Dual toric codes and polytopes of degree one.

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A construction due to Hansen associates a linear code over a finite field $\mathbb{F}_q$ to the projective toric variety $X(P)$ specified by a lattice polytope P. The toric code V is the subspace of $\mathbb{F}_q^t$ constructed by evaluating the polynomials spanned by the lattice points of P at the t points of the torus in $X(P)$ defined over $\mathbb{F}_q$. The dual toric code is its dual subspace V^* consisting of all linear functionals in $(\mathbb{F}_q^t)^*$ which vanish identically on V.

In this talk we will show that some statistical features of the code V^* are controlled by the geometry of the toric variety $X(P)$. This correspondence allows us to distinguish extremal dual toric codes and to classify them using the classification of polytopes of degree one due to Batyrev and Nill.

Joint work with Valerie Gauthier (Universidad del Rosario, Colombia).