Deep Learning for Shape Analysis

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Abstract

The past decade in computer vision research has witnessed the re-emergence of deep learning, and in particular convolutional neural network (CNN) techniques, allowing to learn powerful image feature representations from large collections of examples. Nevertheless, when attempting to apply standard deep learning methods to geometric data which by its nature is non-Euclidean (e.g. 3D shapes, graphs), one has to face fundamental differences between images and geometric objects. The purpose of this tutorial is to overview the foundations and the state of the art on learning techniques for 3D shape analysis. Special focus will be put on deep learning (CNN) applied to Euclidean and non-Euclidean manifolds for tasks of shape classification, retrieval and correspondence. The tutorial will present in a new light the problems of shape analysis, emphasizing the analogies and differences with the classical 2D setting and showing how to adapt popular learning schemes to deal with deformable shapes.