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.