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**Monte Carlo and
Quasi-Monte Carlo Methods 1996**
Proceedings of a conference at the
University of Salzburg, Austria,
July 9–12, 1996



Springer

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Preface

This volume contains the refereed proceedings of the Second International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing which was held at the University of Salzburg (Austria) from July 9–12, 1996. The program of this conference was arranged by a committee consisting of Luc Devroye (McGill University), Henri Faure (University of Provence), Bennett L. Fox (University of Colorado at Denver), Peter Hellekalek (University of Salzburg), Gerhard Larcher (University of Salzburg), Pierre L'Ecuyer (University of Montreal), Gary L. Mullen (Pennsylvania State University), Harald Niederreiter (Austrian Academy of Sciences, chair), Jerome Spanier (Claremont Graduate School), and Peter Zinterhof (University of Salzburg). The local organization was in the hands of Peter Hellekalek, Gerhard Larcher, and Peter Zinterhof. The first conference of this type took place at the University of Nevada, Las Vegas, in June 1994 and the proceedings of that conference were published as Volume 106 of the *Lecture Notes in Statistics*.

Ever since their invention in the 1940s, Monte Carlo methods have been successfully employed to solve difficult problems in scientific computing that cannot be approached by other methods. The important steps in a Monte Carlo method are the setting up of an appropriate stochastic model and the design of a numerical approximation scheme based on random sampling. Monte Carlo methods had their origin in computational physics and were soon applied to computational problems in the other sciences, in engineering, and in econometrics. Today Monte Carlo methods form a basic staple of scientific computing and their applications become ever more diverse.

Quasi-Monte Carlo methods are deterministic versions of Monte Carlo methods, in the sense that random samples are replaced by suitably chosen deterministic point sets and sequences, and they were developed fairly soon after the introduction of Monte Carlo methods. In fact, the term “quasi-Monte Carlo method” already appeared in a Los Alamos technical report of R.D. Richtmyer from 1951. For a long time they were the province of specialists, but in the last ten years their appeal has broadened significantly since it was found that in certain types of computational problems they systematically outperform Monte Carlo methods. This development has gone hand in hand with accelerated progress in the theory of quasi-Monte Carlo methods. Spectacular success stories in exciting new applications such as to mathematical finance have brought quasi-Monte Carlo methods into the limelight in the last few years.

The conference was a showcase for recent developments in Monte Carlo and quasi-Monte Carlo methods and also provided the opportunity of discussing important applications of these methods. These proceedings contain all invited papers presented at the conference and a selection of the submitted contributed papers. The papers were filtered twice: first, the abstracts of the talks were screened by the Program Committee, and then the full papers were subjected to a strict peer-review process. The topics covered here range from theoretical issues in Monte Carlo and simulation

methods, low-discrepancy point sets and sequences, lattice rules, and pseudorandom number generation to applications such as numerical integration, numerical linear algebra, integral equations, binary search, global optimization, computational physics, mathematical finance, and computer graphics.

We would like to thank IBM Austria, the Austrian Computer Society, and the Austrian Ministry for Science and Communications for financial contributions. Essential support for the conference in terms of logistics and manpower was provided by the Department of Mathematics of the University of Salzburg. For special thanks we want to single out Wolfgang Ch. Schmid and Karl Entacher who assisted us in many tasks with enormous energy and enthusiasm. We are greatly indebted to the referees of the papers who provided their time and expertise to help us ensure high quality standards.

We express our gratitude to Springer-Verlag for publishing this volume in their *Lecture Notes in Statistics*, and in particular to John Kimmel for the unfailing support he has given along the way. We are pleased to announce that the next conference in this series is scheduled to be held in June 1998 at the Claremont Graduate School (by then Claremont Graduate University) in California.

Harald Niederreiter
Peter Hellekalek
Gerhard Larcher
Peter Zinterhof

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