
Preface

Probability on discrete structures covers a wide area. Most probability problems involve random variables indexed by space and/or time. Almost always these problems have a version in which space and/or time are taken discrete. Roughly speaking this volume deals with some areas in which the discrete version is more natural than the continuous one, or perhaps even the only one which can be formulated without complicated constructions and machinery. Clear examples of this situation can be found in the articles in this volume on the random cluster model (by Grimmett) and on first-passage percolation (by Howard) and in most of the problems in the forthcoming book “Probability on Trees and Networks” by R. Lyons and Y. Peres. The article by Howard actually also discusses a continuous variant – called Euclidean first-passage percolation – but this came later and even though this continuous version has some clear advantages, its analysis brings in extra difficulties.

Problems on discrete structures can often be stated with minimal prerequisites, and sometimes only “elementary” (but by no means easy) probability theory is needed for their solution. Often the arguments have more of a combinatorial flavor than an analytic one, but the articles here certainly do not shun the use of the tools of analysis.

Since the subject matter of this volume is so broad and varied, it is not surprising that it does not lend itself to a simple linear ordering. It did not seem possible to me to produce a volume which introduced a reader to much of the field in textbook fashion, in which one goes through the chapters in order. Instead, the present volume introduces a reader to the problems and progress so far, in various representative directions and subjects in which there is considerable activity, and which have seen recent successes. The various articles are not dependent on each other.

There is one obvious omission from the list of possible topics in this volume, namely percolation. This subject was omitted here, because its classical aspects have been reviewed only two years ago by G. Grimmett in an encyclopedia article (see *Development of Mathematics, 1950–2000*, Jean-Paul Pier

ed.), while its very recent successes by Lawler, Schramm, Smirnov and Werner are still evolving while this volume is being prepared.

I hope this volume will give a reader a solid introduction to the flavor and excitement of probability on discrete structures and encourage her to work in the subject herself.

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