

## Generalized Bernstein polynomials and total positivity



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## Abstract

"This thesis submitted for Ph.D. degree deals mainly with geometric properties of generalized Bernstein polynomials which replace the single Bernstein polynomial by a one-parameter family of polynomials. It also provides a triangular decomposition and 1-banded factorization of the Vandermonde matrix. We first establish the generalized Bernstein polynomials for monomials, which leads to a definition of Stirling polynomials of the second kind. These are  $q$ -analogues of Stirling numbers of the second kind. Some of the properties of the Stirling numbers are generalized to their  $q$ -analogues. We show that the generalized Bernstein polynomials are monotonic in degree  $n$  when the function  $f$  is convex... Shape preserving properties of the generalized Bernstein polynomials are studied by making use of the concept of total positivity. It is proved that monotonic and convex functions produce monotonic and convex generalized Bernstein polynomials. It is also shown that the generalized Bernstein polynomials are monotonic in the parameter  $q$  for the class of convex functions. Finally, we look into the degree elevation and degree reduction processes on the generalized Bernstein polynomials." -- from the Abstract.

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Thesis, PhD Doctor of Philosophy

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