eigenstates of selected eigenvalues using the same programme.

19. Title: *Nonlinear Functionals of Space Noise*.

Chang Yun Ching
Dept. of Applied Mathematics, National University of Kaohsiung.

Having been suggested by P. Lévy, we understand that there are three kinds of the basic noises. One is the Gaussian noise (white noise $\dot{B}(t)$), and the Poisson noise $\dot{P}(t)$; these are time dependent. The third one is the space noise denoted by $P'(\lambda)$, where $\lambda > 0$ corresponds to the intensity of a Poisson distribution. The $\dot{P}(t)$ and $P'(\lambda)$ appear by appealing to the law of small probability. The space noise $P'(\lambda), \lambda > 0$, is defined by the characteristic functional $C(\xi) = \exp\left(\int_0^\infty \left(e^{\xi(\lambda)} - 1\right) d\lambda\right)$, where $\xi \in E$ and E is a nuclear space, which is dense in $L^2[0,\infty)$. The probability distribution of P' is given on E^*, the dual space of E. We shall discuss functional of $P'(\lambda)$. Starting from linear functionals of $P'(\lambda)$'s. We can introduce a space $\mathfrak{R}_1^{(-1)}$ of generalized linear functional, where $P'(\lambda)$ itself lives. Then we form the space $\mathfrak{R}_n$ of polynomials in $P'(\lambda)$'s of degree n, as well as the space $\mathfrak{R}_n^{(-n)}$ of generalized polynomial, where renormalization is necessary. To define $\mathfrak{R}_n^{(-n)}$, which plays the important role, we use a technique, first restricting the parameter space to be $[0,1]$ (cf. T. Hida and Si Si,*Lectures on White Noise Functionals*, World Sci. Pub. Co. 2008), then extend to $[0,\infty)$. Finally, we shall discuss some invariance of $P'(\lambda)$-polynomials; where we shall give a brief interpretation for how a fractional power distribution arises naturally.

20. Title: *Characterizing Three-Qubit Entanglement Classes by Higher Order Singular Value Decomposition*.

Choong Pak Shen
INSPEM, Universiti Putra Malaysia.

Identifying entanglement classes in multipartite quantum states has been a recurring but important problem in quantum information science. In this study, we propose to utilize a generalized version of singular value decomposition (SVD), namely the higher order singular value decomposition (HOSVD) to identify the entanglement classes of three qubits by local unitary operation. Having a widespread applications in signal processing and multi-variate data analysis, it is noted that HOSVD has only been applied in quantum information science quite recently. Upon inspection, we found that the all-orthogonality conditions imposed by HOSVD provides a possible means of characterizing the entanglement classes of three-qubit states. This characterization is related to the marginals of one-particle reduced density matrices of three qubits, which is also known as the quantum marginal problem. By comparing with the known classification outcomes in the literature, this characterization gives a

new understanding on the properties of the entanglement classes available for three-qubit states.

21. Title: *On the Existence of Strong Solutions of Quantum Stochastic Differential Inclusions*.

Dauda Dikko
University of Ibadan.

In this paper, we establish some results concerning the properties of strong solutions of quantum differential inclusions (QSDI) and prove its' existence theorem. We show further the relationship of this results with its convexified form, stating a relaxation theorem. These results generalises some of its classical counterparts from the classical differential inclusions to the present non- commutative settings which are operator theoretic and remain valid within the framework of the Hudson-parthasarathy formulation of the quantum stochastic calculus. The class of lipchitzian coefficients here, are absolutely continuous in the locally convex space of the solution sets which employs the locally convex strong operator topology. Some of its interesting motivations arise in the study of open quantum systems which are dependent on quantum noises.

22. Title: *The "Zero-Two" Law for Positive Contractions in TheOrlicz-Kantorovich Spaces.*

Dilmurod Bekbaev
International Islamic University, Malaysia.

In this paper we prove a vector version the "zero-two" law for positive contractions in the Orlicz-Kantorovich spaces.

23. Title: *On the Structure of Quantum Markov Semigroups of Weak Coupling Limit Type*.

Fagnol Franco
Politecnico di Milano.

In this talk, based on joint works with J. Bolanos and R. Quezada, we present some recent results on the structure of invariant states of quantum Markov semigroups arising from the weak coupling limit of a system coupled with an environment.We also discuss open problems.

24. Title: *Some Cardinal and Topological Properties the Space of the Complete Linked Systems*.

Farkhod Mukhamadiev
Tashkent state padegogical university named after Nizami.

A.V. Ivanov defined the space NX of complete linked systems (CLS) of a space X in a following way:

Definition 1 A linked system M of closed subsets of a compact X is called *a complete linked system* (a CLS) if for any closed set of X the condition

"Any neighborhood OF of the set F consists of a set $\Phi \in M$"

implies $F \in M$.

A set NX of all complete linked systems of a compact X is called *the space NX of CLS of X*. Let M be a complete linked system of a topological space X. A CLS M is called *a compact complete linked system (CCLS)* if M contains at least one compact element. The space

$$N_c X = \{M \in NX : M \text{ is a CCLS}\}$$

will be said *the compact kernel* of X. A CLS M will be said *a metrizable compact complete linked system (MCCLS)* if M contains at least one metrizable compact element. A space

$$N_{cm} X = \{M \in NX : M \text{ is a MCCLS}\}$$

will be said *the metrizable compact kernel of X*. The CLS M will be said *a thin complete linked system (TCLS)* if M contains at least one finite element. We call *an N-thin kernel* of a topological space X the space

$$N^* X = \{M \in NX : M \text{ is a TCLS}\}.$$

It is clear, $N^* X \subseteq N_{cm} X \subseteq N_c X \subseteq NX$ for any topological space X.

Let P be a family of subsets of a space X and $\tau(X)$ is the topology on X. P is called a *k-network* if whenever K is a compact subset of X and $K \subset U \in \tau(X)$, there is a finite subfamily $P' \subset P$ such that $K \subset \bigcup P' \subset U$.

Theorem 1 Suppose that topological space X have k-network of cardinality $\tau \geq \aleph_0$, then the space $N_c X$ has a k-network of cardinality $\geq \tau$.

Theorem 2 Suppose that topological space X have k-network of cardinality $\tau \geq \aleph_0$, then the space $N_{cm} X$ has a k-network of cardinality $\geq \tau$.

