about distributions—that this is something you need to know and it is no big deal so, just for the record, here is a quick and dirty treatment. I find this approach to be both insightful and refreshing. I expect that it will be both effective and welcome in the classroom. On p. 94 ff., Lax uses ideas from duality to construct the Green's function. On p. 112 ff., he develops the important Galerkin method. On p. 150 ff. he considers the moment problem. There are additional discussions—delightful in their scope and depth—of the Fourier transform, the Hilbert transform, and the Laplace transform. And I have only begun to touch on the diversity and wealth of applications and examples.

The student learning from this book will garner a real education—not just in basic functional analysis, but in *analysis as it is actually practiced*. This book has real power and authority, just because it is written by one of the masters who helped to develop these ideas over the past 60 years.

On the purely mathematical side, this book covers a broad array of functional analytic topics. Apart from the basic ideas that one would expect to find in any textbook, there are also

- scattering theory
- extensive coverage of various aspects of convexity
- spectral theory
- extensive coverage of the Hahn–Banach idea
- shift operators
- Banach algebras
- basic operator theory
- Fredholm theory
- index theory
- invariant subspaces
- compact operators
- trace class operators

And this is just a partial list. It only begins to suggest what a panorama of information lies in these pages.

It may be noted that perhaps the principle unifying theme of the book is the idea of convexity. And there could hardly be a more appropriate choice. The notion of convexity is 2000 years old, but it was only first formalized in the book of Bonneson and Fenchel [1]. Even so, it has become *the* key idea in the geometric theory of functional analysis. Most books do not say nearly enough on the topic. Lax shows it to be the paragon of modern analysis that we all know it to be.

I would be delighted to teach a course from this book. To be sure, I would have to make up my own exercise sets and draw my own figures. But that is no big deal. Both I and the students would learn so much from the experience of working through this book that the extra effort would be time well spent.

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Kernel Methods for Pattern Analysis. *By John Shawe-Taylor and Nello Cristianini.* Cambridge University Press, Cambridge, UK, 2004. $75.00. 476 pp., hardcover. ISBN 0-521-81397-2.

Kernel methods form an important aspect of modern pattern analysis, and this book gives a lively and timely account of such methods. The power and elegance of these methods lie in the fact that nonlinear data can be analyzed in a linear way using the so-called *kernel trick*. This involves mapping the data into a suitable "feature space" whose geometry is completely determined by a kernel function. As a result, very efficient (linear algebra) algorithms for pattern analysis can be obtained.

My overall impression of the book is quite positive, although I believe the authors could have improved it in several ways. Let me start with the positive points. First, the book is well presented and gives a comprehensive treatment of kernel methods. Topics such as kernel regression, kernel principal component analysis, and kernel discriminant analysis are competently described; in addition, more advanced topics such as Rademacher complexity, ANOVA kernels, and partial least squares are discussed in considerable detail. The book is tailored to both practitioner and theorist, but seems less suitable as a text. The accompanying website has useful code, and the code snippets in the book are also helpful. Each chapter is fairly self-contained. There are various "state of the art chapters" that describe the newest methodologies and ideas, such as Chapters 10 and 11 (kernels for text and structured data). Finally, I found the summary at the end of each chapter very useful.

Now let me discuss a number of areas where, in my opinion, the book could have been improved. I'd like to single out three issues: structure, errors, and examples.

Structure. I believe that the book could have benefitted from a better structure. The book comprises three parts: (I) Basic Concepts, (II) Pattern Analysis Algorithms, and (III) Constructing Kernels. Although this partition of the book might have seemed a good idea in theory, in practice it does not work well. It not only makes the book too long, with unnecessary repetitions and introductions. But, more importantly, it obscures (or even hinders) the linear structure of the book. I give three examples of poor structure: (1) The overview and road map in Chapters 1 and 2 are largely redundant and could have been combined into one significant example. A simple reference to the classics, such as Duda, Hart, and Stork's *Pattern Analysis*, should have sufficed. (2) Preparatory material on Hilbert spaces, inner products, positive definite matrices, eigenvalues, and symmetric matrices is introduced in Chapter 3. A good place for this material would have been the appendix, since all results are pretty standard. More importantly, this would have prevented the difficulty that related concepts are introduced/defined all over the place, sometimes well *after* they are used. For example, the generalized eigenvector problem would fit nicely with Chapter 3 (or better, the appendix), but now appears isolated in Chapter 6. Similarly, the covariance is introduced in Chapter 5, the correlation coefficient in section 6.5, but both concepts are used much earlier. Finally, Gram–Schmidt orthonormalization and diagonal matrices are introduced not with the rest of the linear algebra, but much later, in Chapter 5. (3) Various important concepts are introduced far too late in the book. The most salient example is the introduction of the most basic kernel function $k(x,z) = x\,z$ as late as Chapter 9 (p. 318). Surely a better structure would have been to introduce simple examples as early as possible and then build up more complicated examples such as polynomial, ANOVA, etc., kernels.

