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The heterogeneous multiscale method: A ten-year review

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The heterogeneous multiscale method (HMM) was proposed 10 years ago, as a unified framework for designing multiscale algorithms in different applications. It is a top-down strategy in the sense that it relies on a preconceived form of macroscale model. Missing data in the macroscale model are estimated on the fly using a reliable microscale model. In this talk, we will take a critical look at HMM. We will discuss applications to various problems, including dynamic fracture, complex fluids, transition pathways in complex systems and stochastic simulation algorithms. We will also examine areas where improvement are needed in order to make HMM more successful.