One-day conference
dedicated to the memory of academician A. A. Gonchar

Abstracts of talks

Evgeny Abakumov (*Université Paris-Est*)

Proper holomorphic embeddings, radial approximation, and tropical power series

We study the problem of approximation of radial weights by finite sums of moduli of holomorphic functions. Relations to other approximation problems are discussed. As an application, quantitative aspects of proper holomorphic embeddings of planar domains and complex balls into $\mathbb{C}^N$ are considered.

The talk is based on joint work with E. Dubtsov.

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Vladimir Dubinin (*Institute for Applied Mathematics, Vladivostok*)

Symmetrization of condensers and geometrical properties of multivalent functions

In the talk we will give a brief survey of new distortion theorems for holomorphic functions, in which critical values of functions under consideration and the character of the respective covering of a given sets are taken into account. All results are obtained using one general method based on the concept of a circular symmetrization of condensers on Riemann surfaces. One theorem about change of a condenser capacity under symmetrization will be formulated and some its applications to multivalent functions of certain classes will be considered.

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Timur Sadykov (*Plekhanov Russian State University of Economics, Moscow*)

Extremal properties of multivariate hypergeometric polynomials

With any integer convex polytope $P \subset \mathbb{R}^n$ we associate a multivariate hypergeometric polynomial whose set of exponents is $\mathbb{Z}^n \cap P$. This polynomial is defined uniquely up to a constant multiple and satisfies a holonomic system of partial differential equations of Horn's type. Special instances include numerous families of orthogonal polynomials in one and several variables. In the talk, we will discuss several extremal properties of multivariate polynomials defined in this way. In particular, we prove that the zero locus of any such polynomial is optimal in the sense of Forsberg–Passare–Tsikh.

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Mikhail Tyaglov (*Shanghai Jiao Tong University*)

Finite differences as hyperbolicity preservers

Some classes of finite differences that preserve roots of univariate polynomials on lines or in strips and half-planes of the complex plane will be presented. In particular, we describe some of such classes that preserve the hyperbolicity (real-rootedness) of polynomials and prove a finite difference analogue of the Hermite–Pauline theorem (completely different from the one recently established by Brändén, Krasikov and Shapiro). We also found the polynomial whose finite differences has the minimal mesh (minimal distance between roots) among all other polynomials. Corresponding results for entire functions will be presented. Finally, some asymptotic (rather elementary but curious) results for roots of finite differences of polynomials will be presented.

Joint talk with Olga Katkova, Anna Vishnyakova and Jiacheng Xia.

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Yang Chen (*University of Macau*)

Topics In Random Matrices

I will discuss three problems on Hermitian Random Matrices, which ultimately are about orthogonal polynomials:

1. The singularly deformed Jacobi ensembles, where an infinitely fast zero is introduced at an end point of the support of Jacobi weight, and the Hankel determinant under double scaling.

2. On the generating functions of linear statistics of the orthogonal and symplectic ensembles with Gaussian and Gamma "background" distributions.

3. The least eigenvalue of family of Hankel matrices obtained from the large n asymptotic of polynomials orthogonal with respect to $\exp(-x^\beta)$, $x \geq 0$, $\beta > 0$. In general, the smallest eigenvalue goes to zero rapidly, for $\beta > 1/2$ and at $\beta = 1/2$ it is conjectured that the smallest eigenvalue decays slowly. Comparison with numerical computation is made.

These are joint work with Min Chao, Chen Min (*University of Macau*)*, Nigel Lawrence* (*Imperial College*)*, Niall Emmart and Charles C. Weems* (*University of Massachusetts Amherst*).

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