Classifying and Quantifying Nonlinearities in Mathematical Models ALEXANDER SHUMWAY, MARK TRANSTRUM, Brigham Young Univ - Provo — Models with many parameters describing complex systems are ubiquitous in the scientific disciplines. Though they model phenomena as varied as gene expression, complex materials, engineered systems, and machine learning, these models share similar statistical properties. This motivates study of complex models as a whole as opposed to analysis of each one individually. In particular, I work to quantify and classify the parameter nonlinearities of arbitrary models, as it is these nonlinearities that give models interesting behavior. In this talk I will introduce several complex models and show how they are statistically similar. I will further introduce the mathematical framework for quantifying nonlinearity and show with specific examples how analyzing nonlinearities leads to a deep understanding of the model. I will also discuss potential applications and future avenues for this work.

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