People Detection in Crowded Scenes by Context-driven Label Propagation

Jingjing Liu  
Rutgers University  
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Abstract

People detection in images is a fundamental vision problem, which is central to a wide range of applications such as video surveillance, robotics and autonomous driving. Along other effects, exploiting contextual cues has been a key idea to improve people detection in crowded scenes.

In this talk, I will present a unified framework for people detection that integrates visual recognition with graph-based context modeling. The detection task is formulated as an optimization problem where the goal is to find a maximum set of human hypotheses that agree on both visual detection and their contextual interactions in an image. While such an optimization is not theoretically tractable, we show that it can be approximately addressed by label propagation in a progressive way. Label propagation was originally proposed for predicting unlabeled instances from labeled data. It propagates labels to data in the same class iteratively by proximity. In our case, true detections are supposed to be contextually compatible with each other, but irrelevant to false alarms. This suggests that strong detections with high confidence can boost up weak ones by spreading rewards through contextual proximity and meanwhile penalize false positives according to contextual incompatibility, in a similar spirit to label propagation. Our approach was validated using two challenging crowd datasets, one for people detection with variations in pose and size, and the other for pedestrian detection in low resolution images. The results confirm that our method can significantly improve people detection in crowded scenarios, achieving performance comparable to state of the art reported in the literature.