BIRZEIT UNIVERSITY

Department of Mathematics

Birzeit 2018 Conference

"Applied Mathematics and Random Structures"

http://lipn.univ-paris13.fr/~nicodeme/birzeit18RAND/

August 27-30, 2018

Room: Science 240

Organizing Committee

Brigitte Chauvin: Paris Saclay, France
Pierre Nicodème: Paris 13 University, France
Frédérique Bassino: Paris 13 University, France
Abdelrahim Mousa: Birzeit University, Palestine
Hani Kabajah: Birzeit University, Palestine

Speaker: Nicolas Pouyanne
Institution: UVSQ – Paris Saclay University
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Title: Enumeration of planar graphs.

Abstract: A graph is called planar when it can be embedded into the plane so that no two edges cross at an interior point. How does a planar graph with n vertices look like when n grows to infinity? Using generating functions and analytic combinatorics, it will be shown how one can reach results such as:

- give an asymptotic equivalent of the number of planar graphs;
- the number of edges of a planar graph satisfies a central limit theorem with linear mean and variance;
- the number of connected components of an planar graph is asymptotically Poisson distributed.

Speaker: Mohammad Adm
Institution: Konstanz & Palestine Polytechnic University
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Title: On the zero forcing game and maximum nullity of matrices whose graph is acyclic or unicyclic with q negative eigenvalues.

Abstract: In studying the problem of maximum nullity of matrices with a prescribed number of negative eigenvalues whose zero-nonzero pattern is determined by a given graph, the zero forcing game and its variants play crucial roles. In this talk, a modified version of the zero forcing game which plays an important role in studying the maximum nullity of acyclic and unicyclic matrices with one negative eigenvalue, a formula for the maximum nullity and exploration its behavior as a function of the number of negative eigenvalues, and a description of the matrices associated with trees that attain this maximum nullity will be presented. The analysis will then be extended to the unicyclic graphs.

Joint work with Shaun Fallat, University of Regina, Canada.

Speaker: Maryam Fasfous
Institution: Palestine Polytechnic University
Email: maryamwf1990@gmail.com

Title: Binary operations on matrices of graphs.

Abstract: In this paper, we study a new finite undirected graph G from two finite simple graphs G1 and G2 with V(G1)=V(G2) by applying the Boolean operations OR , AND, XOR, and NXOR on their antiadjacency matrices. In addition, we compare the largest eigenvalue of the antiadjacency matrix of G with the largest eigenvalue of the antiadjacency matrices of G1 and G2. Furthermore, we present a new ring structure R consisting of the nxn antiadjacency matrices of simple graphs R together with operations NXOR and OR, also we provide an example of ring structure on the set of all graphs that having the same n vertices, by using their corresponding antiadjacency matrices, and compute an isomorphic function between two rings of graphs.

Speaker: Abdulhakeem Eideh
Institution: Al-Quds University
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Title: Analysis of survey data under informative sampling.

Abstract: The material in this talk serves as a basis for the analysis of survey data under informative sampling design. Section 1 contains an introduction. Sections 2 and 3 define the methods of probability weighting and pseudo likelihood estimation. Section 4 defines the sample distribution and its relationship to the population distribution. In Sections 5 and 6 we treat the sample likelihood function and the sample distribution is derived under different models for sample selection probabilities. Section 7 gives results on the relationships between moments under the sample and the population distributions. Section 8 outlines estimation methods based on the sample likelihood. Section 9 focuses on multivariate normal distribution. In Section 10 we propose the Kullback- Leibler information as a distance measure between the sample and the population distributions. Finally in Section 11 we discuss briefly the relationship between the response-biased and informative sampling designs.

Speaker: Frédérique Bassino

Institution: Paris 13 University

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Title: Random generation of graphs and trees.