Theorem 3 Suppose that topological space X have k-network of cardinality $\tau \geq \aleph_0$, then the space $N^* X$ has a k-network of cardinality $\geq \tau$.

In the work it is shown that some cardinal and topological properties the space of the complete linked systems.

25. Title: *Quantum Markov Chains Associated with Open Quantum Random Walks.*
Farrukh Mukhamedov
International Islamic University, Malaysia.

In this presentation, we construct quantum Markov chains associated with open quantum random walks. Their recurrence and transitivity are investigated. This work is done jointly with A. Dhahri.

26. Title: *Singularity Indexes of Invariant Measures of Critical Maps of the Circle.*
Gulnora Poshakhodjaeva
Samarkand State University

In the present work invariant measures of homeomorphisms of circle with one critical point are learned. We designate with X majority pairs $(\xi(x),\eta(x))$ of analytical strictly increasing homeomorphisms of straight line satisfying the following conditions:

a) $0<\xi(0)<1, \eta(0)=1-\xi(0)$;
b) $\eta(\xi(0))=\xi(\eta(0))$;
c) $\xi(\eta(0)),\xi^2(\eta(0)),...,\xi^{k-1}(\eta(0))<0, \xi^k(\eta(0))>0$;
d) $\xi'(0)=\xi''(0)=\eta'(0)=\eta''(0)=0, \xi'''(0)\neq 0, \eta'''(0)\neq 0$;
e) $(\xi\circ\eta)'''(0)\neq 0, (\eta\circ\xi)'''(0)\neq 0$.

With the help of the pair $(\xi(x),\eta(x))\in X$ we can build homeomorphisms of a single circle $T_{\xi,\eta}: S^1\to S^1$:

$$T_{\xi,\eta}=\begin{cases}\xi(x), & \text{if} \quad x\in[\eta(0),0)\\ \eta(x), & \text{if} \quad x\in[\xi(0),0).\end{cases} \tag{1}$$

We put $\gamma_k=\dfrac{\sqrt{k^2+4}-k}{2}, k\geq 1$. We designate trough X_k under majority X, consisting of such pairs (ξ,η) that number of rotations of appropriate homeomorphisms $T_{\xi,\eta}$ is equal to γ_k. Now we define the transformation of renorm group $R_k: X_k\to X_k$ inaccordance with the formula:

$$R_k(\xi,\eta)=(\alpha\xi^{k-1}(\eta(\alpha^{-1}x)),\alpha\xi^{k-1}(\eta(\xi(\alpha^{-1}))))$$

where $\alpha=\xi^{k-1}(\eta(0))-\xi^k(\eta(0))<-1$.

Renormgroup transformation R_k in the undersplace of X_k has the only hyperbolic fixed point ξ_k,η_k. Here $\xi_k(x)$ and $\eta_k(x)$ are analytical functions of x^3. We designate through $E(T_k)$ plurality of all C^1 conjugate with T_k critical homeomorphisms of the circle with one critical point. The number of rotation of γ_k homeomorphisms T_k is irrational and its expension into continuous fraction has the form of: $\gamma_k=[k,k,...,k,...]$. We designate with $\dfrac{p_n}{q_n}, n\geq 1$ appropriate fractions of the

number γ_k. The number $q_n, n \geq 1$ is named the first return time rotation and satisfy variation of equation $q_{n+1} = k_n q_n + q_{n-1}$ with the initiate conditions $q_0 = 1, q_1 = k$. Besides, $p_{n+1} = q_n, n \geq 0$. It is well known, that analitical homeomorphisms of the circle with one critical point of the type of $(2k+1, k \geq 1)$ and irrational number of rotations is topologically equal to the line turn $G_{\gamma_k}(x) = x + \gamma_k (mod 1)$. Grachek and Swentek proved that the only possible invariant measures μ of critical homeomorphism with irrational number of rotations is singular concerning the measure of Lebeg ℓ, that is there is calcuable plurality $A \subset S^1$ and it the same as $\mu(A) = 0$ and $\ell(A) = 1$. In the present work the signs of singularity of invariant measures for critical homeomorphisms of the circle of $E(T_k)$. Now we formulate the main result of our work.

Theorem 1 Let $T \in E(T_k)$ and μ be the possible invariant measure of critical homeomorphisms T. Then for almost all of x with the Lebeque ℓ measure (measure μ) there is a finite limit $lim_{\varepsilon \to +0} \frac{ln\mu([x, x+\varepsilon])}{ln|\varepsilon|} = \tau(\ell)(= \tau(\mu))$ the meaning of the limit does not depend on x and $0 < \tau(\mu) < 1, 1 < \tau(\ell) < +\infty$.

In the prove of the theorem thermodynamical formalism for critical maps of circle is definitely used.

27. Title: *On Approximations of Renormalization of Circle Diffeomorphisms with Several Break Points*.

Habibulla Ahadkulov
Universiti Utara Malaysia.

This paper reviews recent results related to renormalization theory for circle diffeomorphisms with singularities. We study the renormalizations of circle diffeomorphism with irrational rotation number, with several break points lying on the same orbit and satisfying a certain Zygmund condition. It is proven that the renormalizations of such diffeomorphisms are approximated by Mobius transformations in C^1-topology. Also it is shown, that the coefficients of Mobius transformations get asymptotically linearly dependent.

28. Title: *Empirical Estimation of Risk-Neutral Density from Option Prices*.

Hafizah Bahaludin
International Islamic University Malaysia.

The main objective of this study is to extract the forward looking information that is embedded in option prices namely the risk-neutral density (RND). The smoothing volatility function approach is widely used by applying the proper interpolation in RND estimation. This paper presents the statistical comparison of interpolation techniques between the second and the fourth order polynomials in the calculation of RND. The RNDs are extracted from the Dow Jones Industrial Average (DJIA) index

options that focus on options with a one month constant maturity. The empirical evidence shows that the interpolations of second and fourth order polynomials provide a statistical difference in RND estimation. In addition, the result suggests that the fourth order polynomial is the best interpolation model in which it yields the lowest mean square error.

