Taylor varieties

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Consider the set of rational functions where the number of variables and the degrees of numerator and denominator are fixed. Such functions can be approximated, as usual, by their Taylor polynomials.

The coefficients of these polynomials satisfy some natural algebraic constraint and define what we call a Taylor variety. We were surprised to find that some Taylor varieties have dimension smaller than the expected one (defective cases). The classification of defective cases is known only in particular cases and it is open in general. Another interesting phenomenon is that many Taylor varieties have vanishing Hessian. This is joint work with A. Conca, S. Naldi and B. Sturmfels.