



# Modern Mathematics and Applications in Computer Graphics and Vision

By Hongyu Guo

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“This book gathers different areas of mathematics like algebra, geometry, and topology in one place and shows applications of them to computer graphics and vision. It is written in an accessible fashion with a number of images, examples, and exercises. It is intended for upper level undergraduate students, graduate students and researchers in computer graphics, computer vision, and game programming.” Zentralblatt Math This book presents a concise exposition of modern mathematical concepts, models and methods with applications in computer graphics, vision and machine learning. The compendium is organized in four parts - Algebra, Geometry, Topology, and Applications. One of the features is a unique treatment of tensor and manifold topics to make them easier for the students. All proofs are omitted to give an emphasis on the exposition of the concepts. Effort is made to help students to build intuition and avoid parrot-like learning. There is minimal inter-chapter dependency. Each chapter can be used as an independent crash course and the reader can start reading from any chapter - almost. This book is intended for upper level undergraduate students, graduate students and researchers in computer graphics, geometric modeling, computer vision, pattern recognition and machine learning. It can be used as a reference book, or a textbook for a selected topics course with the instructor's choice of any of the topics.

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### Editorial Review

#### Review

"Written in a pleasant and alive style, with suggestive quotations and witty comments of the author (also many photos illustrating the text are made by the author), the book will be of great help for students in computer science specializing in computer vision and computer graphics. Other students who use mathematics in their disciplines (physics, chemistry, biology, economics) will find the book as a good source of rapid and reliable information." *Stud. Univ. Babeş-Bolyai Math.* 59(2014), No. 3, 393-396 See full review at [cs.ubbcluj.ro/~studia-m/2014-3/11-recenzii.pdf](http://cs.ubbcluj.ro/~studia-m/2014-3/11-recenzii.pdf)

"It gathers different areas of mathematics like algebra, geometry, and topology in one place and shows applications of them to computer graphics and vision.

This book is written in an accessible fashion with a number of images, examples, and exercises. The proofs of the theorems are omitted what furthermore facilitates the reading of the text."

? *Zentralblatt MATH 2015, edited by European Mathematical Society, FIZ Karlsruhe & Springer-Verlag*

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#### From the Inside Flap

The book presents a comprehensive overview of modern mathematical concepts, models, methods and tools with applications in computer graphics, computer vision and machine learning.

Fifteen topics in modern mathematics are arranged in three parts: algebra, geometry and topology, with an emphasis on tensors and manifolds. and a separate part on applications.

It can be used as a textbook for a selected topics course at the undergraduate or graduate level. It can also be used as fifteen short crash courses for self-study of any of the topics in any order, with minimal inter-chapter dependencies. This book is based on the lecture notes of two courses the author has taught in the US "Gaming Mathematics" at the undergraduate level and "Mathematical Methods in Computer Graphics and Vision" at the graduate level, with considerable expansions.

#### About the Author

Hongyu Guo is an Associate Professor of Computer Science at the University of Houston ? Victoria.

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