

Adjoint Sensitivity Analysis: Theory and Applications

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In this course, we give a general overview of the theory of adjoint sensitivities in both time and frequency domain applications. We show that adjoint sensitivity analysis methods reduce the cost of estimating first-order derivatives of an objective function or response from n extra simulations to at most one simulation, where n is the number of parameters. This computational saving is extensive for electromagnetic structures with slow simulations or with many parameters. We illustrate the applications of the theory to the modeling and design optimization of microwave circuits and antennas, THz structures, and Photonic structures.