29. Title: *On Estimates for Oscillatory Integral Operators with Degenerate Phase*.
Halim Turdiev
Affiliation.

In this paper we consider oscillatory integral operators with degenerate phase. The phase function has non-isolated singular points. It is obtained estimate for norm of oscillatory integral operator depending on a large parameter. Moreover, if the amplitude of the oscillatory integral operator does not vanish at the origin then the norm is estimates from below as well as from above. Furthermore, order of lower and upper bounds coin side, which shows sharpness of the obtained results.

30. Title: *A Limit Theorem for Branching Processes with Dependent Immigration*.
Hurshidjon Jumaqulov[a], Yakubjan Khusanbaev[a] & Gayrat Rakhimov[b]
[a]Institute of Mathematics, National University of Uzbekistan,
[b]Academic Lyceum under Architecture and Building, Dept. of Mathematics

Limit theorem for nearly critical branching processes with dependent immigration is proved.

31. Title: *Evolution and Genetic Algebras*.
Izzat Qaraaleh
Tafila Technical University.

In this paper we study the relations between genetic and evolution algebras in dimension three.

32. Title: *Markov Cocycles, Local Times in FockSpace and CCR- Flows*.
Kalyan B. Sinha
J.N. Centre for Advanced Scientific Research, Bangalore, India.

An increasing operator family in Fock space is used to construct a Markov Cocycle which in its turn leads naturally to a quantum Stop-time family . Then these stop-time family leads to a new CCR-flow with the parametrisation of the associated local times.

33. Title: *Stein's Method and Hida Calculus in Normal Approximation for White Noise Functionals*.

Louis Chen
National University of Singapore.

Hida calculus, also known as white noise analysis, is the mathematical theory of white noise initiated by T. Hida in his 1975 Carleton Mathematical Lecture Notes. Let $\{B(t): t \in \mathbb{R}\}$ be a standard Brownian motion and let the white noise $\dot{B}(t) = dB(t)/dt, t \in \mathbb{R},$ be represented by generalized functions. By regarding the collection $\{\dot{B}(t): t \in \mathbb{R}\}$ as a coordinate system, Hida defined and studied generalized white noise functionals $\varphi(\dot{B}(t): t \in \mathbb{R})$ through their \$U\$-functionals. In this talk we will present a connection between Stein's method and Hida calculus in normal approximation for white noise functionals. Our approach is analogous to that for the connection between Stein's method and Malliavin calculus as established by Nourdin and Peccati (*Probab. Theory Relat. Fields***145**, 75-118, 2009). The connection between Stein's method and Hida calculus will be built on the expression of the Ornstein-Ulenbeck operator in terms of the Hida derivatives using integration by parts techniques. This will entail an extension of the domain of the Hida derivative ∂_t, that is the $\dot{B}(t)$-differentiation, and a study of the regularity of ∂_t. This talk is based on joint work with Yuh-Jia Lee and Hsin-Hung Shih.

34. Title: *Quantum Probability, Orthogonal Polynomials and Quantum Field Theory*.

Luigi Accardi
Centro Vito Volterra – University of Rome Torvergata.

TBA.

35. Title: *Anti-Continuum Numerical Solutions for Bright Solitons in Discrete Media with Cubic-Quintic Nonlinearity*.

Lukhman Abdul Taib
International Islamic University Malaysia.

We numerically study the existence of a variety of bright strongly localized vectorial modes in discrete media with cubic-quintic nonlinearity. The stability region of the vectorial modes is also identified.

36. Title: *Ergodicity of Nonlinear Markov Operators on the l_1 space*.

Mansoor Saburov
International Islamic University Malaysia.

In this paper, we study strong and uniform ergodicity of nonlinear polynomial Markov operators on the l_1 space.

37. Title: *Entropic Uncertainty Relations - The Measurement Case.*
Matteo Gregoratti
Politecnico di Milano

We introduce a new informational-theoretic formulation of the measurement uncertainty relations for finite-dimensional quantum systems, based on the notion of relative entropy between measurement probabilities, in the discrete case. We quantify the total error affecting an approximate joint measurement of two observables, we prove the general properties of its minimum value (the uncertainty lower bound) and we study the corresponding optimal approximate joint measurements. The new error bound, which we name "entropic incompatibility degree", turns out to enjoy many key features: among the main ones, it is state independent and tight, it shares the desirable invaraince properties, and it vanishes if and only if the two observables are compatible. In this context, we point out the difference between generic approximate joint measurements and sequential approximate joint measurements; to do it, we introduce a separate index for the tradeoff between the error in the first measurement and the disturbance of the second one. By exploiting the symmmetry properties of the target observables, exact values and lower bounds are computed in two different concrete examples: (1) a couple of spin-1/2 components (not necessarily orthogonal); (2) two Fourier conjugate mutually unbiased bases in prime power dimension.

38. Title: *The Multistage Homotopy Perturbation Method for solving Hyperchaotic System of Ordinary Differential Equations.*
Md Sazzad Hossien Chowdhury
International Islamic University Malaysia

In this study, the multistage homotopy-perturbation method (MHPM) is applied to the nonlinear system of ordinary differential equations (ODEs). MHPM is a technique adapted from the standard homotopy- perturbation method (HPM) where the HPM is treated as an algorithm in a sequence of time intervals. To ensure the precision of the MHPM technique applied in this work, the results are compared with a fourth-order Runge-Kutta method and the standard HPM. Numerical comparisons demonstrate the limitations of HPM and promising capability of the MHPM for solving chaotic and hyperchaotic systems. The results obtained with minimum amount of computational work show that the MHPM is an efficient and powerful technique in solving hyperchaotic systems.

39. Title: *Non commutative Stochastic Integral Inclusions*.
Michael Ogundiran
Obafemi Awolowo University, Ile-Ife Nigeria.

We formulated the operator-valued stochastic integral inclusions by using the matrix elements of Hudson-Parthasarathy quantum stochastic calculus. Existence of solution of quantum stochastic differential inclusion was then established.

40. Title: *Jacobi Sequences of Squares of Random Variables*.
Mohamed Rhaima
University of Tunis EL Manar, Tunisia.

We express the Jacobi sequences of the square ofa real valued random variable with all moments, not necessarily symmetric,as functions of the corresponding sequences of the random variable itself. In the symmetric case, the result is known we give a new, purely algebraic proof of it.