Errors. Unfortunately, quite a few typographical errors and inconsistencies have slipped through the proofreading net. Examples of obvious errors are: p. 37: hyperplaneis ⇝ hyperplane is; p. 80: Chapter 7.. ⇝ Chapter 7.; p. 26: less points ⇝ fewer points; p. 40: l.-7: $\kappa \rightsquigarrow \hat{\kappa}$; p. 89, 3rd formula: $S_n \rightsquigarrow S_\ell$; p. 91: (4.4) ⇝ (4.5); p. 94: that two people ⇝ that two or more people; p. 95: Z is introduced in a nonexisting theorem; p. 132: $f(x) \rightsquigarrow f(\mathbf{x})$; p. 224: slack variables are not circled; p. 117: LaTeX "quad" appearing in formula. Examples of inconsistencies are the frequent interchange of "expectation" and "average," e.g., on pp. 131–132. In statistics the expectation and variance of a random variable are quite different from the corresponding sample mean and sample variance. Another distraction is the use of L_2 for the Hilbert space ℓ_2 (but ℓ_∞ is used instead of L_∞). Another odd notation is the use of $\mathbb{E}_x[\phi(x)]$ for the expectation of a function ϕ of a random variable x. Sentences like (p. 71) "treat the eigenvalues as an (unnormalized) distribution" or (p. 34) "an exponential number of dimensions" do not add to the clarity of exposition either.

Examples. What I missed the most in this book were concrete examples. For example, although image analysis is mentioned many times, no actual analysis of image data (or even an image) is presented. The "concrete" examples are too trivial (e.g., the phone number example in Chapter 1 and the credit card example in Chapter 4) and do not contribute to a better understanding. More importantly, the authors do not build upon examples. For example, the book starts with an example for Keppler's planetary data, but nowhere in this book is the example revisited. This is surely a missed opportunity. If it is the goal of the book to present a toolbox of methods, it should have included a range of examples and data to show how in practice one "tunes" the kernels to best analyze the data. For example, in the discussion of visualization quality in Chapter 8, why not visualize (give a picture of) what it means in practice? The same holds for the novelty detection in Chapter 7: no examples are given.

However, as I said above, my general impression of the book is positive. Don't expect the beauty and clarity of a classic textbook like Duda, Hart, and Stork, but if you want to get a good idea of the current research in this field, this book cannot be ignored.

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A Field Guide to Algebra. *By Antoine Chambert-Loir.* Springer-Verlag, New York, 2005. \$49.95. x+195 pp., hardcover. ISBN 0-387-21428-3.

This is a textbook for a second course in undergraduate abstract algebra. As indicated by its title, it focuses on field theory, or more specifically on its classical impossibilities: the three Greek construction problems and the unsolvability of the quintic equation by radicals. In addition, the Galois theory of differential equations is sketched and it is shown that certain elementary functions have no elementary antiderivative. Along the way, certain very interesting results are covered that are not often seen in books at this level: Puiseux's theorem on the dependence of the roots of a polynomial on its variable coefficients, Hilbert's irreducibility theorem on the behavior of Galois groups under specialization, and Hilbert's Nullstellensatz. The author provides comments on both the historical development of these results and their current implementation in computer algebra systems. In addition, he includes numerous exercises which significantly extend material in the text. Examination problems used in the author's courses appear at the end.

Though the book is essentially self-contained, it is fairly terse; its readers should have a fairly strong algebraic background. The first chapter treats the classical ruler and compass constructions and proves the transcendence of e and π, the latter result being needed to show that the circle cannot be squared. The next two chapters treat the field-theoretic part of Galois theory; after a quick review of some group theory in the next chapter, the following one rounds out ruler and compass constructibility and exhibits quintic polynomials over the rationals that are not solvable by radicals. Hilbert's irreducibility theorem is proved here. Finally, the last chapter sketches the Picard–Vessiot extension of Galois theory to differential field extensions and presents the classical examples of elementary functions with no elementary antiderivative.

There is no other single book that I know of that treats all of these topics, though one could cover most of them by combining Hadlock's Carus Mathematical Monograph [1] with Stewart's 1973 text on Galois theory [2] (*not* the later edition of this text!) Hadlock's and Stewart's books are written on a less sophisticated level than the present one, but could serve as useful alternatives to it for readers with weaker backgrounds.

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Shock Waves and Explosions. *By P. L. Sachdev.* Chapman & Hall/CRC, Boca Raton, FL, 2004. \$99.95. xii+278 pp., hardcover. Chap-