SIMPLE HYPERSURFACE SINGULARITIES AND REPRESENTATION THEORY OF LOCAL RINGS

LARS WINTHER CHRISTENSEN

In our first course on linear algebra, we learn to solve systems of linear equations. For example, how to find all points in space that satisfy both of the equations

$$x + y + z = 0 \quad \text{and} \tag{1}$$

$$x - 2y + z = 0. \tag{2}$$

The geometry of this problem is simple. The points that solve (1) form plane, the solution set for (2) is a different plane, and the set of common solutions is their intersection, which is a line. In comparison, equations that involve higher powers of the variables, say x^2 or the product xyz, are surprisingly complicated, and it is a fundamental goal to understand the geometry of their solution sets, which are called algebraic varieties.

It is a general principle in mathematics to study an object via functions defined on it. The polynomial functions defined on an algebraic variety form a commutative ring, and it is an established maxim that understanding a ring is tantamount to understanding its module category. In the talk I will describe recent progress in our understanding of the connections between curve singularities and module categories.