41. Title: *Mathematical Formulation of Laminated Composite Thick Conical Shells*.
Mohammad Zannon
Tafila technical university.

This paper presents the mathematical formulation of thick conical shells using third order shear deformation of thick shell theory. Furthermore, we consider shell's system transverse normal stress, rotary inertia and shear deformation.

42. Title: *The Dynamics of Ising-Potts Mapping over p-adic Field*.
Mohd Ali Khameini Ahmad
International Islamic University Malaysia.

To show the behavior of the Ising-Potts mapping over *p*-adic field and cubic equation over *p*-adic field.

43. Title: *Constant & Time-Varying Hedge Ratio for FBMKLCI Stock Index*.
Mohd Aminul Islam
International Islamic University Malaysia.

This paper examines hedging in stock index futures for Kuala Lumpur Composite Index futures of Malaysia. We employed two different econometric methods such as- vector error correction model (VECM) and bivariate generalized autoregressive conditional heteroskedasticity (BGARCH) models to estimate optimal hedge ratio by using daily data of KLCI index and KLCI futures for the period from January 2012 to June 2016 amounting to a total of 1107 observations. We found that VECM model provides better results with respect to estimating hedge ratio for spot month futures and one-month futures, while BGACH shows better for distance futures. While VECM estimates time invariant hedge ratio, the BGARCH shows that hedge ratio changes over time. As such, hedger should rebalanced the future position time to time in order to reduce risk exposure.

44. Title: *On Ground States and Phase Transitions of Lambda Model on Cayley Tree*.

Mohd Hakim Jamil
International Islamic University Malaysia.

We analyze phase transitions for λ-model with spin values $\lambda \{1, 2, 3\}$ on the Cayley tree of order two. Under this results, we calculated the ground states of the λ-model on Cayley tree. We proved that under each cases for ground states the existence of three translation-invariant, periodic and uncountable number of ground states. Other than that, we also showed the description of translation-invariant Gibb measures for λ-model. Lastly, we proved for the 2-periodic Gibbs measures for λ-model considering some particular cases.

45. Title: *The Ganikhodjaev Model of ABO Blood Groups*.

Mohd Saipuddin Arshat
International Islamic University Malaysia.

N. Ganikhodjaev proposed a model of ABO and Rh blood groups of human being in 2010. In his paper, N. Ganikhodjaev construct a model of ABO blood group evolution of Malaysian people. Numerically he showed that, a mathematical model of Malaysian peoples ABO blood group has a unique fixed point and its trajectory is regular to that fixed point. In this work/paper, we analytically proved that Ganikhodjaev's model of ABO blood group has a unique fixed point.

46. Title: *Anti-Continuum Approach on Stability Analysis of Nonlinear Localized Modes in Dipolar Bose-Einstein Condensates in Optical Lattice.*

Muhammad Hanis Badarudin
International Islamic University Malaysia

This research aims to analyze the stability of nonlinear localized modes in dipolar Bose-Einstein condensates in optical lattice by anti-continuum approach. It is relatively convenient to employ the anti-continuum method for solving discrete nonlinear Schrödinger equation. This method has shown the ability to produce similar result of analysis of the system stability as produced by other methods. The dynamical stability of the system has been investigated within certain permissible range of parameters. The implementation of physical practices on dipolar Bose-Einstein condensates in optical lattice is also included.

47. Title: *Square Root and Cube Root Functions over* $\mathbb{Q}_p$.

Muhammad Jundullah Ismail
International Islamic University Malaysia.

In this paper, we introduce square and cube root functions over *p*-adic fields, $\mathbb{Q}_p$. We calculated square root of some *p*-adic numbers. This work enables to study solvability of lower degree of lower degree trinomial equations over *p*-adic fields.

48. Title: *Ising Model on Trees: (k_0)-Periodic Gibbs Measures*.

Muzaffar Rahmatullaev
Institute of Mathematics, National University of Uzbekistan.

The Cayley tree Γ^k of order $k \geq 1$ is an infinitetree, i.e., a connected graph without cycles, such that exactly $k+1$ edges originate from each vertex. Let $\Gamma^k = (V, L)$ where V is the set of vertices and L the set of edges. Twovertices x and y are called*nearest neighbours* if thereexists an edge $l \in L$ connecting them. We will use the notation $l = \langle x, y \rangle$. A collection of distinct nearest neighbour pairs $\langle x, x_1 \rangle, \langle x_1, x_2 \rangle, ..., \langle x_{d-1}, y \rangle$ is called a*path* from x to y. Thedistance $d(x, y)$ on the Cayley tree is the number of edges of theshortest path from x to y.

For a fixed $x^0 \in V$, called the root, we set $W_n = \{x \in V | d(x, x^0) = n\}$, $V_n = \bigcup_{m=0}^{n} W_m$ and denote $S(x) = \{y \in W_{n+1} : d(x, y) = 1\}$, $x \in W_n$, the set of *direct successors* of x.The n.n. Ising model is then defined by theformal Hamiltonian $H(\sigma) = -J \sum_{\langle x,y \rangle \subset V} \sigma(x)\sigma(y)$.Here sum runs over n.n. vertices $\langle x, y \rangle$, the spins $\sigma(x)$ take values ± 1, and the real parameter J stands for the interaction energy.

One of the main problems for the Ising model is to describe all limiting Gibbs measures corresponding to this model. It is well known that for the Ising model, such measures form a nonempty, convex, and compact subset in the set of all probability measures. The problem of completely describing the element of this set isfar from being completely solved. Some translation-invariant, periodic, weakly periodic, and continuum sets of non-periodic, Gibbs measures for the Ising model on a Cayley tree have already been described.

