

TITLE: Unexpected curves: from secant varieties to line arrangements

ABSTRACT: Consider a set of points on the complex projective plane: how many curves of fixed degree pass through the points and are also singular at the points with a prescribed order? That is, how many homogeneous polynomials in three variables of fixed degree vanish at the points and have all partial derivatives up to a prescribed order also vanishing at the points? This question, and its generalizations to higher dimensional projective varieties, produced a very fruitful field of research with a lot open problems which are keeping algebraic geometers busy since the XIX century. In this talk, I want to give a brief introduction to some of these problems, with a particular focus on their relations to the study of secant varieties and tensor decompositions, and to the study of combinatorial properties of line arrangements.