Active Basis Model, Shared Sketch Algorithm, and Sum-Max Maps

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Abstract

This talk presents an active basis model, a shared sketch algorithm, and a computational architecture of sum-max maps for representing, learning, and recognizing deformable templates in images. In our generative model, a deformable template is in the form of an active basis, which consists of a small number of Gabor wavelet elements at selected locations and orientations. These elements are allowed to slightly perturb their locations and orientations before they are linearly combined to generate the observed image. The active basis model, in particular, the locations and the orientations of the basis elements, can be learned from training images by the shared sketch algorithm. The algorithm selects the elements of the active basis sequentially from a dictionary of Gabor wavelets at a dense collection of locations and orientations. When an element is selected at each step, the element is shared by all the training images, and the element is perturbed to encode or sketch a nearby edge segment in each training image. The recognition of the deformable template from an image can be accomplished by a computational architecture that alternates the sum maps and the max maps. The computation of the max maps deforms the active basis to fit the image data, and the computation of the sum maps scores the template matching by the log-likelihood of the fitted model.