EIGENVALUES OF SUMS OF HERMITIAN MATRICES AND THE COHOMOLOGY OF GRASSMANNIANS

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Abstract. One remarkable application of classical Schubert calculus on the cohomology of the Grassmannian is its close connection to the eigenvalue problem on sums of hermitian matrices. The eigenvalue problem asks: Given three sequences of real numbers, do there exist hermitian matrices $A + B = C$ with eigenvalues given by the three sequences? This problem has a generalization to eigenvalues of majorized sums of hermitian matrices where we replace "$A + B = C$" with "$A + B > C$". In this talk, I discuss joint work with D. Anderson and A. Yong where we show that the eigenvalue problem on majorized sums is related to the Schubert calculus on the torus-equivariant cohomology of the Grassmannian in the same way that classical Schubert calculus is related to eigenvalue problem on usual sums of Hermitian matrices. One consequence of this connection is a generalization of the celebrated saturation theorem to T-equivariant Schubert calculus.