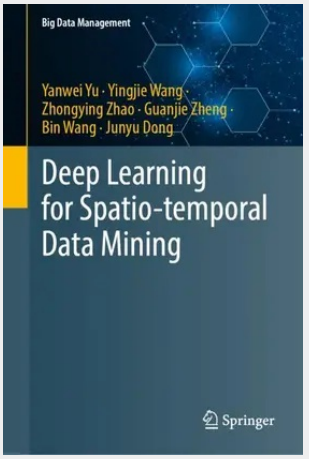
Yu / Wang / Zhao

Deep Learning for Spatio-temporal Data Mining



Spatio-temporal data generated by traffic sensors, mobile devices, and Internet of Things (IoT) systems exhibits explosive growth in both volume and complexity. Due to its inherent spatio-temporal correlations and dynamic variations, this data poses unique challenges for extracting actionable insights. While traditional data mining methods often struggle to capture the complex spatial dependencies and dynamic temporal patterns embedded in such data, the rapid advancement of deep learning techniques has provided powerful tools for modeling these intricate features. This book fills a critical gap by systematically integrating spatio-temporal mining with deep learning. The content is organized into three closely integrated parts. The first part establishes a solid framework by introducing classical tasks such as multivariate time series forecasting, traffic volume inference, and outlier detection, utilizing advanced techniques like Dynamic Graph Learning and Mixture of Experts. The second part delves into trajectory representation learning and similarity modeling, covering self-supervised contrastive techniques, semantic alignment, and social relationship inference. The third part explores emerging applications, demonstrating how theoretical models, such as Transformer-based architectures and Diffusion networks, can be translated into real-world solutions for challenges like cross-platform mobility identity linkage and generative modeling of trajectories. Designed to balance academic rigor with accessibility, this volume features numerous real-world case studies that provide practical, actionable insights. Requiring only basic knowledge of deep learning and programming, this book serves as a valuable resource for researchers, practitioners, and postgraduate students in computer science and data science.

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149,79 €
139,99 € (zzgl. MwSt.)

vorbestellbar, Erscheinungstermin ca. Februar 2027

Artikelnummer: 9789819256044
Medium: Buch
ISBN: 978-981-9256-04-4
Verlag: Springer
Erscheinungstermin: 24.02.2027
Sprache(n): Englisch
Auflage: Erscheinungsjahr 2027
Serie: Big Data Management
Produktform: Gebunden
Seiten: 342
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)