# Higher rank quadratic algebra of the $N$-dimensional quantum Smorodinsky-Winternitz system

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Algebraic methods are powerful tools in classical and quantum mechanics. Superintegrable systems are an important class of classical and quantum systems which can be solved using algebraic approaches. In this talk, I present higher rank quadratic algebra of the $N$-dimensional quantum Smorodinsky-Winternitz system, which is a maximally superintegrable and exactly solvable model. It is shown that the model is multiseparable and the wave function can be expressed in terms of Laguerre and Jacobi polynomials. We present a complete symmetry algebra $\mathcal{SW}(N)$ of the system, which it is a higher-rank quadratic one containing Racah algebra $\mathcal{R}(N)$ as subalgebra. The substructures of distinct quadratic Q(3) algebras and their related Casimirs are also studied. The energy spectrum of the $N$-dimensional Smorodinsky-Winternitz system is obtained algebraically via the different set of subalgebras based on the Racah algebra $\mathcal{R}(N)$.