The (finite-dimensional) Gibbs distributions over configurations at inverse temperature $\beta = 1/T$ are defined by

$$\mu_n(\sigma_n) = Z_n^{-1}(h) \exp\left\{\beta J \sum_{\langle x,y \rangle \subset V_n} \sigma(x)\sigma(y) + \sum_{x \in W_n} h_x \sigma(x)\right\} \quad (1)$$

with partition functions given by $Z_n(h) = \sum_{\sigma_n} \exp\left\{\beta J \sum_{\langle x,y \rangle \subset V_n} \sigma(x)\sigma(y) + \sum_{x \in W_n} h_x \sigma(x)\right\}$. Here the spin configurations σ_n belong to $\{-1, +1\}^{V_n}$ and $h = \{h_x \in \mathbb{R},\ x \in V\}$ is a collection of real numbers that stands for (generalized) boundary condition. The probability distributions (1) are said compatible if for all σ_{n-1}

$$\sum_{\omega_n} \mu_n(\sigma_{n-1}, \omega_n) = \mu_{n-1}(\sigma_{n-1}) \quad (2)$$

where the configurations ω_n belong to $\{-1, +1\}^{W_n}$.It is well known that measure (1) satisfy (2) if and only if for any $x \in V$ the following equation holds

$$h_x = \sum_{y \in S(x)} f(h_y, \theta) \quad (3)$$

where $\theta = \tanh(\beta J)$, $f(h,\theta) = \operatorname{arctanh}(\theta \tanh h)$. Namely, for any boundary condition satisfying the functional equation (3) there exists a unique Gibbs measure, the correspondence being one-to-one. A boundary condition satisfying (3) is called *compatible*. It is well known that Γ^k can be represented as a free product G_k of $k+1$ cyclic groups of the second order with the generators $a_1, a_2, ..., a_{k+1}$.

Definition 1 A set $h = \{h_x, x \in G_k\}$ of quantities is called $\hat{G}_k$ *-periodic* if $h_{xy} = h_x$, for all $x \in G_k$ and $y \in \hat{G}_k$, were $\hat{G}_k$ is a subgroup of G_k.

Definition 2 A Gibbs measure μ is said to be $\hat{G}_k$ -periodic if it corresponds to the $\hat{G}_k$ -periodic h. We call a G_k -periodic measure a translation-invariant measure.

We consider antiferromagnetic model of Ising (i.e. $J < 0$). Let $G_k^{(2)} = \{x \in G_k$: the length of word x is even$\}$. On Cayley tree of order k_0 any $G_k^{(2)}$ -periodic a set of quantities h has the form

$$h_x = \begin{cases} u & \text{if } x \in G_k^{(2)} \\ v & \text{if } x \in G_k \setminus G_k^{(2)}, \end{cases}$$

where the pair (u,v) satisfies the following system of equations

$$\begin{cases} u = k_0 f(v,\theta) \\ v = k_0 f(u,\theta). \end{cases} \tag{4}$$

In the antiferromagnetic case ($\theta \le 0$) the system (4) has a unique solution $h_*^0 = (0,0)$ if $\theta \ge -1/k$, and three distinct solutions $h_*^{\mp} = (-h_*, h_*)$, $h_*^0 = (0,0)$, $h_*^{\pm} = (h_*, -h_*)$ if $-1 < \theta < -\theta_c$. Now, with $h_*^{\mp}$ construct new solutions functional equation (3). We construct the set of quantities $h = \{h_x, x \in V\}$ (where $h_x \in \{-h_*, h_*\}$) as follows:

(i) If on the vertex of the x, we have $h_x = h_*$, then at each vertex from $S_{k_0}(x)$ we put the value $-h_*$, and on each vertex of $S_{k-k_0}(x)$ we put one of the values of h_* and $-h_*$, so that satisfy the following equality

$$\sum_{y \in S_{k-k_0}(x)} f(h_y, \theta) = 0. \tag{5}$$

(ii) If on the vertex of the x, we have $h_x = -h_*$, then at each vertex from $S_{k_0}(x)$ we put the value h_*, and on each vertex of $S_{k-k_0}(x)$ we put one of the values of h_* and $-h_*$, so that satisfy (5).

The set of quantities h, constructed according to the rules (i),(ii), we call $(k_0)-$periodic. Similarly, using the $h_*^{\pm}$, we can construct another $(k_0)-$periodic set of quantities h.

Proposition Any $(k_0)-$periodic set of quantities on the Cayley tree Γ^k satisfies the functional equation (3).

Proof

Let $h_x = h_*$, then

$$h_* = \sum_{y \in S(x)} f(h_y, \theta) = \sum_{y \in S_{k_0}(x)} f(h_y, \theta) + \sum_{y \in S_{k-k_0}(x)} f(h_y, \theta) = k_0 f(-h_*, \theta).$$

Let $h_x = -h_*$, then

$$-h_* = \sum_{y \in S(x)} f(h_y, \theta) = \sum_{y \in S_{k_0}(x)} f(h_y, \theta) + \sum_{y \in S_{k-k_0}(x)} f(h_y, \theta) = k_0 f(h_*, \theta).$$

Consequently, $(k_0)-$peroidic set of quantities $h = \{h_x, x \in V\}$ satisfies the functional equation (3).For $(k_0)-$peroidic set of quantities $h = \{h_x, x \in V\}$, constructed with $h_*^{\pm}$, similarly proved, that it is also satisfies the functional equation (3).

A measure corresponding to a $(k_0)-$periodic set of quantities is called a $(k_0)-$periodic Gibbs measure. As a result, we obtain the following theorem

Theorem Let $k \geq 2, k_0 \geq 2$ such, that $(k - k_0)$ is even a positive number, and $T < T_{c,k_0}$. Then, for an antiferromagnetic Ising model on a Cayley tree of order k, there are exactly two $(k_0)-$periodic Gibbs measures, were $T_{c,k_0} = \dfrac{J}{arcth(\dfrac{1}{k_0})}$.

49. Title: *Invariance Group for Some Contingency Tables.*

***Nadia F. Mohammed[a], Isamiddin S. Rakhimov[a,b], and Sharifah Kartini Said Husain[a,b]**

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Let B be a Markov basis for a $\left(p(v-1)(p-v)\right)/2v \times v \times p/v$ contingency table with fixed two-dimensional marginals, where p is a multiple of v and greater than or equal to $2v$. This type Markov bases have been considered in a paper by Mohammed, Rakhimov and Shitan in 2016. In this work, we define an invariance subgroup H of the dihedral group D_p for the Markov basis B. More precisely, we focus on contingency tables with
v equals 2. Additionally, we prove that the subgroup H is the largest subgroup of D_p acting on B.

