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Introduction to Random Geometry

Advanced Topics in mathematical Physics and Probability

Period: Marzo-Aprile 2024

Schedule: 20 hours

This course wants to give an overview of active research topics in the field of Random Geometry, with a focus on growth models. We will start by discussing discrete growth models such as the Eden model, Diffusion Limited Aggregation and Internal DLA. We will then move to the continuum for the remaining part of the course. After discussing conformal invariance of Brownian motion, we will focus on the class of randomly growing domains on the complex plane which can be described via Loewner dynamics. We will introduce several random aggregation models on the complex plane, which go under the name of Hastings-Levitov models and Aggregate Loewner Evolutions, of which we will study the large-scale features, presenting existing results and several open questions.

Keywords: Random aggregation, Diffusion Limited Aggregation, Schramm-Loewner Evolutions, Hastings-Levitov, Aggregate Loewner Evolutions.

Prerequisites: The course will be as self-contained as possible. However, basic notions of Probability and Analysis are necessary. Some knowledge of complex analysis, martingale theory and stochastic calculus is desirable but not required.

See also on youtube:

<https://www.youtube.com/watch?v=NkdlqW1hmlY>

<https://www.youtube.com/watch?v=gCdjAvGlQA8>

<https://www.youtube.com/watch?v=dqQ4ITwWCPc>