



Operations Research Seminar

Statistical Foundations for the Validation of Computer Models

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Science-based computational models of physical phenomena are being used increasingly to supplement or replace physical testing. Confidence in predictions provided by such models is enhanced if the potential 'error' in these predictions (the difference between the prediction and nature's outcome in the situation being simulated) can be credibly bounded. The "model-validation" process by which experimental or field results are compared to computational predictions provides the raw material for characterizing a computational model's predictive capability in terms of such error limits. In general, the goal is to evaluate predictive capability, first for predictions in the region of experimentation, then, if possible, for predictions in untested regions of applications. This whole process is fundamentally statistical because it requires the acquisition and careful analysis of appropriate data. I establish a statistical model for characterizing predictive-capability and discuss various experimental design and statistical data analysis issues and approaches for resolving them. An example pertaining to the thermal degradation of polyurethane foam illustrates the issues and analyses.

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