50. Title: *Gaussian Noncommutative Quadratic Stochastic Operators.*

Nasir Ganikhodjaev

International Islamic University Malaysia

In this paper we present some class of quantum quadratic stochastic operators acting on the space $\mathcal{H}_N$ of $N \times N$ Hermitian matrices. Being a subspace of the space of

$N \times N$ matrices with complex entries, $\mathcal{H}_N$ embeds naturally into $\mathbb{C}^{N^2}$. Let dM be the N^2-dimensional Lebesgue measure,

$$dM = \prod_{j=1}^{N} dM_{jj} \prod_{j \neq k}^{N} dReM_{jk} dImM_{jk} \tag{1}$$

and $\mathbb{B}$ be the corresponding Borel σ-algebra. We will consider the probability distribution on $\mathcal{H}_N$ given by

$$d\mu_N M = \frac{1}{Z_N} e^{-NTrV(M)} dM, \tag{2}$$

where $V(x)$ is a real analytic function satisfying the growth condition that

$$\frac{V(x)}{\log(|x|^2 + 1)} \to +\infty \text{ as } |x| \to \infty. \tag{3}$$

For $V(M) = M^2$, the measure μ_N is the probability distribution of the Gaussian unitary ensemble (GUE), such that the matrix elements in GUE are independent. If the function $V(x)$ is not quadratic, then the matrix entries become dependent.

Let $S(\mathcal{H}_N)$ be the set of all probability measures on $\mathcal{H}_N$ and $\{F(P,Q,A) : P,Q \in \mathcal{H}_N, A \in \mathbb{B}\}$ be a family of functions on $\mathcal{H}_N \times \mathcal{H}_N \times \mathbb{B}$ that satisfy the following conditions:

i) $F(P,Q,\cdot) \in S(\mathcal{H}_N)$ for any fixed $P,Q \in \mathcal{H}_N$;

ii) $F(P,Q,A)$ regarded as a function of two variables P and Q with fixed $A \in \mathbb{B}$ is measurable function on $(\mathcal{H}_N \times \mathcal{H}_N, \mathbb{B} \otimes \mathbb{B})$;

iii) $F(P,Q,A) = F(Q,P,A)$ for any $P,Q \in \mathcal{H}_N, A \in \mathbb{B}$.

In this case a nonlinear transformation (quantum quadratic stochastic operator) $W : S(\mathcal{H}_N) \to S(\mathcal{H}_N)$ is defined as following

$$(W\lambda_N)(A) = \int_{\mathcal{H}_N} \int_{\mathcal{H}_N} F(P,Q,A) d\lambda_N(P) d\lambda_N(Q) \tag{4}$$

where $\lambda_N \in S(\mathcal{H}_N)$ is an arbitrary initial probability measure and $A \in \mathbb{B}$ is an arbitrary Borel set.

We will consider the probability distribution $F(P,Q,\cdot) \in S(\mathcal{H}_N)$ given by

$$d\mu_{P,Q,N} M = \frac{1}{Z_N} e^{-NTrV_{P,Q}(M)} dM \tag{5}$$

where $V_{P,Q}(x)$ is a real analytic function satisfying (3).

Definition 1 An operator W (4) is called Gaussian noncommutative quadratic stochastic operator (Gaussian noncommutative qso), if the probability distribution $F(P,Q,\cdot) \in S(\mathcal{H}_N)$ given by (5) with $V_{P,Q}(x) = V_{Q,P}(x)$ is a real analytic function satisfying (1).

Definition 2 A Gaussian noncommutative qso is called $n-$Gaussian if $\{V_{P,Q}(x) : P,Q \in \mathcal{H}_N\} = \{V_1, V_2, \cdots, V_n\}$.

Theorem
The $n-$Gaussian noncommutative qso is the regular transformation with respect to strong convergence for $n=1$ and $n=2$.
Note that the authors proved similar result for usual Gaussian qso.

51. Title: *On (3,3)-Gaussian Quadratic Stochastic Operator*.
Nasir Ganikhodjaev & *Nur Zatul Akmar Hamzah
International Islamic University Malaysia.

Let $X=\mathbb{R}$, F is σ-algebra of Borel subsets of X and $S(X,F)$ is the set of all probability measures on (X,F). The quadratic stochastic operator V on $S(X,F)$ is defined by family of functions $\{P(x,y,A): x,y\in X, A\in F\}$ such that $P(x,y,\cdot)\in S(X,F)$ for any fixed $x,y\in X$ as follows: for arbitrary measure λ and arbitrary Borel set $A\in F$,

$$(V\lambda)(A)=\int_{\mathbb{R}}\int_{\mathbb{R}}P(x,y,A)d\lambda(x)d\lambda(y).$$

In this paper, we consider the family of functions such that for any fixed $x,y\in X$, a probability measure $P(x,y,.A)$ is a Gaussian distribution

$$P(x,y,A)=\frac{1}{\psi(x,y)\sqrt{2\pi}}\int_A e^{-\frac{1}{2}\frac{(u-\varphi(x,y))^2}{\psi^2(x,y)}}du \qquad \textbf{(1)}$$

with mean $\varphi(x,y)$ and variance $\psi(x,y)>0$.

Definition 1 An operator V generated by this family of functions (1) is called *Gaussian quadratic stochastic operator* (*Gaussian QSO*).

Definition 2 A Gaussian QSO is called (n,k)-*Gaussian QSO* if $\left|\{\varphi(x,y): x,y\in X\}\right|=n$ and $\left|\{\psi(x,y): x,y\in X\}\right|=k$.

In this paper, we investigate trajectory behavior of the $(3,3)$-Gaussian QSO and prove that this quadratic stochastic operator is regular or there exists a cycle of second order and all trajectories tend to this cycle.

52. Title: *Uniform Ergodicities of Lotz - Raebiger's Nets of Markov Operators on Ordered Banach Spaces*.
Nazife Erkursun Ozcan[a] & *Farrukh Mukhamedov[b]
[a]Hacettepe University.
[b]International Islamic University Malaysia

It is known that Dobrushin's ergodicity coefficient is one of the powerful tools in the investigations of limiting behavior of Markov chains. Several interesting properties of the ergodicity coefficient of a positive mapping defined on ordered Banach space with a base have been studied. In this talk, we will mention uniformly ergodicities of Lotz - R\"abiger's nets of Markov operators on ordered Banach spaces. We will prove uniform ergodicity criterion in terms of the ergodicity coefficient. Moreover, our

main results open new perspectives in quantum Markov processes defined on von Neumann algebras. Moreover, by varying the Banach spaces one can obtain several interesting results in both classical and quantum settings as well.