Abstract: Random generation plays an important role in domains dealing with enormous volumes of data, for example in interaction networks (computer, sociological, biological networks); in this case, random generation allows the comparison of models and the evaluation of their adequacy for real data. We will present methods to draw at random combinatorial objects. More precisely, to generate the objects one can use ad hoc methods or generic approaches like Markov chains, the recursive method and Boltzmann samplers. We will mainly focus on generic generation with the following combinatorial methods :

- The recursive method due to Nijenhuis and Wilf allows both exhaustive and random generation. It was systematized by Flajolet, Zimmermann and Van Custem to treat decomposable structures.
- Boltzmann samplers, introduced by Duchon, Flajolet, Louchard and Schaeffer, are based on the idea that an object receives a probability essentially proportional to an exponential of its size. A Boltzmann generator is a program randomly generating objects according to this probability distribution. They generate structures in linear time.

Speaker: Sondos Khalil

Institution: Birzeit University

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Title: Numerical results with economic implications of a continuous time model.

Abstract: In this paper we consider the problem faced by an economic agent whose trying to find the optimal consumption, investment and pension strategies while investing his total wealth in a financial market composed of one risky-free asset and one risky asset whose prices evolve with time according to linear stochastic differential equation. We resort to the dynamic programming principle to derive an explicit solution for the problem under consideration.

Speaker: Farida Ghazawneh
Institution: Birzeit University
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Title: Dynamics of piecewise isometries.

Abstract: We analyze and give details of the paper of Arek Goetz, where we begin with a systematic study of Euclidean piecewise isometric dynamical systems (p.i.d.s.) with a particular focus on the interplay between geometry, symbolic dynamics, and the group of isometries associated with p.i.d.s. We investigate various aspects of the dynamical information contained in the coding: symbolic growth and the periodic behavior of codings and cells. This theoretical investigation is motivated by the many examples of piecewise isometric dynamical systems found recently in the literature. Piecewise isometric dynamical systems are direct generalizations of interval exchange transformations to non-invertible, higher dimensional maps.

Speaker: Abdelrahim Mousa
Institution: Birzeit University
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Title: Geometric approaches and bifurcations in the dichotomous decision model.

Abstract: Resorting to the dichotomous decision model, where individuals can make alternative decisions, we study two geometric approaches to construct all possible decisions tilings. Each decision tiling indicates the way the Nash equilibria co-exist and change with the relative decision preferences of the individuals. We find the Nash domains for the pure and mixed strategies and characterize the space of all parameters where the pure Nash equilibria are either cohesive or disparate. We show how the coordinates of the influence matrix together with the total number of individuals affect significantly the occurrence of bifurcations with and without overlaps between the pure strategies.

Speaker: Ala Talahmeh
Institution: Birzeit University
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Title: Blow up in a nonlinear damped wave equation with variable exponents of nonlinearity.

Abstract: In this talk, we consider a nonlinear wave equation with variable exponents. By using the Faedo–Galerkin method, the existence of a unique weak solution is established under suitable assumptions on the variable exponents. We also prove the finite time blow-up of solutions and give a two-dimension numerical example to illustrate the blow up result. Our result generalize some known results existing in the literature from the constant-exponent case to the variable-exponent case.

Speaker: Hanene Mohamed
Institution: Nanterre University
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Title: Mean field analysis for inhomogeneous bike sharing systems.

Abstract: Bike sharing systems with stations having a finite capacity are studied as stochastic networks. The inhomogeneity is modeled by clusters. We use a mean field limit to compute the limiting stationary distribution of the number of bikes at the stations. This method is an alternative to analytical methods. It can be used even if a closed form expression for the stationary distribution is out of reach as illustrated on a variant. Both models are compared. A practical conclusion is that avoiding empty or full stations does not improve overall performance.

Speaker: Thierry Monteil
Institution: Paris 13 University
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Title: Introduction to the computer algebra system SAGE.

Abstract: We will introduce the basic concepts of SAGE and present many examples based on graphs algorithms.

Speaker: Mai Mismar
Institution: Al-Quds Open University
Email: mmismar@qou.edu

Title: Finding the Optimal Solution of The Assignment Problems Using probabilities and without Any Iteration.

Abstract: I propose a new technique for solving the assignment problems. I will explain a new method for solving the balanced assignment problem. This method is based on building a new matrix from the given cost matrix which I call the probability matrix. This can be done by calculating the expected value in the probability matrix for each in the given cost matrix, then using the two matrices I can obtain the optimal solution directly without any iteration. To show the efficiency of this method I'll consider some numerical examples.

