Abstract:

The question of how polynomial roots move under differentiation is classical. Contributions to this subject have been made by Gauss, Lucas, Marcel Riesz, Polya and many others. In 2018, Stefan Steinerberger derived formally a PDE that should describe the dynamics of polynomial roots under differentiation in certain situations. The PDE in question is of hydrodynamic type and bears a striking resemblance to the models used in mathematical biology to describe collective behavior and flocking of various species—such as fish, birds or ants. I will discuss joint work with Changhui Tan in which we establish global regularity of Steinerberger's equation and make a rigorous connection between its solutions and evolution of roots under differentiation for a class of trigonometric polynomials.