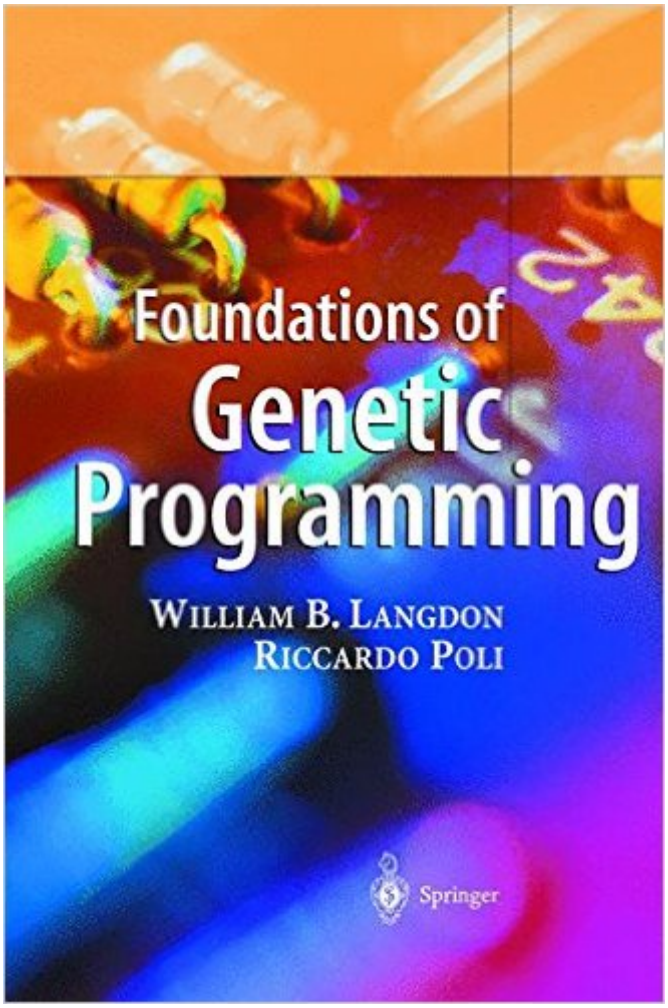
Foundations Of Genetic Programming



Synopsis

This is one of the only books to provide a complete and coherent review of the theory of genetic programming (GP). In doing so, it provides a coherent consolidation of recent work on the theoretical foundations of GP. A concise introduction to GP and genetic algorithms (GA) is followed by a discussion of fitness landscapes and other theoretical approaches to natural and artificial evolution. Having surveyed early approaches to GP theory it presents new exact schema analysis, showing that it applies to GP as well as to the simpler GAs. New results on the potentially infinite number of possible programs are followed by two chapters applying these new techniques.

Book Information

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Customer Reviews

This book was published in 2002 to provide a survey of the direction research had taken in the field of Genetic Programming. There is an explanation of what genetic programming is and how it is different from genetic algorithms in chapter 1(GP is a "generalization" of GA). Chapter 2 discusses the problems with the fitness landscape. Chapter 3 - 6 discusses various schema theory approaches and proofs. Chapter 6 has a great explanation of effective fitness.There are numerous theorems and proofs in the book. There are informative examples of the max problem and the artificial ant (Santa Fe Trail) problems. Chapter 11 is about how GP convergences are a tricky matter and how subtrees can hide interesting incidences of convergence.This is not an introductory text, it is intended for graduate level or higher readers. There is much theoretical work here and a limited background in this area will result in limited understanding of the material.

Langdon and Poli are both internationally recognized experts in Evolutionary Computation (EC) and, in particular, Genetic Programming. They have both contributed extensively to the theoretical "foundations" of GP and hence may speak with no small degree of authority about GP theory. As a physicist working in EC I like the balance that the authors have struck between mathematical rigor and understandable intuition. The book is not as rigorous as Vose's well known GA book. However, it is much easier to read. Neither does it take the "engineering" rule of thumb approach, as does Goldberg's book for instance. It covers very well recent important developments in the theory of GP and in that sense makes very good reading for anyone with a serious interest in EC theory. It is not for the novice, even though technically it is not a difficult book. It is really a research monograph and not a textbook. In that sense the title is a little bit misplaced. With the exciting direction the authors are pointing in I believe that in five years time another book of the same title should truly be able to lay out what are the foundations of GP theory and also show the theoretical unity that exists between the different branches of EC.

Langdon and Poli do a fantastic job of summarizing the major theoretical results of genetic programming. The first chapter gives a quick and clear introduction to genetic programming. They continue with a comprehensive summary of previous research in schema theory, and then they present their exciting theoretical results. Their description of an exact schema theorem (microscopic and macroscopic) for GP is a bit dense, but they provide a good discussion of how to interpret these results. As a whole, this book is generally easy to follow, even with little prior exposure to genetic programming. Of course, this book is not intended to be a general introduction to genetic programming (one of John Koza's books would be more appropriate), but instead it is intended to present some of the theoretical foundations of the field.

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