Speaker: Pierre Nicodème
Institution: Paris 13 University
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Title: Height of discrete bridges and excursions.

Abstract: We consider directed discrete walks progressing by one unit to the right at each step; besides, at each step, the vertical jumps belong to a finite subset of $\mathbb{Z}$. The walks begins at (0,0).

- Bridges terminates at altitude zero.
- Excursions terminates at altitude zero and remains above the horizontal axis. We use generating functions to encode the walks. In the case of the bridges, a method named kernel method allows to get an explicit form of the generating function of bridges of bounded height. Next, singularity analysis and computer algebra provide an asymptotic refinement of the limit law of the height of a standard brownian bridge, which is the Rayleigh distribution. The case of Dyck paths in bijection with the binary trees is handled by continuous fractions; it leads to a Theta law for the height. A more sophisticated analysis handles more general trees.

Speaker: Frédéric Paccaut
Institution: Picardy University
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Title: An introduction to dynamical systems: basic definitions and examples.

Abstract: A dynamical system is an action of a map on a space. An orbit is the set of iterates of this map on a point of the space. The main question one can ask about a dynamical system is : how do the orbits behave ? The aim of this short course will be to explain how a purely deterministic dynamical system may give rise to random behaviors. Basic notions of topological and measurable dynamics will be introduced and illustrated on examples : dynamics on the interval, on the circle, on the shift space.

Speaker: Khalid Salah
Institution: Al-Quds University
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Title: An approximation of a longitudinal stochastic model.

Abstract: We propose to approximate a model for repeated measures that incorporated random effects, correlated stochastic process and measurements error. The stochastic process used in this research is the Integrated Ornstein-Uhlenbeck (IOU) process. We consider a Bayesian approach which is motivated by the complexity of the model, thus, we propose to approximate the IOU stochastic process into a continuous spatial model that constructed by convolving a very simple and independent, process with a kernel function. This approach offers a number of advantages over specification through a spatial covariogram. In particular, this process convolution specification leads to computational simplifications and easily extends beyond simple stationary models, which are flexible and able to accommodate large amounts of data.

Speaker: Brigitte Chauvin
Institution: Paris Saclay University
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Title: Binary Search Trees.

Abstract: We present first the binary search trees which model one of the most famous sorting algorithm of computer science; we precise next where the *alea* occurs. We analyze their height and path length, important cost parameters for the computer scientist. The asymptotic analysis is done on one hand by analytic combinatorics and generating functions and on the other hand by a probabilistic approach using martingales. The asymptotic analysis leads to a fixed point equation in distribution, the latter being studied by a contraction method. We precise the relationship of the model with branching processes which allows results of large deviation for the height.

Speaker: Asma Shareef
Institution: Birzeit University
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Title: Neimark Sacker Bifurcation of higher order rational difference equations.

Abstract: I will present two difference equations one of order three and the other of order four, mainly I studied the stability of each one and the presence of Neimark sacker bifurcation and It's direction. Finally I gave a numerical example to show that.

Speaker: Batool Raddad
Institution: Birzeit University
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Title: Dynamics and bifurcation of second and third order rational difference equations.

Abstract: In this talk, we discuss the bifurcation of second and third order rational difference equations. We focus on the dynamic behavior of the positive fixed points and the type and sufficient conditions of the bifurcation exists where the change of stability occurs. Then, numerical examples are treated to support the results.

Speaker: Walaa Yassen
Institution: Birzeit University
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Title: Using Symmetries To Solve Some Difference Equations.

Abstract: We study symmetry method to solve some difference equations by determining Lie groups of symmetries. Then we use these groups to achieve successive reductions of order. If there are enough symmetries, the difference equations can be completely solved.

Speaker: Wisam Samarah
Institution: Al-Quds University
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Title: A Mathematical Solutions to an Unstable Economic Environment: A Case Study of the Palestinian Economy.

