



# Statistics for Imaging, Optics, and Photonics

*Peter Bajorski*

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## **Statistics for Imaging, Optics, and Photonics** Peter Bajorski

A vivid, hands-on discussion of the statistical methods in imaging, optics, and photonics applications

In the field of imaging science, there is a growing need for students and practitioners to be equipped with the necessary knowledge and tools to carry out quantitative analysis of data. Providing a self-contained approach that is not too heavily statistical in nature, *Statistics for Imaging, Optics, and Photonics* presents necessary analytical techniques in the context of real examples from various areas within the field, including remote sensing, color science, printing, and astronomy.

Bridging the gap between imaging, optics, photonics, and statistical data analysis, the author uniquely concentrates on statistical inference, providing a wide range of relevant methods. Brief introductions to key probabilistic terms are provided at the beginning of the book in order to present the notation used, followed by discussions on multivariate techniques such as:

- Linear regression models, vector and matrix algebra, and random vectors and matrices
- Multivariate statistical inference, including inferences about both mean vectors and covariance matrices
- Principal components analysis
- Canonical correlation analysis
- Discrimination and classification analysis for two or more populations and spatial smoothing
- Cluster analysis, including similarity and dissimilarity measures and hierarchical and nonhierarchical clustering methods

Intuitive and geometric understanding of concepts is emphasized, and all examples are relatively simple and include background explanations. Computational results and graphs are presented using the freely available R software, and can be replicated by using a variety of software packages. Throughout the book, problem sets and solutions contain partial numerical results, allowing readers to confirm the accuracy of their approach; and a related website features additional resources including the book's datasets and figures.

*Statistics for Imaging, Optics, and Photonics* is an excellent book for courses on multivariate statistics for imaging science, optics, and photonics at the upper-undergraduate and graduate levels. The book also serves as a valuable reference for professionals working in imaging, optics, and photonics who carry out data analyses in their everyday work.

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