

## **A computational statistics and stochastic modeling approach to materials-by-design<sup>\*</sup>**

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We will address the development of viable solutions to the problem of materials-by-design through a unique combination of computational techniques modeling microstructure evolution, statistical machine learning with contiguous information transfer at various length scales, and stochastic computational approach for process simulation accounting for the full statistical nature of material features. Particular issues to be discussed include the following:

- Development of a multi-length scale database of material systems through simulation of material structure evolution at various length scales.
- Development of spectral stochastic methods utilizing micro- and meso-scale statistics for modeling macroscopic material behavior.
- Use of statistical learning tools over the meso- and micro-scale databases for identifying synergies between processing, structure and properties.
- Development of a stochastic design framework aided by data mining for property optimization.

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