Summer School on Complex Analysis

Title & Abstract

SLE and Scaling Limits: An Introduction

Ilia Binder
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Recently, there has been significant progress in understanding the scaling limits of various lattice models of statistical physics. A vital tool in this advancement is the Schramm Loewner Evolution (SLE), introduced by Oded Schramm in 1998. The lecture series will cover these developments. The topics will include basic properties of lattice models such as Percolation, Ising, Potts, and Self Avoiding Random Walk; the definition and geometric properties of SLE, along with the necessary background in Geometric Function Theory; proofs of the existence of scaling limits and their connections to Schramm Loewner Evolution; and the discussion of the rate of convergence of critical interfaces to SLE curves.

Introduction to Teichmüller Theory

Mario Bonk
University of California, Los Angeles, USA

In my lectures I will give a gentle introduction to the theory of Teichmüller spaces for beginners with no prior knowledge of the subject. The prerequisites are a basic familiarity with real and complex analysis corresponding to the content of a first-year graduate course on these subjects. Specific topics of my lectures include: Riemann surfaces, quasiconformal mappings, the measurable Riemann mapping theorem, quadratic and Beltrami differentials, construction of Teichmüller spaces, Teichmüller metric, the mapping class group, Schwarzian derivatives, Bers embedding and complex structures, infinitesimal theory of Teichmüller spaces, Weil–Petersson metric.

Literature:

1. L.V. Ahlfors, Lectures on Quasiconformal Mappings, 2nd ed., AMS, 2006.
2. O. Lehto, Univalent Functions and Teichmüller Theory, Springer, 1987.
3. Y. Imayoshi and M. Taniguchi, An Introduction to Teichmüller Spaces, Springer, 1992.

Newton's Method

John Erik Fornæss
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I report on recent joint work in progress with Hu, Truong and Watanabe Newtons method is used to find roots of complex polynomials in C. Each root has a basin of attraction. Normally these basins have fractal boundaries. Truong has found a version of Newtons method where computer pictures indicate that the basins have smooth boundaries. We are working to see if this discovery can be proved rigorously.

Introduction to Quasiregular Curves

Pekka Pankka
University of Helsinki, Finland

I will discuss a class of mappings, called quasiregular curves, which connect quasiconformal geometry to holomorphic curves and more generally to conformal geometry of calibrated geometries. Particular examples of quasiregular curves are quasiregular and quasiconformal mappings, holomorphic and pseudoholomorphic curves, together with Smith maps associated vector cross products. In these lectures, I will discuss results in the local analytic theory and global geometric theory of these mappings, and the classical Liouville theorem in the context of calibrations.