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## Phase Behavior of Thermodynamic Skyrmiions in CaVO, SHD, Triangular, and Honeycomb Lattices: A Monte Carlo and Neural Network Study

We study the formation of topological spin textures in two-dimensional archimedean lattices under various field and temperature conditions, aiming to explore non-collinear magnetic states in SHD (square-hexagonal-dodecagonal), CaVO, Honeycomb and Triangular archimedean lattices. Following the conventional approach for constructing phase diagrams for two-dimensional lattices, phase diagrams B-T (where B, represent the applied external field, temperature) will be determined in the modeled systems. Parameters determining magnetic frustration will be varied, including the lattice geometry and short-range interactions. These diagrams will be constructed using final configurations obtained from Monte Carlo simulations for each pair of different parameters to train a Deep Learning model. The model will classify states and construct the indicated phase diagrams.

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