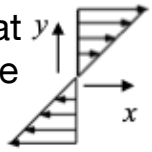
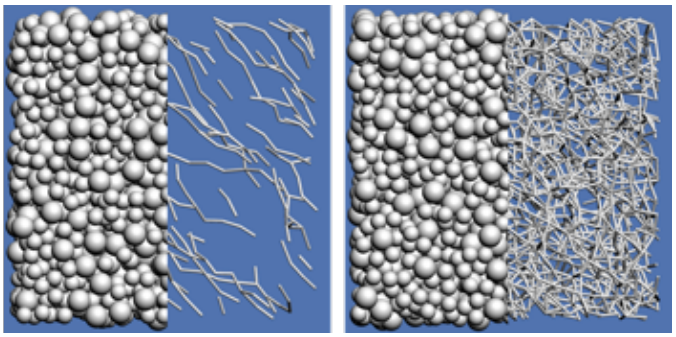
Analysis of dense suspensions by network-based methods

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The project focuses on developing new fundamental directions in dynamic materials science by studying network topology in flowing dense suspensions. The aim is to develop and place on a robust mathematical foundation the physical relationship of these properties to the underlying networks of contacts and forces between particles. The suspensions will be described via simulations, which can generate vast amounts of data due to large particle numbers in time-dependent ensemble calculations. These data will be analyzed using tools based on persistent homology (PH) and k-core analysis (KCA). These methods enable substantial data reduction and enhance physical understanding by elucidating essential structural measures through these two network-theoretical approaches. From a mathematical perspective, the coupled study of PH and KCA, one based upon physical cluster classification by connectivity and one based on well-defined metrics of the overall network structure, will deepen our understanding of both methods.

The project is carried out in collaboration with the materials science group at CCNY. The figure shows the spontaneously formed interaction networks in sheared suspensions (courtesy of Prof. Jeffrey Morris (CCNY).





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