

Intelligent Transportation Systems

Face Detection

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概要

- 引言
- 鲁棒的实时人脸检测

人脸信息处理

- Face detection 检测
- Face alignment 对齐
- Face verification 校验
- Face recognition 识别

人脸检测

基于知识

- 模板匹配
- 人脸特征
- 形状与边缘
- 纹理特性
- 颜色特征

基于统计

- 主成分分析与特征脸
- 神经网络方法
- 支持向量机
- 隐马尔可夫模型
- Adaboost算法

A cascade of haar-like classifier

- Haar分类器算法的要点
 - ① 使用Haar-like特征做检测
 - ② 使用积分图（Integral Image）对Haar-like特征求值进行加速
 - ③ 使用AdaBoost算法训练区分人脸和非人脸的强分类器。
 - ④ 使用筛选式级联把强分类器级联到一起，提高准确率。

鲁棒的实时人脸检测

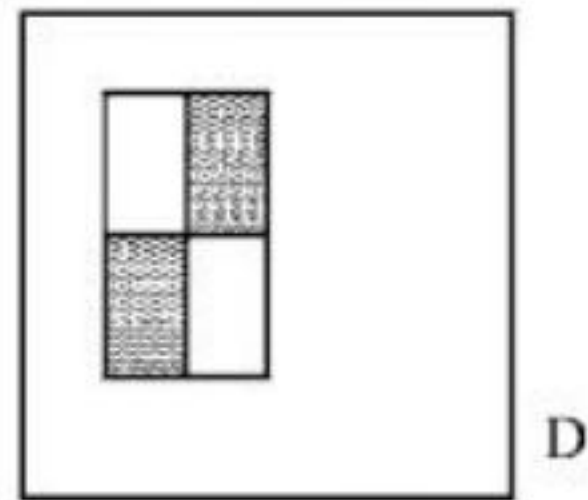
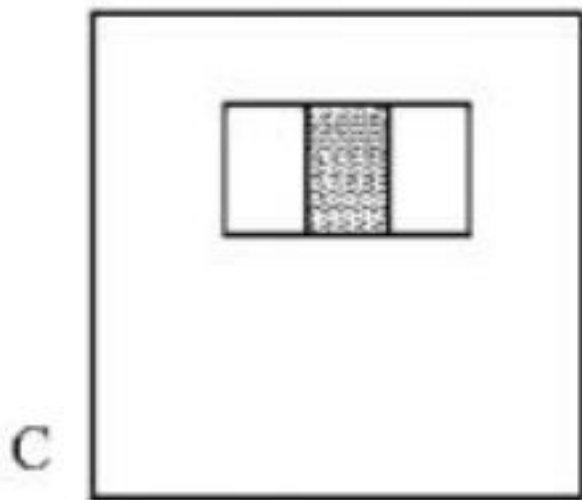
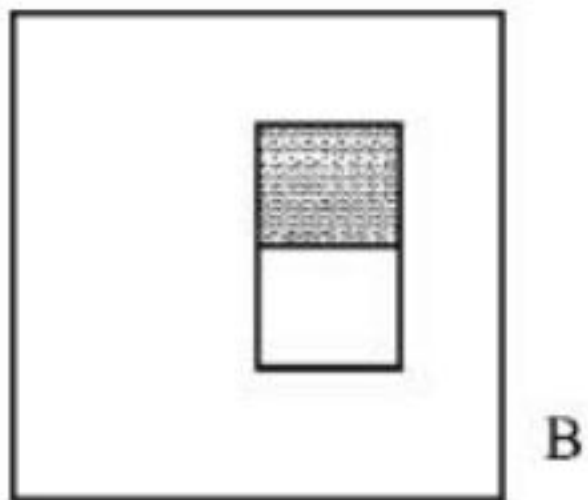
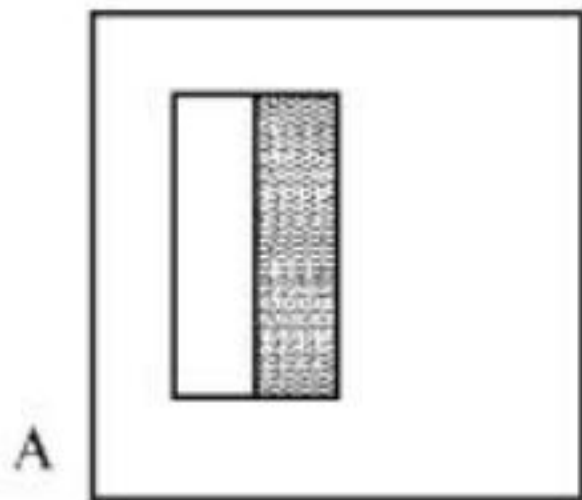
Robust real-time face detection

