Booklet of Abstracts

WORKSHOP WOMEN IN MATHEMATICS

Ghent, 13 May 2024

Dedicated to the International day of women in Mathematics and the birthday of Maryam Mirzakhani (may12.womeninmaths.org)

Organisers: Marianna Chatzakou, Jozefien D'haeseleer and Michael Ruzhansky

Scientific Committee: Jan De Beule, Claudia Garetto, Sylvie Paycha, Michael Ruzhansky and Leo Storme

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GENERAL INFORMATIONS

We welcome you all to Workshop Women in Mathematics in Ghent University. The workshop will take place in a hybrid form, with the in-presence events being held at the Lecture room 3.1, Building S8, Campus Sterre.

ZOOM link:
https://us02web.zoom.us/j/83095584409?pwd=c3huaUhZcWFrZ2NNMU05Ujg4aUlWQT09

Meeting ID: 830 9558 4409, **Passcode**: 135803

INTERNET ACCESS

Participants can either login using personal EDUROAM access at your home university, or select network "UGentGuest" and enter the credentials

login: guestWomeni **Passcode**: UCE9VyLW

ABSTRACTS - ordered according to timetable

09:00-09:30 *welcome coffee & opening ceremony*

09:15-09:30 Gender Gap in Mathematical, Computing and Natural Sciences

Colette Guillopé
(marie-francoise.roy@univ-rennes.fr, guillope@u-pec.fr)
Université Paris-Est Créteil and CNRS, France

The Global Gender Gap Project in Science was funded by the International Science Council from 2017 to 2019. The project had three parts: a global survey of scientists with more than 30,000 answers, from half women and half men; an analysis of academic publications where millions of publications have been analysed since 1970; a database of good practices with over 60 activities. In the global survey of scientists, mainly in the fields of the project, Mathematics, Computer Science, Biology, Chemistry, Physics, Astronomy, History and Philosophy of Science, the questions were broadly organised around nine themes: (1) Secondary degree; (2) First university degree; (3) Master and Doctoral degree; (4) Employment; (5) Grants, publications and related topics; (6) Interruptions in studies and career; (7) Marriage, partnership and parenthood; (8) Discouragement and discrimination and (9) Sexual harassment. The results of the project have been published in the book [1]. An additional study was conducted on the global survey data in Mathematics, which includes data in Applied Mathematics [2]. We will present and discuss the results of the project, especially the results for Mathematics.

References:

1. C. Guillopé, M.-F. Roy (Ed.): A Global Approach to the Gender Gap in Mathematical, Computing, and Natural Sciences. How to Measure It, How to Reduce It?. International Mathematical Union, ISBN-10 3000655336 ISBN-13 9783000655333 (2020). https://zenodo.org/record/3882609
2. S. Dabo-Niang, M. J. Esteban, C. Guillopé, M.-F. Roy: Aspects of the gender gap in mathematics, EMS Magazine 131, 22-31 (2024).

10:30-10:45 coffee break

10:45-11:15 Generalised Fock spaces with applications to sampling and interpolation sets

Paula Cerejeiras

(pceres@ua.pt)
Universidade de Aveiro, Portugal

In this talk we introduce a Fock space related to derivatives of Gelfond-Leontiev type, of which fractional derivatives and Dunkl operators are particular examples. For this space a modified Bargmann transform will be established and used to prove density theorems for sampling and interpolation.

11:15-11:45 From martingales to quality of life: Mathematics finds statistics to solve real world problems

Els Goetghebeur
(els.goetghebeur@ugent.be
Ghent University, Belgium

Randomized trials are the gold standard design for evaluating treatment effects but tend to exclude 'complicated patients' with multiple treatments or at high risk of dying. Single arm trials of treated patients are then more feasible but lack concurrent controls. Such studies are on the rise in late stage oncology, where time to death as well as quality of life matter. These outcomes are typically right censored - due to limited observation time - while quality of life no longer exists after death. Standard random effects regressions then implicitly impute outcomes after death. Methods of causal inference then help understand how causal effects on quality of life over time may be evaluated. They require adjustments for gaps in observation due to confounding and censoring, while drop out after death, or other intercurrent events, must be handled properly. We develop (double) Inverse Probability Weighting and censored outcome regression to standardize the bivariate outcome of survival and quality of life -while alive. It enables a focus on meaningful estimands when evaluating various choices of treatment in the presence of intercurrent events. Targeting the right estimand (in large samples) with justified confidence intervals in a manner that is as robust and efficient as possible requires careful mathematical developments, sometimes relying on martingale derived stochastic processes. Meaningful developments and relevant implementation need rigorous mathematics combined with plausible assumptions and thus collaboration across many stakeholders. We work on this with StatGent in the context of the European IMI-SISAQOL project in collaboration with STRATOS.