53. Title: *Group Theoretical Properties of Certain Bilinear Combinations of the Non-Commutative Ladder Operators.*

[*]Nurisya Mohd Shah[a,b] , Hishamuddin Z. [a,b] and Chan Kar Tim [a,b]
[a]Dept. of Physics, Faculty of Science, Universiti Putra Malaysia
[b]Laboratory of Computational Sciences & Mathematical Physics, INSPEM, Universiti Putra Malaysia.

Non-commutative Quantum Mechanics model have become of current interest in the field of mathematical physics. The idea is to introduce the non-commutativity between the space-space and momentum-momentum commutation relations. We present here some group structures that emerge from the Lie algebras built using bilinear combinations of the non-commutative raising and lowering operators which arise in the two-dimensional NCQM model. We provide details for the formulation of this NCQM features. It is shown that these algebras and groups depend on the non-commutative parameter α, and we explore the situations as α ranges through its allowed values: $0 < \alpha < 1$. The allows values is the limit for which the system is deduced to the usual commutative quantum mechanical system.

54. Title: *Note on Complexity for Quantum Open Systems*.

Noboru Watanabe
Tokyo University of Science.

In order to treat several complicated systems, it is important to study the dynamics of state change and the complexity of states of systems. Information Dynamics introduced by Ohya is a new concept synthesizing the research schemes of several complicated systems. In ID, there are two typesof complexities, (1) a complexity of state describing system itself and (2)a transmitted complexity between two systems. Classical and quantum entropies are the example of the complexities of those complexites. Based on the Umegaki's relative entropy of Umegaki and the compound state, the quantum mutual entropy was defined by Ohya in 1983, and it was extended to general quantum systems by using the relative entropy of Araki and Uhlmann. One can discuss the coding theorems by means of the mean entropy and the mean mutual entropy defined by the dynamical entropy. In this talk, we will discuss about complexity of open system dynamics.

55. Title: *TBA*.

Nobuhiro Asai
Aichi University of Education, Japan.

TBA.

56. Title: *The Soliton Interaction in Weakly Nonlocal Nonlinear Media on the External Potentials*.

Nor Amirah Busul Aklan & *Bakhram Umarov
International Islamic University Malaysia.

This paperwork had observed the analytical and numerical study of the solitons interaction and scattering of the weakly nonlocal nonlinear media on the external potential called delta potential. Using generalized form of Nonlinear Schrodinger Equation (NLSE) which is Cubic-Quintic NLSE, in weakly nonlocal nonlinear media, we applied the variational approximation method to derive the equations for soliton parameters evolution during scattering process. Then a direct numerical simulation of NLSE is used to check the validity of approximations, considering the soliton initially located far from potential. Depending on initial velocity of the soliton, the phenomenon of reflection and transmission of the soliton through the potential have been showed. The critical values of the velocity separating these two scenarios have been identified.

57. Title: *On p-adic Solid-on-Solid model on a Cayley tree*.

Otabek Khakimov
Institute of Mathematics, National University of Uzbekistan.

We consider a nearest-neighbor p-adic Solid-on-Solid(SOS) model with $m+1$ spin values and coupling constant $J \in \mathbb{Q}_p$ on a Cayley tree. It is found conditions under which a phase transition does not occur for this model. It is shown that under condition
$p \mid m+1$ for some J a phase transition occurs. Moreover, we give criterion of boundedness of p-adic Gibbs measures for the $m+1$-state SOS model.

58. Title: *TBA*.

Pradip Kumar Das
Indian Statistical Institute, India.

TBA.

59. Title: *Fredholm Partial Integral Equations ofSecond Type with Degenerate Kernel*.

Ramziddin Kucharov
National University of Uzbekistan, Uzbekistan.

In this talk we give the solvability of the Fredholm partial integral equations of second type with degenerate kernels.

60. Title: *A 2×2 Block Operator Matrix with Purely Essential Spectrum*.
Rustam G'aybullayev
National University of Uzbekistan, Uzbekistan.

We consider a 2×2 block operator matrix acting in the direct sum of one- and two-particle subspaces of a Fock space. We show that the spectrum of this operator is purely essential and it consists the union of at most three closed intervals.

61. Title: *Dynamic Modelling of the Quadriceps Muscle of Knee Joint Using Neural Network Time Series Models: Part 3*.
Saadi Ahmad Kamaruddin
International Islamic University Malaysia.

Artificial neural approach has been utilized in various recorded, and a champion amongst the most understood widespread approximators. Neural framework has for quite a while been known for its ability to handle a complex nonlinear system without a logical model and can learn refined nonlinear associations gives. Theoretically, the most surely understood computation to set up the framework is the back propagation (BP) count which relies on upon the minimization of the mean square error (MSE). This paper exhibits the improvement of quadriceps muscle model by utilizing counterfeit smart procedures named back propagation neural network nonlinear autoregressive (BPNN-NAR) and back propagation neural network nonlinear autoregressive moving average (BPNN-NARMA) models in view of utilitarian electrical incitement (FES). A progression of tests utilizing FES was led. The information that is gotten is utilized to build up the quadriceps muscle model. 934 preparing information, 200 testing and 200 approval information set are utilized as a part of the improvement of muscle model. It was found that both BPNN-NAR and BPNN-NARMA performed equally in modelling this type of data. As a conclusion, the neural network time series models performed efficiently for non-linear modelling such as active properties of the quadriceps muscle with one input, namely output namely muscle force.

62. Title: *Boundary Layer Flow of a Dusty Fluid on a Stretching Sheet Of Another Quiescent Fluid*.
Sharena Mohamad Isa[a] & [*]Nurul Farahain Mohammad[b]
[a]Universiti Teknologi Malaysia
[b]International Islamic University Malaysia.

