Hyperbolic polynomials, cones and multiplicities

Hyperbolic polynomials generalize characteristic polynomials of symmetric matrices to the multivariate case. Originated from the theory of PDEs, hyperbolic polynomials are nowadays addressed mostly from an algebraic viewpoint. To a given hyperbolic polynomial one can associate a convex cone (called the hyperbolicity cone); polyhedra or spectrahedra are special examples of such cones. In this talk we will describe this class of polynomials and show special subclasses, giving an overview of the known results of the area. Then in the last part recent results on an algebraic approach to hyperbolic programming (linear optimization over hyperbolicity cones) will be discussed.