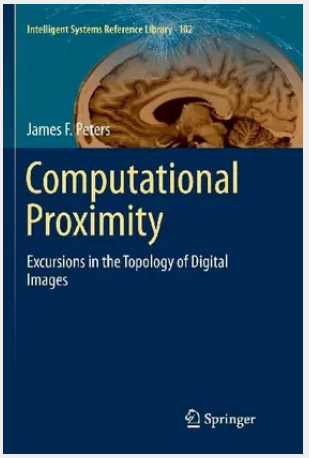
Peters

Computational Proximity

Excursions in the Topology of Digital Images



This book introduces computational proximity (CP) as an algorithmic approach to finding nonempty sets of points that are either close to each other or far apart. Typically in computational proximity, the book starts with some form of proximity space (topological space equipped with a proximity relation) that has an inherent geometry. In CP, two types of near sets are considered, namely, spatially near sets and descriptivelynear sets. It is shown that connectedness, boundedness, mesh nerves, convexity, shapes and shape theory are principal topics in the study of nearness and separation of physical aswell as abstract sets. CP has a hefty visual content. Applications of CP in computer vision, multimedia, brain activity, biology, social networks, and cosmology are included. The book has been derived from the lectures of the author in a graduate course on the topology of digital images taught over the past several years. Many of the students have provided important insights and valuable suggestions. The topics in this monograph introduce many forms of proximities with a computational flavour (especially, what has become known as the strong contact relation), many nuances of topological spaces, and point-free geometry.

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106,99 €
99,99 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9783319807645
Medium: Buch
ISBN: 978-3-319-80764-5
Verlag: Birkhäuser
Erscheinungstermin: 22.04.2018
Sprache(n): Englisch
Auflage: Softcover Nachdruck of the original 1. Auflage 2016
Serie: Intelligent Systems Reference Library
Produktform: Kartoniert
Gewicht: 6964 g
Seiten: 433
Format (B x H): 155 x 235 mm

Kundenservice Verlag Dr. Otto Schmidt KG
Neumannstraße 10, 40235 Düsseldorf | kundenservice@otto-schmidt.de | 0221-93738-997 (Inland)