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Inferring low-dimensional microstructure representations using convolutional neural networks NICHOLAS LUBBERS, TURAB LOOKMAN, KIPTON BARROS, Los Alamos National Laboratory — We apply recent advances in machine learning and computer vision to a central problem in materials informatics: The statistical representation of microstructural images. We use activations in a pre-trained convolutional neural network to provide a high-dimensional characterization of a set of synthetic microstructural images. Next, we use manifold learning to obtain a low-dimensional embedding of this statistical characterization. We show that the low-dimensional embedding extracts the parameters used to generate the images. According to a variety of metrics, the convolutional neural network method yields dramatically better embeddings than the analogous method derived from two-point correlations alone.

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