Affine Schubert calculus and diagonal coinvariants
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The diagonal coinvariant algebra $DR_n$ is the ring of polynomials in 2n variables $\mathbb{Q}[x_1, ..., x_n, y_1, ..., y_n]$ modulo the ideal generated by the nonconstant "diagonally symmetric functions," i.e. functions that are symmetric under simultaneously permuting the x and y variables. It is a well-studied vector space whose dimension was shown by Haiman to be $(n+1)^n - 1$. Whereas the single variable version is well-known to be isomorphic to the homology of the complex flag variety, it was observed by Hikita, Gorsky-Mazin, and others that the diagonal coinvariant ring has the same Hilbert series as the homology of a much more intricate space called the "$(n,n+1)$ affine springer fiber," and it was hoped that this fact would lead to a proof of the "shuffle conjecture," which is a combinatorial formula for the decomposition of each bigraded component of $DR_n$ into irreducible $S_n$-representations, later proved by Mellit and myself. I'll present a more recent result with A. Oblomkov that constructs a particular isomorphism of $DR_n$ with the aforementioned homology group, and explain how this leads to an explicit vector basis of $DR_n$ by monomials.

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