35th International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms

AofA 2024, June 17–21, 2024, University of Bath, UK

Edited by

Cécile Mailler

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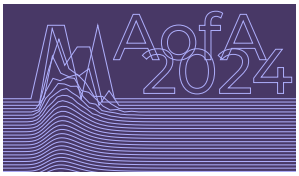

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Dedicated to the memory of Philippe Flajolet.

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Preface

The 35th International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA 2024) was held at the University of Bath, UK, during June 17 – 21, 2024.

Analysis of algorithms is a scientific basis for quantifying the efficiency of computation, providing a link between abstract algorithms and the performance characteristics of their implementations in the real world. The general effort to predict precisely the performance of algorithms and data structures – the amount of time, storage, or other resources needed – has produced mathematical methods of sweeping generality that unify and simplify making such predictions in a rigorous way, as well as software tools supporting their application. In enabling this progress, AofA has come to involve research in analytic combinatorics, the analysis of random discrete structures, asymptotic analysis, exact and limiting distributions, and other fields of inquiry in computer science, probability theory, and enumerative combinatorics. See the AofA community websites for more details: `https://www.math.aau.at/AofA/`.

The Call for Papers invited papers in

- analytic algorithmics and combinatorics,
- probabilistic analysis of algorithms,
- randomized algorithms.

We also welcomed papers addressing problems such as: combinatorial algorithms, string searching and pattern matching, sublinear algorithms on massive data sets, network algorithms, graph algorithms, caching and memory hierarchies, indexing, data mining, data compression, coding and information theory, and computational finance. Papers were also welcomed that address bridges to research in related fields such as statistical physics, computational biology, computational geometry, and simulation.

The conference program featured the 2024 Philippe Flajolet Lecture by Michael Drmota, 30 contributed papers, which are collected in this volume, as well as 8 invited lectures:

- Antoine Genitrini (Sorbonne Université): “Varieties of Trees with Constrained Labelings”
- Leslie Goldberg (University of Oxford): “The Complexity of Approximate Counting”
- Daniel Krenn (Paris Lodron University of Salzburg): “Multi-pivot quicksort and how to compute precise asymptotics”
- László Kozma (Freie Universität Berlin): “Analysis of algorithms via extremal combinatorics”
- Alessandra Caraceni (Scuola Normale Superiore Pisa): “Growing random geometries: making trees blossom and triangulations flip”
- Markus Lohrey (Universität Siegen): “Grammar-based tree compression: combinatorics and algorithms”
- Thomas Sauerwald (University of Cambridge): “Balanced Allocations: The Power of Choice versus Noise”
- Sylvie Corteel (CNRS and Université Paris Cité): “Combinatorics of k-tilings”

As a typical convention in the field is to list authors in alphabetical order, we randomized the order of papers in these proceedings to avoid biases; the same order was used for the conference, so the proceedings volume gives paper in chronological order of presentation.

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Flajolet Lecture

The *Philippe Flajolet Lecture Prize* for outstanding contributions to analytic combinatorics and analysis of algorithms is awarded every two years by the Analysis of Algorithms (AofA) community.

At the AofA 2024 conference, Michael Drmota presented the sixth Flajolet Lecture, entitled "The Moment Method Revisited". Previous Flajolet Lectures Prize recipients are Donald E. Knuth, Robert Sedgewick, Luc Devroye, Wojciech Szpankowski, and Svante Janson.

The prize is named in honor and recognition of the extraordinary accomplishments of the late Philippe Flajolet and his formative influence on the growth and flourishing of the AofA community. Philippe spent most of his scientific life at INRIA, France. He is best known for fundamental advances in mathematical methods for the analysis of algorithms. His research laid the foundation of a subfield of mathematics now known as analytic combinatorics. Analytic combinatorics is a modern basis for the quantitative study of combinatorial structures (such as words, trees, mappings, and graphs), with applications to probabilistic study of algorithms that are based on these structures. It also strongly influences research in other scientific domains, such as statistical physics, computational biology, and information theory. Flajolet's work takes the field forward by introducing original approaches in combinatorics based on two types of methods: symbolic and analytic. The symbolic side is based on the automation of decision procedures in combinatorial enumeration to derive characterizations of generating functions. The analytic side treats those functions as functions in the complex plane and leads to precise characterization of limit distributions. Beyond these foundational contributions, Philippe's research opened new avenues in various domains of applied computer science, including streaming algorithms, communication protocols, database access methods, data mining, symbolic manipulation, text-processing algorithms, and random generation.

Cécile Mailler and Sebastian Wild,
on behalf of the Program and Steering Committees

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