

Heterogeneous Random Materials

- Data-driven reduced-order **representation of random microstructures** (polycrystalline materials, functionally graded materials, composites)
- **Stochastic Mechanics**: Modeling the deformation, predicting failure and allowing for error-bars in the performance of devices/components made from random heterogeneous materials
- **Dynamic phenomena in random media** (impact, shocks, penetration)
- **Structural reliability analysis**: Predicting failure probability of structural and mechanical systems subject to random loads, material properties, and geometry. This is because the fundamental problem in reliability analysis entails the calculation of a high dimensional integral.
- **Stochastic fracture mechanics**: Characterizing uncertainties and quantifying their impact on fracture initiation/propagation and integrity of structures made of random heterogeneous materials.