

# Fast and accurate evaluation of dual Bernstein polynomials

Filip Chudy<sup>a</sup>, Paweł Woźny<sup>a</sup>

<sup>a</sup> Institute of Computer Science, University of Wrocław (Poland)  
Filip.Chudy@cs.uni.wroc.pl, Pawel.Wozny@cs.uni.wroc.pl

Dual Bernstein polynomials have strong connections to hypergeometric functions and the shifted Jacobi and Hahn families of orthogonal polynomials. They find many applications in approximation theory, computational mathematics, numerical analysis, and computer-aided geometric design. In this context, one of the main problems is fast and accurate evaluation both of these polynomials and their linear combinations. New simple recurrence relations of low order satisfied by dual Bernstein polynomials were given in [1] and expanded upon in [2]. In particular, a first-order non-homogeneous recurrence relation linking dual Bernstein and shifted Jacobi orthogonal polynomials has been obtained. When used properly, it allows to propose fast and numerically efficient algorithms for evaluating all  $n + 1$  dual Bernstein polynomials of degree  $n$  with  $O(n)$  computational complexity.

## References

- [1] F. Chudy, P. Woźny, *Differential-recurrence properties of dual Bernstein polynomials*, Applied Mathematics and Computation 338 (2018), 537-543.
- [2] F. Chudy, P. Woźny, *Fast and accurate evaluation of dual Bernstein polynomials*, Numerical Algorithms 87 (2021), 1001-1015.