

Inducing passivity in data-driven models

Christopher Beattie

Virginia Tech / TU - Berlin, Blacksburg, USA

`beattie@vt.edu`

The modeling of physical systems should take into account conservation laws, but this can be a significant challenge when models are derived directly from system response data. Observational noise and unmodeled sources can further complicate the enterprise. I will discuss a few (equivalent) characterizations of energy conservation for dynamical systems and describe how one can ascertain whether an observed response profile could have been generated by a passive system. This leads naturally to a data-driven modeling framework that yields a convex family of passive models all of which are consistent with the observed response profile. Evidently, this sets the stage for selecting a model that is consistent with the observed response profile that also optimizes a separate performance goal or perhaps satisfies other ancillary conditions. I will discuss a particular approach that can provide a data-driven model having maximal passivity margins.