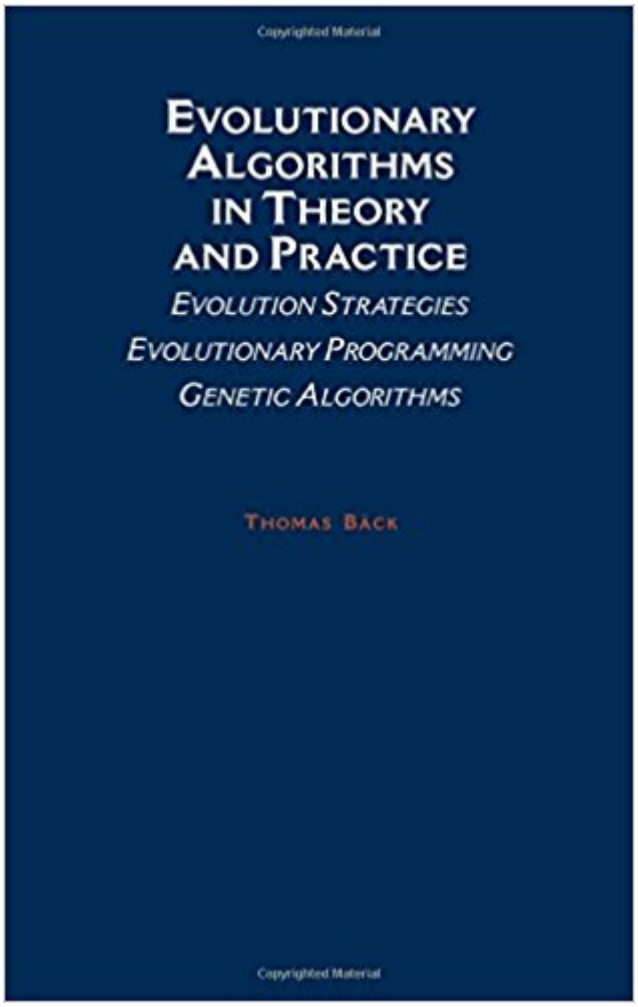
Evolutionary Algorithms In Theory And Practice: Evolution Strategies, Evolutionary Programming, Genetic Algorithms



Synopsis

This book presents a unified view of evolutionary algorithms: the exciting new probabilistic search tools inspired by biological models that have immense potential as practical problem-solvers in a wide variety of settings, academic, commercial, and industrial. In this work, the author compares the three most prominent representatives of evolutionary algorithms: genetic algorithms, evolution strategies, and evolutionary programming. The algorithms are presented within a unified framework, thereby clarifying the similarities and differences of these methods. The author also presents new results regarding the role of mutation and selection in genetic algorithms, showing how mutation seems to be much more important for the performance of genetic algorithms than usually assumed. The interaction of selection and mutation, and the impact of the binary code are further topics of interest. Some of the theoretical results are also confirmed by performing an experiment in meta-evolution on a parallel computer. The meta-algorithm used in this experiment combines components from evolution strategies and genetic algorithms to yield a hybrid capable of handling mixed integer optimization problems. As a detailed description of the algorithms, with practical guidelines for usage and implementation, this work will interest a wide range of researchers in computer science and engineering disciplines, as well as graduate students in these fields.

Book Information

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Customer Reviews

"The book as a whole is well written, easy to read, and it will be valuable to readers interested in practical and computational issues in solving general optimization problems."--Mathematical

Reviews

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In comparing this book with, say Goldberg's "Genetic Algorithms..." (may be the most popular genetic algorithms text), this book reads more like a German habilitation thesis (which I imagine it may have served as such), where as Goldberg's book seems more of a light introduction for the mathematically uninitiated. Indeed, Back's book seems quite scholarly with lots of useful references, and gives a good introduction to not only genetic algorithms, but also to evolutionary strategies (a paradigm that is most applicable to Euclidean-type search spaces) and evolutionary programming(simular to ES and not to be confused with genetic programming).I found Chapters 1 and 2 quite good, in that Chapter 1 presented the biological motivations for evolutionary computing along with a brief introduction to the theory of computation and computational complexity, while Chapter 2 gave a very good introduction to the above-mentioned evolutionary computing paradigms. The remainder of the book reads more like a report on the author's experiments in evolutionary computing.It is important to note that Goldberg's book does not cover Evolutionary Strategies, which I have found to be a more fruitful approach since it is specifically designed for Euclidean space where many if not most interesting optimization problems are formulated in.Finally, I offer bit of advice for those who plan to read through this book. Some of the definitions are stated with such generality that they seem very opaque upon first reading. It is very important to understand them, so do not give up! Once the defintions are understood, the algorithms will seem much easier to comprehend. In fact, the algorithms have a very simple outline:i) initialize populationii) while the terminating condition is not yet met: recombine to form new population members, mutate the population members, select the most fit population members to form the next generation. The partial analyses provided for the algorithms can be skipped on first reading.

Although this book is much less popular than Goldberg's and Mitchell's, it is the most complete reference on evolutionary algorithms in my opinion. If you're looking only for an introduction to EAs, this may not be the perfect book for you (the 2 other ones are more concise) but if you're seeking a detailed review of foundations of EAs, this book is excellent. It provides mathematical insight, and examples of how to implement such algorithms.

I don't really know why this book didn't sell as well as some of the other standard books in

evolutionary algorithms. It's much better in many respects and presents a balanced view of the entire field, including evolution strategies, evolutionary programming, and genetic algorithms. Anyone who is interested in evolutionary algorithms should have this book....

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