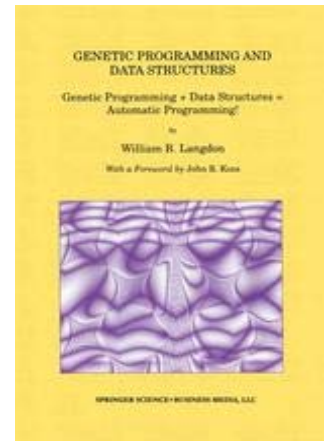


## Genetic Programming + Data Structures = Automatic Programming!

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### Overview

Computers that 'program themselves' has long been an aim of computer scientists. Recently genetic programming (GP) has started to show its promise by automatically evolving programs. Indeed in a small number of problems GP has evolved programs whose performance is similar to or even slightly better than that of programs written by people. The main thrust of GP has been to automatically create functions. While these can be of great use they contain no memory and relatively little work has addressed automatic creation of program code including stored data.

This issue is the main focus of this book. It's motivated by the observation from software engineering that data abstraction (e.g., via abstract data types) is essential in programs created by human programmers. This book shows that abstract data types can be similarly beneficial to the automatic production of programs using GP. The book shows how abstract data types (stacks, queues and lists) can be evolved using genetic programming, demonstrates how GP can evolve general programs which solve the nested brackets problem, recognises a Dyck context-free language, and implements a simple four-function calculator. In these cases, an appropriate data structure is beneficial compared to simple indexed memory. This book also includes a survey of GP, with a critical review of experiments with evolving memory, and reports investigations of real-world electrical network maintenance scheduling problems that demonstrate that genetic algorithms can find low-cost viable solutions to such problems.

This book should be of direct interest to computer scientists doing research on genetic programming, genetic algorithms, data structures, and artificial intelligence. In addition, this book will be of interest to practitioners working in all of these areas and to those interested in automatic programming.

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