Persistence and computation of some invariant objects in functional perturbations of an ODE

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With very minor assumptions, I show that periodic orbits and hyperbolic sets in an ODE persist under singular perturbations of including a delay term. These perturbations change the phase space from finite to infinite dimensions. The results apply to electrodynamics and give new approaches to handle state-dependent, small, nested, and distributed delays.

I will discuss and explain motivations, the new methods, sketches of the proofs, computer assisted proofs, and possible applications. I will end the talk giving some ideas of work in progress and possible future works.

Joint work with Jiaqi Yang (Clarkson University, USA) and Rafael de la Llave (Georgia Institute of Technology, USA).