On the Hierarchical Modeling Technique with Applications
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The hierarchical modeling technique consists of the following steps to study a given system or dataset. It first identifies any low-rank, or low-dimensional, or other compact features using appropriate and mathematically rigorous definitions. The compressed representations are then recursively collected from children to parents and transmitted between different nodes on a hierarchical tree structure using properly compressed translation operators. In its numerical implementation, the hierarchical models are often re-expressed as recursive algorithms, which can be easily interfaced with existing dynamical scheduling tools from HPC community for optimal parallel efficiency.

In this talk, I will discuss the fundamentals of the hierarchical modeling technique and provide three case studies where this technique is successfully applied to develop the state-of-the-art numerical algorithms for important applications.