

SYZYGIES: PAST, PRESENT, AND FUTURE

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Abstract: This talk will first discuss basic notions connected with syzygies: their definition, properties, and Hilbert's syzygy theorem. A special case of interest will be the free resolutions of three-generated ideals, and we will review the famous syzygy theorem of Evans and Griffith.

The main point of the talk will be explaining using syzygies to calculate important numerical invariants associated with hypersurface singularities. In particular the talk will discuss a recently introduced measure of the singularity of a hypersurface called the F-threshold, which is closely related to the log-canonical threshold coming from birational algebraic geometry.

The talk will explain how syzygies help one to calculate this invariant for plane curves. A well-known result of Mason, the abc conjecture for $k[X]$, comes into play. The talk will close with an application (due to Monsky) of Mason's theorem to syzygies of three generated ideals, which gives a lower bound on the F-threshold.