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Normality and Singularity of Closures of Nilpotent Conjugacy Classes

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The conjugate of a complex symmetric $n \times n$ matrix by a complex $n \times n$ orthogonal matrix is also symmetric. Suppose that Y is an $n \times n$ complex nilpotent symmetric matrix and $\mathcal{O}_Y$ denotes the conjugacy class of Y with respect to $n \times n$ complex orthogonal matrices whose determinant equals one. Let $\overline{\mathcal{O}_Y}$ denote the closure of $\mathcal{O}_Y$ as a subset of $\mathbb{C}^{n\wedge 2}$. $\overline{\mathcal{O}_Y}$ is an irreducible complex algebraic variety. This talk will discuss preliminary work on a few aspects (e.g., normality and singularity) of the geometry of $\overline{\mathcal{O}_Y}$ and relate this geometry to the representation theory of Lie groups. It will focus on several examples involving 3×3 matrices, and curves and surfaces. It will also develop basic notions like normality from scratch.