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Newton-Okounkov Bodies of Peterson and Bott-Samelson Varieties

The study of toric varieties is a beautiful part of algebraic geometry. It is an old and active area of research, and has connections with polyhedral geometry, commutative algebra, combinatorics, and symplectic geometry. Its elegant structure also makes it an invaluable tool in other areas of research such as coding theory, physics, and algebraic statistics.

The theory of Newton-Okounkov bodies is a generalization of the rich theory of toric varieties; it associates a convex body to an arbitrary variety (equipped with auxiliary data). Although initial steps have been taken for formulating geometric situations under which the Newton-Okounkov body is a rational polytope, there is much that is still unknown. In particular, very few concrete and explicit examples have been computed thus far. During my graduate studies I have been working on explicitly computing Newton-Okounkov bodies of Peterson and Bott-Samelson varieties. These varieties arise, for instance, in the geometric study of representation theory. In this introductory level talk, I plan to motivate why this theory is important.