
APPROXIMATION PROPERTIES AND GBS EXTENSIONS OF BIVARIATE (λ, μ) -BERNSTEIN OPERATORS

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ABSTRACT

In this study, we construct a bivariate extension of the (λ, μ) -Bernstein operators recently introduced by Zhou and Cai (2025). We investigate the fundamental approximation properties of these operators, explicitly evaluating the rate of convergence by utilizing both partial and complete moduli of continuity. Furthermore, we examine the approximation errors and the order of convergence through the application of Peetre's K -functional. Beyond the classical operators, we introduce their Generalized Boolean Sum (GBS) variants and analyze their approximation behaviors for Bögel-continuous and Bögel-derivable functions. Finally, we provide comprehensive numerical examples and graphical illustrations to visually demonstrate the theoretical convergence behavior and highlight the operational flexibility offered by varying the parameters λ and μ .

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Keywords (λ, μ) -Bernstein operators · GBS operators · rate of convergence

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