OPSFOTA'2

The 2nd meeting of the Research Group on

Orthogonal Polynomials, Special Functions and Operator Theory and Applications

All talks will take place in Room S5.20
Department of Mathematics - King's College London
Strand, London WC2R 2LS - press here to see on the map

11.00 - 12.00	Igor **Krasovsky** (Imperial College, London) Title: *Asymptotics of Toeplitz determinants and orthogonal polynomials for weights with fixed, merging, and emerging singularities*	Room S5.20
12.00 - 13.30	Lunch	
13.30 -14.30	Ana **Loureiro** (University of Kent) Title: *Three-fold symmetric multiple orthogonal polynomials*	Room S5.20
14.30 - 15.00	Coffee/Tea break	Room S5.21
15.00 - 16.00	György **Geher** (University of Reading) Title: *Some geometric properties of normed spaces*	Room S5.20
16.00 - 16.30	Coffee/Tea break	Room S5.21
16.30 - 17.30	Walter **Van Assche** (University of Leuven, Belgium) Title: *Multiple Hermite polynomials and simultaneous quadrature*	Room S5.20
18.00 -	Dinner	

This meeting is supported by

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EST. 1865

György Geher (University of Reading, U.K.)

Title. Some geometric properties of normed spaces

Abstract. In my talk I will consider the following problem for $d \in \mathbb{N}, d \geq 2$ and general real normed spaces $(X, \|\cdot\|)$: how can we characterise those, at least d-dimensional spaces X such that for every set of $d+1$ affine independent points $p_0, \dots p_d$, the distances $\{\|x - p_j\|\}_{j=0}^{d}$ determine the point x lying in the simplex $\mathrm{Conv}(p_0, \dots p_d)$ uniquely.

The above property is trivially true in Euclidean spaces, even if we consider the affine hull instead of the convex hull of the points. First, we will see why the affine hull version of the above problem has always a negative answer in general normed spaces (other than Euclidean). Then, we will consider the above phrased more complex problem, in particular, we will see that the characterization depends on d.

Igor Krasovsky (Imperial College of London, UK)

Title. Asymptotics of Toeplitz determinants and orthogonal polynomials for weights with fixed, merging, and emerging singularities

Abstract. We will review results on the asymptotic behaviour of Toeplitz determinants and associated orthogonal polynomials on the unit circle whose orthogonality weights possess root-type and jump singularities. We will discuss some applications in the Ising model and random matrix theory, and mention extensions to Hankel determinants and corresponding orthogonal polynomials on the real line.

Ana Loureiro (University of Kent, UK)

Title. Three-fold symmetric polynomials with an algebraic classical behaviour

Abstract. I will discuss sequences of polynomials of a single variable that are orthogonal with respect to a vector of weights on a three-star of the complex plane. Such polynomial sequences satisfy a recurrence relation of finite (and fixed) order higher than 2. The main focus will be on polynomial sequences possessing a three-fold symmetry and whose multiple orthogonality is preserved under the action of the derivative operator. Among other things, I will also explain the asymptotic behaviour of the zeros of those polynomial sequences. This is a joint work with Walter Van Assche.

Walter Van Assche (University of Leuven, Belgium)

Title. Multiple Hermite polynomials and simultaneous quadrature

Abstract. Multiple Hermite polynomials are an extension of the classical Hermite polynomials for which orthogonality conditions are imposed with respect to $r > 1$ normal (Gaussian) weights with different means $c_i/2$, $1 \leq i \leq r$. These polynomials have a number of properties, such as a Rodrigues formula, recurrence relations (connecting polynomials with nearest neighbor multi-indices), a differential equation, etc.

The asymptotic distribution of the (scaled) zeros is well understood and an interesting new feature happens: depending on the distance between the means c_i, $1 \leq i \leq r$: the zeros may accumulate on s disjoint intervals, where $1 \leq s \leq r$.

We will use the zeros of these multiple Hermite polynomials to approximate integrals of the form $\int_{-\infty}^{\infty} f(x) \exp(-x^2 + c_j x)\, dx$ simultaneously for $1 \leq j \leq r$. The behavior of the quadrature weights depends in an important way on whether or not the zeros are on disjoint intervals or on one interval.