StatGent: https://www.ugent.be/dass/en/consulting
IMI-SISAQOL: https://www.imi.europa.eu/projects-results/project-factsheets/sisaqol-imi
STRATOS: https://stratos-initiative.org/en

11:45-12:00 *coffee break*

12:00-12:30 Global regularity of Weyl pseudo-differential operators in the Gelfand-Shilov setting

Smiljana Jaksic
(smiljana.jaksic@sfb.bg.ac.rs)
University of Belgrade, Serbia

We analyse a class of pseudo-differential operators in the Gelfand-Shilov setting whose Weyl symbols are radial in each phase-space variable separately. Namely, the symbols are of the form

$$a_\vartheta(x,\xi) := a(2x_1^2 + 2\xi_1^2, \dots, 2x_d^2 + 2\xi_d^2),$$

where a is a measurable function on $\mathbb{R}^d_+ := \{r \in \mathbb{R}^d \,|\, r_j > 0,\, j = 1, \dots, d\}$ and has Gelfand-Shilov L^p-growths. We prove that the action of these pseudo-differential operators on a Gelfand-Shilov ultradistribution f can be given by a series of Hermite functions with coefficients that are explicitly computed in terms of the Laguerre coefficients of a and the Hermite coefficients of f. As a consequence, we give a characterisation of the functions a in terms of the growths of their Laguerre coefficients for which the Weyl quantisation of a_ϑ are globally Gelfand-Shilov regular.

12:30-14:00 *lunch break*

14:00-14:30 A survey on hyperbolic equations with multiplicities

Claudia Garetto
(c.garetto@qmul.ac.uk)
Queen Mary University of London, UK

In this survey talk I will give an overview on the theory of hyperbolic equations with multiplicities. I will also celebrate the contributions of female mathematicians to this exciting area of mathematics.

14:30-15:00 The mathematics of superoscillations

Irene Sabadini
(irene.sabadini@polimi.it)
Politecnico di Milano, Italy

I will introduce superoscillating sequences (or superoscillations in brief) which are commonly known as band-limited functions that can oscillate faster than the highest frequency that they contain. This apparently paradoxical phenomenon was observed by Yakir Aharonov and has its roots in quantum mechanics. In this talk I shall present some of the problems regarding such functions, in particular their time evolution when they are considered as the initial condition for the Schrodinger equation with suitable potentials. I will show how infinite order differential operators and spaces of entire functions with growth conditions naturally appear in the study of the evolution problem.

15:00-15:20 *coffee break*

15:20-15:50 An Overview on Algebraic Coding Theory

Gianira Alfarano
(gianira.alfarano@ucd.ie)
University College Dublin, UK

The theory of error-correcting codes deals with corrections of errors occurring in noisy communication. This topic has inspired many mathematicians who were interested in applying techniques from algebra and discrete mathematics in order to progress on questions in information processing. For thisreason, this branch of mathematics goes under the name *Algebraic Coding Theory.* It lies at the intersection of several disciplines in pure and applied mathematics such as finite geometry, algebra, number theory, probability theory, statistics, combinatorics, complexity theory, and statistical physics. In this talk we will provide the basics of Algebraic Coding Theory and some of its applications in information theory

15:50-16:20 Are almost all graphs determined by their spectrum?

Aida Abiad
(a.abiad.monge@tue.nl)
Eindhoven University of Technology, Netherlands

We look at the spectrum (eigenvalues) of the adjacency matrix of a graph, and ask whether the eigenvalues determine the graph. This is a difficult, but important problem which plays a special

role in the famous graph isomorphism problem. It has been conjectured by van Dam and Haemers that almost every graph is determined by its spectrum. The mentioned problem has been solved for several families of graphs; sometimes by proving that the spectrum determines the graph, and sometimes by constructing nonisomorphic graphs with the same spectrum. In recent years this problem has attracted much interest. In this talk we will report on several results concerning this conjecture.

16:20-16:35 *coffee break*

16:35-17:05 Acoustic Wave Propagation Through a Cluster of Hard Upright Cylinders: Porous Media and Radiative Transfer Approach

Elena Shabalina
(elena.shabalina@ditf.de)
Technology Center E-Textiles & Acoustics, Germany

Clusters of cylinders are a useful way to model the wave propagation through several natural and complex media: crowds of people, forests, arrays of scatterers, or various materials. Depending on the absorption properties of the cylinders, as well as their size- and distance-to-wavelength ratio, different physical mechanisms are at play: scattering, viscous and thermal dissipation, absorption within the material of the cylinders themselves.

We consider the low frequency case when the wavelength is larger than both the cylinder diameter and spacing. Most multiple scattering theories require larger than wavelength spacing and are not applicable in the case of dense clusters and at low frequencies. As a first approximation, a porous medium model is used to calculate the speed of sound in the cluster. However, this approach does not readily give access to the coherency of the signal.

Recently, a radiative transfer approach was used to model forest acoustics to examine the transformation of the coherent sound field into an incoherent sound field. We use this approach to examine the coherent to incoherent field transition depending on the wavelength to diameter and spacing.

17:05-18:00 *short movie exposition ("Alicia Boole in the land of polytopes" and "Kovaleskaya' Spinning Top") provided to us by may12.womeninmaths.org & closing ceremony*