- PAUL VIOLA, MICHAEL J. JONES
- 计算机视觉
- 2004

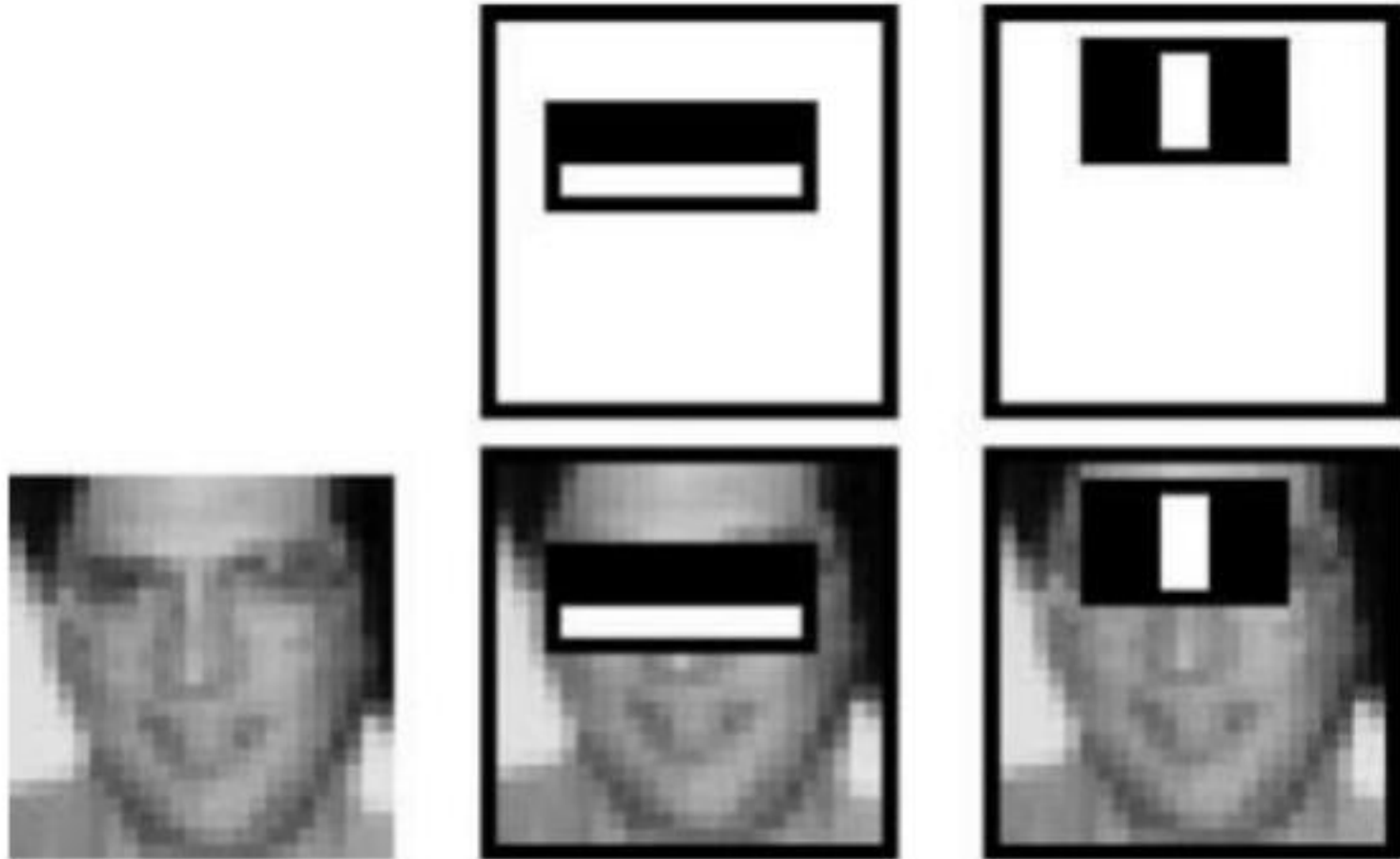
- 被引用次数: 12, 000+

Robust real-time face detection

- A face detection framework
 - Detection rates
 - Efficiency
- ✓ integral image representation
- ✓ AdaBoost classifier
- ✓ cascade structure



