

Abstract:

Phase diagrams in condensed-matter physics are often very complex. The development of methods that can identify distinct phases without any prior knowledge is, therefore, of great interest. In this study, we applied unsupervised machine learning methods to find phase boundaries in the Falicov-Kimball model, using principal component analysis and the prediction-based method. We showed that both methods can distinguish the ordered from the disordered phase. Moreover, these methods are able to distinguish the weakly localized phase from the Anderson insulator phase, which both exist within the disordered phase.

Keywords: prediction-based method, principal component analysis, Falicov-Kimball model, unsupervised phase classification, Machine Learning