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Data Fitting and Uncertainty: A Practical Introduction to Weighted Least Squares and Beyond

By Tilo Strutz



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The subject of data fitting bridges many disciplines, especially those traditionally dealing with statistics like physics, mathematics, engineering, biology, economy, or psychology, but also more recent fields like computer vision. This book addresses itself to engineers and computer scientists or corresponding undergraduates who are interested in data fitting by the method of least-squares approximation, but have no or only limited pre-knowledge in this field. Experienced readers will find in it new ideas or might appreciate the book as a useful work of reference. Familiarity with basic linear algebra is helpful though not essential as the book includes a self-contained introduction and presents the method in a logical and accessible fashion. The primary goal of the text is to explain how data fitting via least squares works. The reader will find that the emphasis of the book is on practical matters, not on theoretical problems. In addition, the book enables the reader to design own software implementations with application-specific model functions based on the comprehensive discussion of several examples. The text is accompanied with working source code in ANSI-C for fitting with weighted least squares including outlier detection. Among others the book covers following topics * fitting of linear and nonlinear functions with one- or multi-dimensional variables * weighted least-squares * outlier detection * evaluation of the fitting results * different optimisation strategies * combined fitting of different model functions * total least-squares approach with multi-dimensional conditions

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