Nonlinear dynamics of Horndeski theories in spherical collapse

Justin L. Ripley* and Frans Pretorius†
Department of Physics, Princeton University, Princeton, New Jersey 08544, USA.
(Dated: March 14, 2019)

Horndeski theories are a class of scalar-tensor modified gravity theories that have been extensively used to model, for example dark matter, dark energy, the very early universe, and exotic compact objects. We discuss numerical and analytical work in understanding the mathematical and physical properties of various Horndeski theories in spherical collapse. In particular, we investigate the nonlinear stability of 'hairy' black holes in shift symmetric Einstein dilaton Gauss-Bonnet (EdGB) gravity, along with the hyperbolicity and the potential for shock formation in EdGB gravity and other Horndeski theories in the strong field, dynamical regime. We discuss the potential implications of our results on the use of Horndeski theories in modeling exotic compact objects.

* jripley@princeton.edu
† fpretori@princeton.edu