



## **Feature Learning Methods for Computer Vision**

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### **Abstract**

Hand-designed features such as SIFT and HOG underpin many successful object recognition approaches. However, these only capture low-level edge information and it has proven difficult to design features that effectively capture mid-level cues (e.g. edge intersections) or high-level representation (e.g. object parts). However, recent developments in machine learning have shown how hierarchies of features can be learned in an unsupervised manner directly from data. This lecture will describe these feature learning approaches, as applied to images and video.

The lecture will start by motivating the need to learn features, rather than hand-craft them. It will then introduce several basic architectures, explaining how they learn features, and showing how they can be "stacked" into hierarchies that can extract multiple layers of representation. Throughout, links will be drawn between these methods and existing approaches to recognition, particularly those involving hierarchical representations. The final part of the lecture will examine the current performances obtained by feature learning approaches on a range of standard vision benchmarks, highlighting their strengths and weaknesses.

*Keywords: feature learning, deep learning, object recognition*