矩形特征



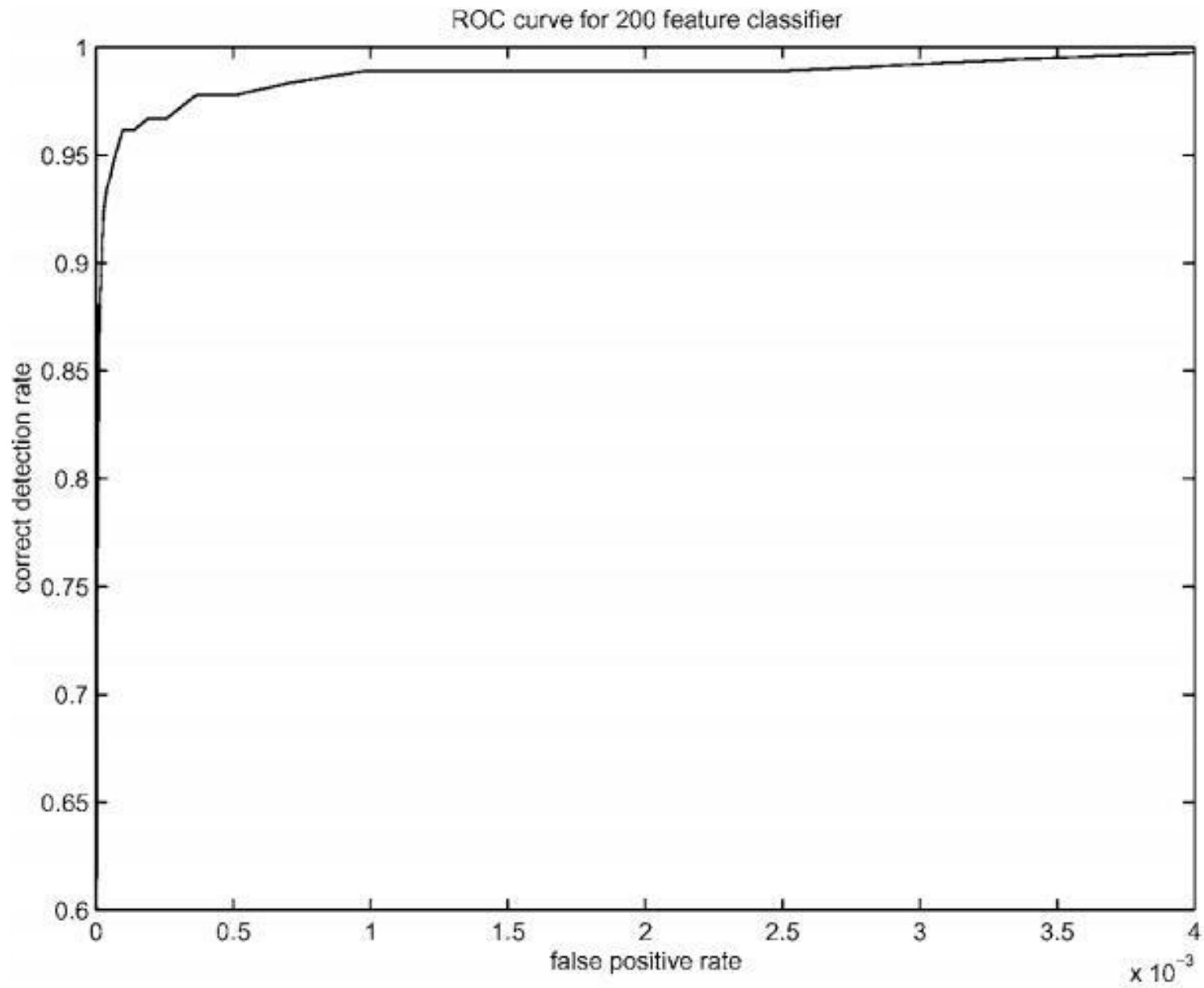
Integral image representation

$$ii(x, y) = \sum_{x' \leq x, y' \leq y} i(x', y'), \quad \leftarrow \quad s(x, y) = s(x, y - 1) + i(x, y) \quad (1)$$

