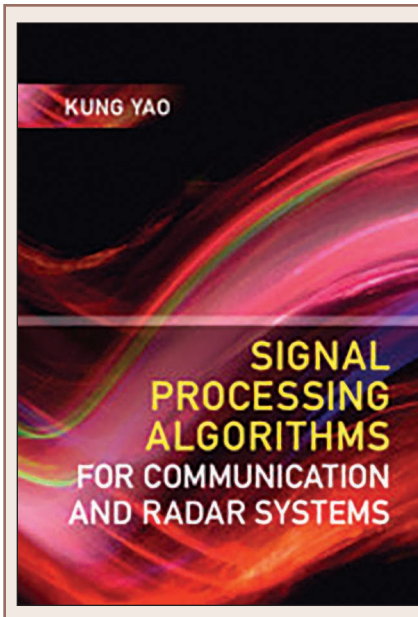
Book/Software Reviews

Better Signals Are Processed Signals

■ **Alfy Riddle**

We all know how computers have changed our working lives, but computers have also changed everything we do because they enable signal processing algorithms, which have revolutionized how we communicate. Ethernet cables would be much shorter without active equalization. Without the digital signal processing that helps extract signals from noise, cell phone networks would be limited, and the ever-increasing use of radar in our lives would be practical only for applications involving much shorter ranges. In *Signal Processing Algorithms for Communication and Radar Systems*, Prof. Kung Yao provides in relatively few pages an extensive tour of practical signal processing.

Signal Processing Algorithms covers a lot of ground and works through multiple matrix mathematics and transformations. This text, developed from courses taught by Prof. Yao, includes seven opening chapters that provide background and supporting mathematics. With five chapters devoted to applications, the book has a nice balance for a course. The final four chapters are on systolic arrays, which are interesting but not essential to a course. The chapter on chaotic signal analysis and processing is another area that many people will find intriguing and useful. The practical side of this book and the attention to historical development help balance out all of the mathematics and make of the signal processing more memorable. There is also space devoted to the history of mathematical transforms and array-processing systems.



Signal Processing Algorithms for Communication and Radar Systems
By Kung Yao
Cambridge University Press, 2019
ISBN: 978-1-108-42390-8
340 pages, hardback US$99.

This book covers three basic areas: mathematics background, applications, and systolic arrays. Of the 16 chapters, nine are devoted to the mathematical foundations of signal processing, with four chapters on systolic arrays, as noted previously, as well as three on applications. But applications are also part of the mathematical background chapters, so this text is useful in a number of ways. Of course, the book covers the basics of Fourier transforms, autoregressive and moving average models, windows, wavelet transforms, and time–frequency representations. The issues of sampling, quantization, and saturation are

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Figure 1. *Images from the inaugural ceremony and the follow-up Workshop on Microwave Theory, Techniques, and Applications.*

The highly successful event was attended by 95 participants comprising professional MTT-S members; scientists from the Indian Space Research Organisation; and academicians, students, and faculty members from various colleges in India's Kerala state. The workshop included productive interactions among attendees and lecturers, and feedback was very positive.

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covered with respect to impact on data and algorithms. Numerical methods, such as QR factorization, singular value decomposition, least squares fitting, Monte Carlo simulation, and maximum entropy methods, are all discussed, as are multiple input/multiple output and Kalman filters. This book also explores newer areas, such as the use of multiple-signal classification for direction of arrival estimation, wavelets for compression, chaotic Monte Carlo simulation to increase efficiency, and Cramér–Rao bound and approximate maximum likelihood methods for beamforming.

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Prof. Yao's *Signal Processing Algorithms* is a compact book with broad coverage and an enjoyable read, making it a nice addition to a rather crowded shelf of books in this field. I expect it would be good for a course, although the instructor will need to supply more problems to solve. If you are teaching a course, have a look at this book. And, if you want an overview of signal processing in communications and radar systems, this book is a great start.