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(Invited Talk)

Study of Qualitative Properties of Some Linear Approximation Processes

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Abstract

It is acknowledged that linear positive operators are a useful tool in approximation signals from various spaces. In our talk we propose to analyze qualitative properties in three directions.

Referring to operators of either discrete or continuous type, a natural challenge is to highlight the asymptotic expansion valid for locally smooth functions. All coefficients are derived and explicitly given. Each time a Voronovskaja type theorem is reobtained. Our presentation focuses primarily on this aspect. Here are six classes of operators studied from this point of view: the semi-exponential Post–Widder operator with the power function p, $p(x) = x^2$, $x \geq 0$; a general class of convolution operators based on Landau functions enjoying a feature less commonly encountered by integral type operators, namely they reproduce the affine functions; an extension of Weierstrass integral operators correlated with the diffusion equation and involving modified Bessel functions; a class of higher order Szász–Mirakjan operators of Kantorovich type; Jain operators based on a generalized Poisson distribution; the quasi-interpolants of Gauss–Weierstrass operators, and our results apply to all integrable real functions f on $\mathbb{R}$ satisfying the growth condition $f(t) = \mathcal{O}\left(\exp(ct^2)\right)$ as $|t|$ tends to ∞ for some $c > 0$.

The second direction of study is about uniform approximation of some classes of linear positive operators expressed by series. It is known that the Bohman–Korovkin criterion does not guarantee uniform convergence for operators acting on functions defined on unbounded intervals. In our talk we identify functions for which the operators provide uniform approximation over unbounded intervals.

The last part offers a transition from uniform to statistical convergence. Our study pays special attention to binomial operators.