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Rapid Object Detection Using Independent Component Analysis

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RAPID OBJECT DETECTION USING INDEPENDENT COMPONENT ANALYSIS

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Face detection is the task of determining the locations and sizes of human faces in arbitrary digital images. A commonly used approach is based on the techniques of boosting and cascading, which allows for real-time face detection. However, systems based on boosted cascades have been shown to suffer from low detection rates in the later stages of the cascade. In this paper we introduce a novel variation of the boosting process that uses features extracted by Independent Component Analysis (ICA), which is a statistical technique that reveals the hidden factors that underlie sets of random variables or signals. The information describing a face may be contained in both linear as well as high-order dependencies among the image pixels. These high-order dependencies can be captured effectively by representation in ICA space. Moreover, it has been argued that the metric induced by ICA is superior to other methods in the sense that it may provide a representation that is more robust to the effect of noise such as variations in lightening. We propose that features extracted from such a representation may be boosted better in the later stages of the cascade, thus leading to improved detection rates while maintaining comparable speed. We present the results of our face detector, as well as comparisons with existing systems.