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**The Use of Stochastic Collocation Methods to  
Understand Pseudo-Spectra in Linear Stability Analysis**

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Eigenvalue analysis is a well-established tool for stability analysis of dynamical systems. However, it is also known that there are situations where eigenvalues miss some important features of physical models. For example, in models of incompressible fluid dynamics, there are examples where eigenvalue analysis predicts stability but transient simulations exhibit significant growth of infinitesimal perturbations. This behavior can be predicted by pseudo-spectral analysis. In this work, we show that an approach similar to pseudo-spectral analysis can be performed inexpensively using stochastic collocation methods and the results can be used to provide quantitative information about the nature and probability of instability.