Abstract: The world economy is currently facing a unique paradox which is defined by the existence of an unparalleled global production capacities associated with rising levels of unemployment, inequality, financial instability, social unrest and ecological degradation. This is why economists are now interested in volatility, uncertainty, complexity and ambiguity (VUCA). The Palestinian economy is a perfect example of a VUCA economy. Thus why the Palestinian economy cannot achieve Stability Certainty Simplicity and Clarity (SCSC)? The purpose of this paper is to study the pattern of the Palestinian GDP and determine the variables that will most influence the movement in the GDP over time. We will use a graphical analysis and then proof mathematically the existence of a functional relationship between GDP and the given variables that affect the GDP throughout time. Then we will take a closer look at the given differential equation and how it moves over time. We will then use time series analysis to empirically show estimate the equation. Finally, advice will be given to policy makers on how decisions should be made in such an environment.

Speaker: Sima Abualrub
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Title: Determinants of student's success at Birzeit University**.**

Abstract: This talk explores determinants of academic performance among university students in Birzeit University. A stratified random sample of 400 undergraduate students in Birzeit University will be surveyed using a self-administered questionnaire; the survey will be conducted in the spring semester 2018. Both factors analysis and generalized linear regression model will be used, variables like gender, entrance test (General High School Test), psychological well-being, classes attendance, and other factors will be tested to determine their effect on academic performance. This is the first study of this type conducted in Birzeit University. Therefore, the results contribute to the research literature on students' well-being and academic performance through increased understanding of the determinants of both response variables.

Speaker: Rasha Shadeed
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Title: Multicollinearity.

Abstract: In this report, we recognize the concept of multicollinearity. We will be able to answer some questions like, when does collinearity exist, why multicollinearity is important and we will learn how to test it . Finally, we will identify some solutions to this problem.

Speaker: Elie de Panafieu
Institution: Nokia Bell Labs, Saclay
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Title: Analytic combinatorics of graphs.

Abstract: Graph combinatorics aims at counting graphs families and deriving their statistical properties. For example, what is the probability that a random graph is connected, given its number of vertices and edges? How many graphs are there where all degrees are even integers? What is the typical size of the largest component in a random graph? Those problems and many others have been solved using various tools, mainly from probability theory, but also spectral analysis and analytic combinatorics. This course focuses on the contributions from this last field of research.

Speaker: Walaa Doufesh
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Title: Ideals on Skew Lattices.

Abstract: In this work we discuss the concept of Skew Lattice which is an Algebraic Structure (S, ∧, ∨) where ∧ and ∨ are associative and idempotent binary operations satisfying the absorption identities. In general Skew Lattices are non-commutative generalization of lattices. We also discuss the Green's Relations on these kinds of lattices, and enrich the concepts of Skew ideals and filters on Skew Lattices.

Speaker: Lucas Gerin
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Title: Uniform random permutations.

Abstract: This course is at the crossroads of combinatorics and probability. I will present different aspects of uniform random permutations: How to simulate them? How to sort them? What can be said about the typical number of cycles? the typical number of fixed points? We will see in passing several universal phenomena in probability: the Poisson paradigm, reinforcement, size-bias.

Speaker: Hind Sweis
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Title: Solving Local Fractional Fredholm Integral Equation of the Second Kind with Separable Kernel.

Abstract: The local fractional integral equations are one of the applications on local fractional calculus, this work study the local fractional fredholm integral equation of the second kind with separable kernel, thats mean the kernel k(x,t) can be expressed as a sum of finite numbers of terms each of which is a product of a function of x only and a function of t only, then we solve this equation by following a certain procedure to obtain a system of linear equations that can be used to solve the local fractional fredholm integral equation, also the work displays examples that show the effectiveness of this method. Keywords: local fractional calculus, local fractional fredholm integral equation, separable kernel.

Speaker: Fedaa Shoman
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Title: A discrete game theoretical Model.

Abstract: In this paper we will study a special case in the decision model introduced by Dr. Mousa et. al by considering one type of homogeneous individuals who have uncertainly in their decision. The model has model two possible decisions that individuals can make. The individuals' decisions are made according to individuals' preferences. The preferences have the interesting feature of taking into account not only how much an individuals like or dislike a certain decision but also the other individuals' decisions. In this paper we characterize the space of all parameters in which the Nash equilibria are either pure (cohesive or disparate) or mixed. This decision model has wide applications in real life and can be used to understand better the social interaction, tourism, industry and economical and political revolutions.