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Collocation Approach with B-spline Basis Functions using MATLAB

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This book provides a practical and accessible introduction to the collocation method with B-spline basis functions using MATLAB, offering a clear and powerful approach to solving a wide range of differential equations in science and engineering. It demystifies the technique through intuitive explanations and hands-on implementation, guiding the reader from foundational concepts—such as B-splines and the MATLAB environment—to more advanced, application-driven topics.

Step-by-step chapters illustrate how to solve specific types of equations, including detailed methodologies for constructing numerical schemes, forming matrices, applying boundary and initial conditions, and using the Thomas algorithm. Comprehensive case studies feature Fisher's equation, Burgers' equation, and the coupled Burgers' equation, accompanied by complete MATLAB codes that can be directly executed, modified, and visualized through figures and tables.

The book concludes by showcasing the flexibility of the method through variations such as trigonometric B-splines. Designed for students, researchers, and professionals, this resource equips readers with the confidence and tools needed to apply B-spline collocation techniques effectively to real-world computational problems.
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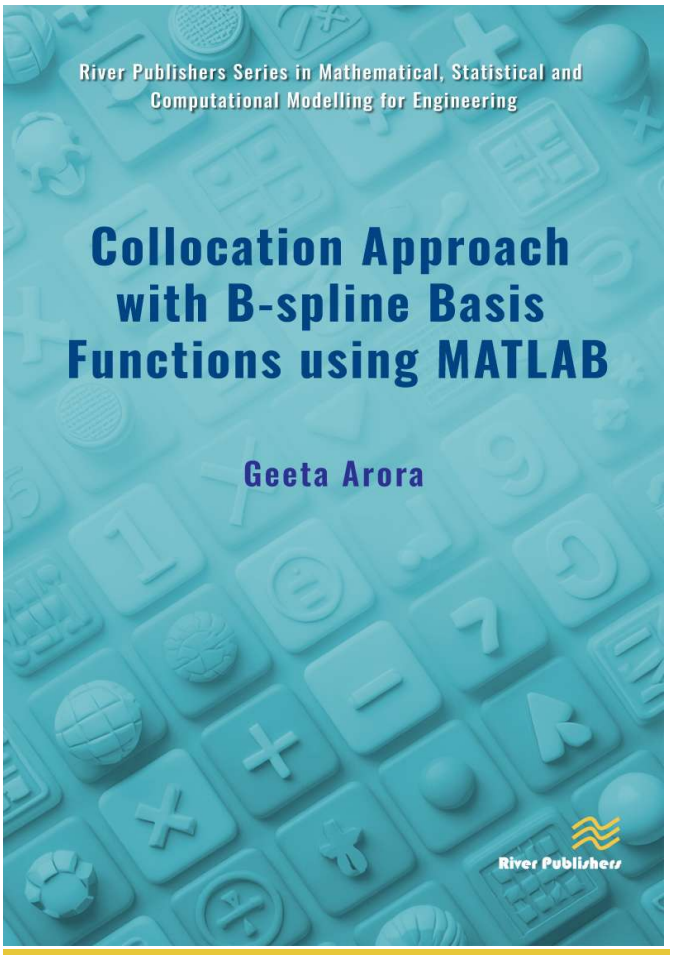

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Numerical methods, collocation method, B-spline basis functions, differential equations, MATLAB implementation, Fisher's equation, Burger's equation, coupled Burger's equation, Thomas algorithm, trigonometric B-spline.

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