

## **Abstract**

The construction of superintegrable system Hamiltonians based on Lie algebras and their universal enveloping algebras has attracted significant interest in recent years. However, most of these frameworks rely heavily on explicit realizations through differential operators, homogeneous spaces, and Marsden-Weinstein reductions. In this talk, I will talk about an entirely algebraic approach to finding superintegrable systems and their corresponding symmetry algebras based on the subalgebras of a Lie algebra. As examples, I will present the commutant of one dimensional subalgebras of the 2D conformal algebra and construct the corresponding Hamiltonians with integrals in algebraic forms. Moreover, I will talk about a classification and explicit formulas for the elements that span the centralizer of Cartan subalgebras of complex semisimple Lie algebras of non-exceptional type in their symmetric algebras.