A research study on boundary layer flow of a dusty viscous fluid past a stretching sheet of another dusty viscous quiescent fluid is conducted. The upper lighter fluid imposes downward on a lower heavier fluid. The existence of solid particles in a dusty fluid either naturally or deliberately in the form of dust, ash or soot suspended in the fluid may influence both upper and lower fluid flow characteristic. Therefore, this study investigates the effects of specific physical parameters such as fluid particle interaction, stretching rate, suction and injection. The governing partial differential equations are transformed into ordinary differential equations by using similarity

transformation. The resulting differential equations are solved numerically by using Runge Kutta Fehlberg method (RKF45 Method). The behaviors of physical parameters on velocity profile as well as skin frictions are presented graphically.

63. Title: *Chains of Evolution Algebras*.

Sherzod Murodov
Institute of Mathematics, National University of Uzbekistan.

The concept of evolution algebras lies between algebras and dynamical systems. Algebraically, evolution algebras are non-associative Banach algebra; dynamically, they represent discrete dynamical systems. Evolution algebras have many connections with other mathematical fields including graph theory, group theory, stochastic processes, mathematical physics, etc. It is important to note that, there exist several classes of non-associative algebras (baric, evolution, Bernstein, train, stochastic, etc.), whose investigation as provided a number of significant contributions to theoretical population genetics. Such classes have been defined different times by several authors, and all algebras belonging to these classes are generally called "genetic". Chain of evolution algebras is a dynamical system the state of which at each given time is an evolution algebra. The chain is defined by the sequence of matrices of the structural constants which satisfies the Chapman-Kolmogorov equation.

64. Title: *The Singularity Exponents of Some One-Dimensional Maps*.

Shuxrat Djalilov
Institut of Economics and Service of Samarkand.

Consider the circle homeomorphism f with one break point x_b and irrational rotation number rho_f of bounded type. Suppose f satisfies the following conditions:

i) $f \in C^1\{x_b\}$;

ii) Df is absolutely continuous on $[x_b, x_b + 1]$.

We prove that the singular invariant measure is of Holder type.

65. Title: *The Support Projection of State and A Quantum Extension of the Classical Lévy-Austin-Ornstein Theorem*.

Skander Hachicha
University of Tunis EL Manar, Tunisia

We characterize the support projection of a state evolving under the action of a quantum Markov semigroup with unbounded generator represented in the generalized GKSL form and a quantum version of the classical Lévy-Austin-Ornstein theorem.

66. Title: *Regular Representations of Completely Bounded Maps*.
Sumesh Kappil
Indian Institute of Mathematical Sciences (IMSc), Chennai, India.

We study properties and structure of some special classes of homomorphisms on C^*-algebras. These maps are $*$-preserving up to conjugation by a symmetry. Making use of these homomorphismswe prove a new structure theorem for completely bounded maps from a unital C^*-algebra into the algebra of bounded linear maps on a Hilbert space.

67. Title: *Displacement Operator and Generalization of Cameron-Martin-Girsanov Transformation*.
Un Cig Ji
Chungbuk National University.

We study the displacement operators within the framework of quantum white noise calculus. The displacement operators are characterized by implementation problems which are equivalent to linear differential equations associated with the quantum white noise derivatives for white noise operators. Then the displacement operators are applied to study a generalization of the Cameron-Martin-Girsanov theorem.

More precisely, we prove that the affine transform, with an isometric dilation and a regular drift, of a Brownian motion is again a Brownian motion with respect to a new probability measure which is derived explicitly in terms of the displacement operators.This talk is based on series of joint works with N. Obata.

68. Title: *On Classification of n-dimensional Algebras*.
Ural Bekbaev
International Islamic University, Malaysia.

A general constructive approach to the classification and invariance problems, with respect to basis changes, of n-dimensional algebras is offered. A way of construction of an invariant open, dense (in the Zariski topology) subset of the space of structural constants of such algebras is shown. A classification theorem of algebras with structural constants from this dense set is given which provides also the canonical representatives of their orbits. A finite system of generators for the corresponding field of invariant rational functions of structural constants is shown as well.

69. Title: *The Fundamental Basis Theorem of Geometry from an Algebraic Point of View*.
Ural Bekbaev
International Islamic University, Malaysia.

An algebraic analog of the Fundamental Basis Theorem of geometry is offered with a pure algebraic proof involving the famous Waring's problem for polynomials. Unlike the geometry case the offered system of invariant differential operators is commuting, which is a new result even in the classical geometry of surfaces. Moreover the

algebraic analog works in more general settings then does the Fundamental Basis Theorem of geometry.

70. Title: *Conjugations of Critical Circle Homeomorphisms*.
Utkir Safarov
Institute of Mathematics, National University of Uzbekistan.

We study conjugation between two critical circle homeomorphisms. Let f_i, $i=1,2$ be circle homeomorphisms with a critical point. Suppose that they have a same irrational rotation number and the order of critical points are not equal to each other. Then the conjugation map between f_1 and f_2 are singular function.

71. Title: *Moments of Quantum Levy Areas Using Sticky Shuffle Hopf Algebras*.
Wu Yue
Xi'anJiaotong-Liverpool Univerisity.

We study a family of quantum analogs of L\'{e}vy's stochastic area forplanar Brownian motion depending on a variance parameter $\sigma \geq 1$ which deform to the classical L\'{e}vy area as $\sigma \to \infty$. They are defined as second rank iterated stochastic integrals against thecomponent of planar Brownian motion, which are one-dimensional Brownian motions, which satisfy Heisnberg-typecommutation relations. Such iterated integrals can be multiplied using thesticky shuffle product determined by the underlying It\^{o} algebra ofstochastic differentials. We use the corresponding Hopf algebra structure toevaluate the moments of the quantum L\'{e}vy areas and study how they deformto their classical values, which are well known to be given essentially bythe Euler numbers, in the infinite variance limit.

72. Title: *Quasi-Free Stochastic Processes from Quantum Random Walks*.
Zhong Ping
Lancaster University.

Attal and Joye studied an operator-valued quantum random walk driven by particles in a faithful normal state. They found the quantum stochastic differential equation obeyed by its limit process, and showed that the quantum noises appearing in this Langevin equation satisfy the commutation relations for a certain quasi-free state. Inspired by this example, we report on the development of a general framework to handle such quasi-free random walks. The necessary theory of quantum stochastic integration builds on early work of Hudson and Lindsay, together with more recent work of Lindsay, Margetts and Weatherall. Joint work with Alexander Belton, Lancaster University.

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