Book Reviews


Poisson approximation is a subject with a long history and many ramifications. The book under review demonstrates the enormous progress made in Poisson approximation in the last 15 years (in particular by the authors themselves) essentially based on combining the fruitful ideas of coupling and the Stein-Chen method. In analogy to Charles Stein's basically new approach to the normal approximation of sums of dependent random variables, CHEN (1975) worked out a similar technique for Poisson approximation. The starting point of what is called in the book Stein-Chen method is the identity

$$E\{\lambda g(Z+1) - Z g(Z)\} = 0$$

for any bounded function $g$ on $\{0, 1, \ldots\}$

which is satisfied if and only if $Z$ is Poisson distributed with parameter $\lambda > 0$. The introductory chapter is intended to sketch the historical development of Poisson approximation of rare events and to give a description of the main ideas behind the Stein-Chen method. Furthermore, Chapter 1 motivates the more detailed results involving the use of coupling presented in the Chapters 2 and 3 as well as the Poisson process approximation in Chapter 10. The remaining Chapters 4–9 are primarily concerned with applications of these methods in a variety of contexts - many of them classical. The main feature of the Stein-Chen method consists in its surprising simplicity and, simultaneously, in obtaining good (often optimal) estimates of the accuracy of Poisson approximation. Its wide applicability is excellently demonstrated in the Chapters 4–9 whose headlines are as follows:

- Chapter 4: Random Permutations
- Chapter 5: Random Graphs
- Chapter 6: Occupancy and Urn Models
- Chapter 7: Spacings
- Chapter 8: Exceedances and Extremes
- Chapter 9: Independent and Dissociated Terms

As promised in the preface of the book most of the material can be understood by everybody being familiar only with elementary discrete probability theory. The only criticism to be noticed is that in connection with Poisson-Charlier expansions the fundamental paper of P. FRANKEN (Math. Nachr. 27, 303–340, 1964) on sums of independent 0–1 random variables (using the method of characteristic functions) was not mentioned. In fact the estimates of the remainder terms in Franken's asymptotic expansions are of the same quality as in the present book.

All in all this book can be warmly recommended to students and researchers in probability theory and its applications. The reader interested in a deeper insight into the applications touched in the Chapters 4–9 is referred to the more than 120 references at the end of the book.

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