The Abdus Salam International Centre for Theoretical Physics

United Nations Educational, Scientific and Cultural Organization

IAEA International Atomic Energy Agency

Arithmetic and Analysis Day
November 23, 2018
ICTP

Venue: Luigi Stasi seminar room (ICTP Leonardo da Vinci Building)

9:30 - 10:30 **Emanuel Carneiro** (ICTP)

Title: **Bounds for zeta and primes via Fourier analysis**

Abstract: This will be a light talk (a survey-type talk with mention to several open problems) on some of the recent bounds for objects related to the Riemann zeta-function via the use of Fourier analysis machinery. Certain very interesting Fourier optimization problems come into play, naturally related to our number theoretical entities. Very little analysis/number theory background is expected in order to get the big picture of the talk.

10.30 - 11:00 Coffee break

11:00 - 12:00 **Umberto Zannier** (SNS, Pisa)
Title: **Pell-Abel equation X^2-D(t)Y^2=1, to be solved in polynomials X(t),Y(t), and applications.**

Abstract: We shall discuss the so-called Pell-Abel equation, i.e. X^2-D(t)Y^2=1. This is similar to the classical Pell equation (proposed in fact by Fermat), which appears in many issues of Number Theory. The polynomial version seems less well-known, but is old as well, studied e.g. by Abel in 1826. We shall survey about this equation, illustrating different mathematical issue involving it. Then we shall also present some recent results about solvability of the equations, when D(t) runs through a pencil of polynomials.

12:00 Lunch

14:00 - 15:00 **Danylo Radchenko** (MPI)
Title: **Universal optimality, Fourier interpolation, and modular forms**

Abstract: I will talk about a joint work with Henry Cohn, Abhinav Kumar, Stephen D. Miller, and Maryna Viazovska. We look at the problem of arranging points in Euclidean space in order to minimize their potential energy. In some exceptional case it might turn out that a single configuration is optimal for all potentials that are completely monotone; in this case such a configuration is called universally optimal. We show that the E8 lattice and the Leech lattice are universally optimal in their respective dimensions.

15:00 - 15:30 Coffee break

15:30 - 16:30 **Felipe Gonçalves** (University of Bonn)
Title: **Uncertainty principles connected with sphere packings.**

Abstract: In this talk we discuss recently discovered uncertainty principles related to the problem of packing spheres in Euclidean space. Time permitting, we will also discuss how these techniques can be used on other problems in number theory.

Everyone is welcome to attend