Probability, Trees and Algorithms

Organised by
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Abstract. The subject of this workshop were probabilistic aspects of algorithms for fundamental problems such as sorting, searching, selecting of and within data, random permutations, algorithms based on combinatorial trees or search trees, continuous limits of random trees and random graphs as well as random geometric graphs. The deeper understanding of the complexity of such algorithms and of shape characteristics of large discrete structures require probabilistic models and an asymptotic analysis of random discrete structures. The talks of this workshop focused on probabilistic, combinatorial and analytic techniques to study asymptotic properties of large random combinatorial structures.

Mathematics Subject Classification (2010): 60F05, 60C05, 68W40, 68P10.

Introduction by the Organisers

The asymptotic analysis of random discrete structures that are related to the complexity of fundamental algorithms is an active field both in Mathematics and in Computer Science. In this area various probabilistic and analytic techniques have been developed in the last decades including methods based on martingales, connections to branching random walks, the contraction method, techniques using generating functions, and the method of moments. In Computer Science random trees appear in the performance analysis of data structures, in the context of coding schemes as well as connected to fundamental algorithms such as sorting, searching and selecting. Moreover, in the last years also fascinating connections of these random tree models to coalescent processes, fragmentation theory and other combinatorial stochastic processes have been found. Also their random continuous limits such as random real trees have led to a much refined understanding of these structures and the related complexities. The aims of this workshop were advances
and a deeper understanding in the probabilistic analysis of random discrete structures and their limiting objects and to discuss their connections beyond the realm of models motivated from Computer Science.

The talks covered the following themes:

- Random binary search trees, random recursive trees, other search trees and digital trees (Addario-Berry, Bubeck, Bertoin, Gnedin, Hwang, Janson, Leckey, Neininger, Rössler, Kabluchko)
- Combinatorial tree structures (Duquesne, Gittenberger, Mailler, Sulzbach)
- Random graphs, geometric graphs and their limits (Bhamidi, Grübel, Mitsche, Müller)
- Geometric probabilities (Marckert)
- The smoothing transform (Alsmeyer)
- Formal power series and probability (Fill)

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