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Recent developments in the theory of generalized derivatives via algebra

We outline a few recent developments in the theory of generalized derivatives: 1) the solution to the subject's main problem on the equivalence between the Peano and Riemann derivatives, going back to Khintchine in 1927; 2) the solution of the problem of classifying the equivalences between any two generalized Riemann derivatives, going back to Ash in 1967; 3) the solution to the GGR conjecture on the equivalence between the Peano and sets of generalized Riemann derivatives, formulated by Ginchev, Guerragio and Rocca in 1998; and 4) the solution to a question by G. Benkart in 2021, on the Leibniz Rule for generalized Riemann derivatives. All these recent proofs involved some sort of algebra: linear algebra, polynomial algebra, graded algebra, group algebra, and coalgebra. The talk is based on joint work with J. Marshall Ash, William Chin, Marianna Csörnyei and Hajrudin Fejzić.