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I obtained my Ph.D. in Physics from Brandeis University under the supervision of Prof. Bulbul Chakraborty in 2019. My Ph.D. thesis work, which focused on the collective behavior of Granular materials and suspensions. The work involved extensive collaborations with researchers in different disciplines such as fluid dynamics, statistical mechanics, and computational physics. I analyzed software written to simulate the fluid dynamics of dense suspensions and created an interface to feed that data into statistical mechanics analysis platforms. I have extensive experience in working with sophisticated cluster analysis tools such as DB-SCAN. I have performed Monte Carlo Simulations of model systems such as gaseous particles having orientation-dependent interactions between them. I have translated the results of particle simulations to abstract frameworks such as force-space representations (PRL Publication), and I have translated the abstract information back to equations of state for particulate systems.

I have recently also taken a three-month intensive course on machine learning and artificial intelligence from AI-Institute. In this course, I was exposed to in-depth operational experience on AI using IT tools such as Python, R, SQL, SAS, AWS, and ML API. I gained conceptual understanding in machine learning, deep learning algorithms for Natural Language Processing, Image Processing & Computer Vision with Tensorflow, Sci-kit Learn, and Keras frameworks. I also worked on diverse projects related to fraud detection, customer segmentation, and a personal project on object detection of small data sets based on Convolutional Neural Network (CNN), Transfer Learning (FaceNet), and ResNet.

List of Codes

1. I have worked with the construction of numerical and statistical models, which involve complex mathematical concepts of probability, statistics, graph theory, and linear algebra. I have modified and implemented basic, existing, codes to achieve my goals.
2. I have constructed an effective, free energy description to represent the statistics of graphs that represent the frictional forces experienced by particles in a dense suspension undergoing Discontinuous Shear Thickening. This project involved performing important-sampling (Metropolis) Monte Carlo using effective potentials between vertices of the graphs, that I constructed from the data of first-principles numerical simulations of suspensions performed by my collaborators.
3. I have computationally enumerated density of states of Hard Core Lattice Gas models are governed different k-nearest (k=3, k=5) neighbors exclusion using efficient many sites tomographic sampling.
4. I have written a machine learning code to classify images of cars based on their car types. Several machine learning algorithms were used for this classification like Convolutional Neural Network (CNN), FaceNet, and ResNet (online source).

Examples of the above codes are given in the following link in git-hub (the link will be provided here).