Title: Computing with smooth dynamical systems

Abstract: *In this talk we will explore several interconnections between dynamical systems theory and the theory of computation. A fundamental problem in the theory of computation is to understand which problems are algorithmically solvable, where the notion of algorithm is made precise via an appropriate model of computation such as Turing machines. Remarkably, there are noncomputable problems which are algorithmically unsolvable, such as Hilbert's 10th problem. In this talk we will survey a selection of results involving both smooth dynamical systems and the theory of computation. We will show that many such dynamical systems can inherently compute and also that they can have highly complex behavior which can be appropriately characterized with tools from the theory of computation, providing a complementary approach to understand the complexity of a dynamical system. We will in particular show that several problems such as finding invariant sets, basins of attraction, etc., can be noncomputable.*