$$ii(x, y) = ii(x - 1, y) + s(x, y) \quad (2)$$

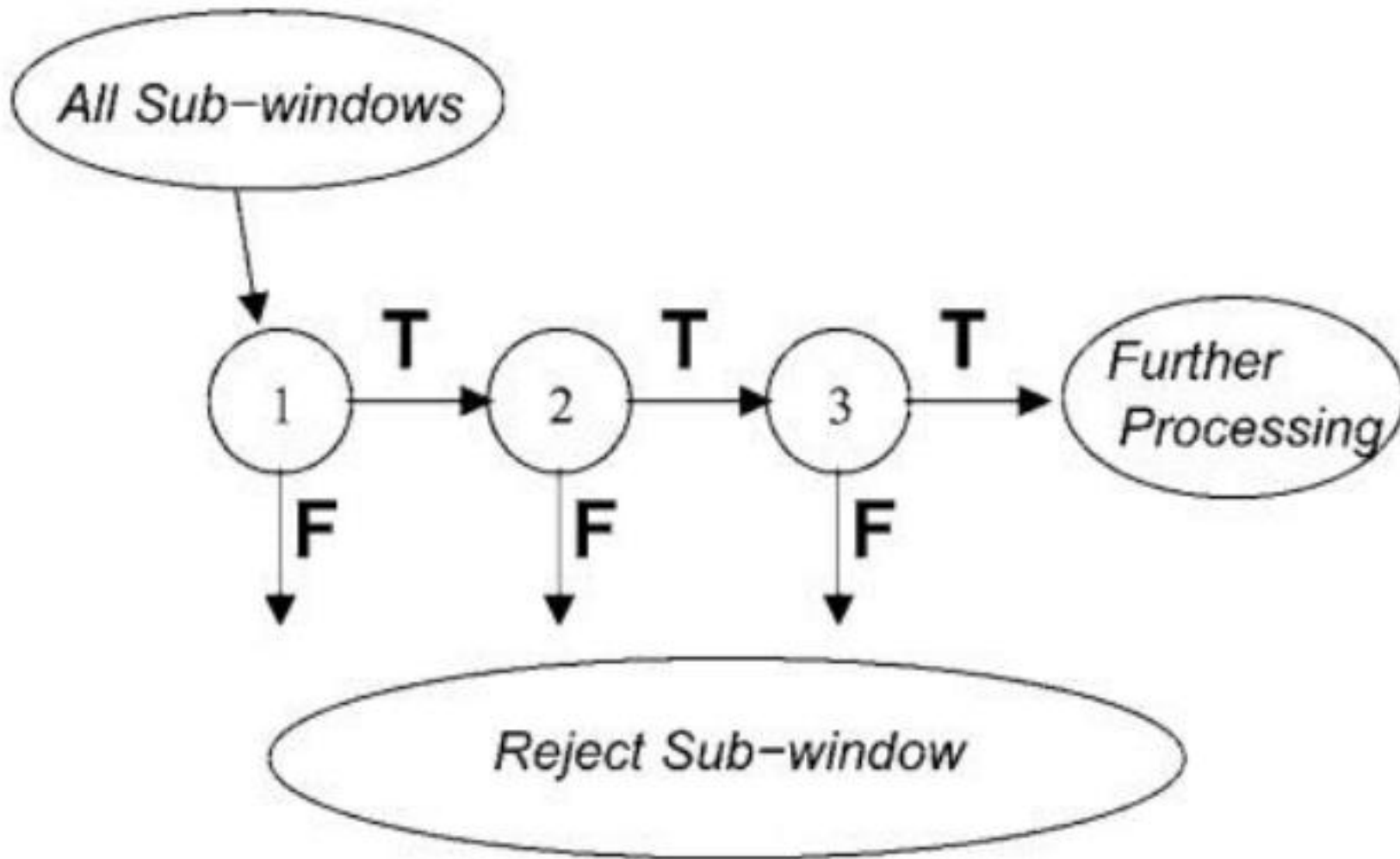
AdaBoost classifier

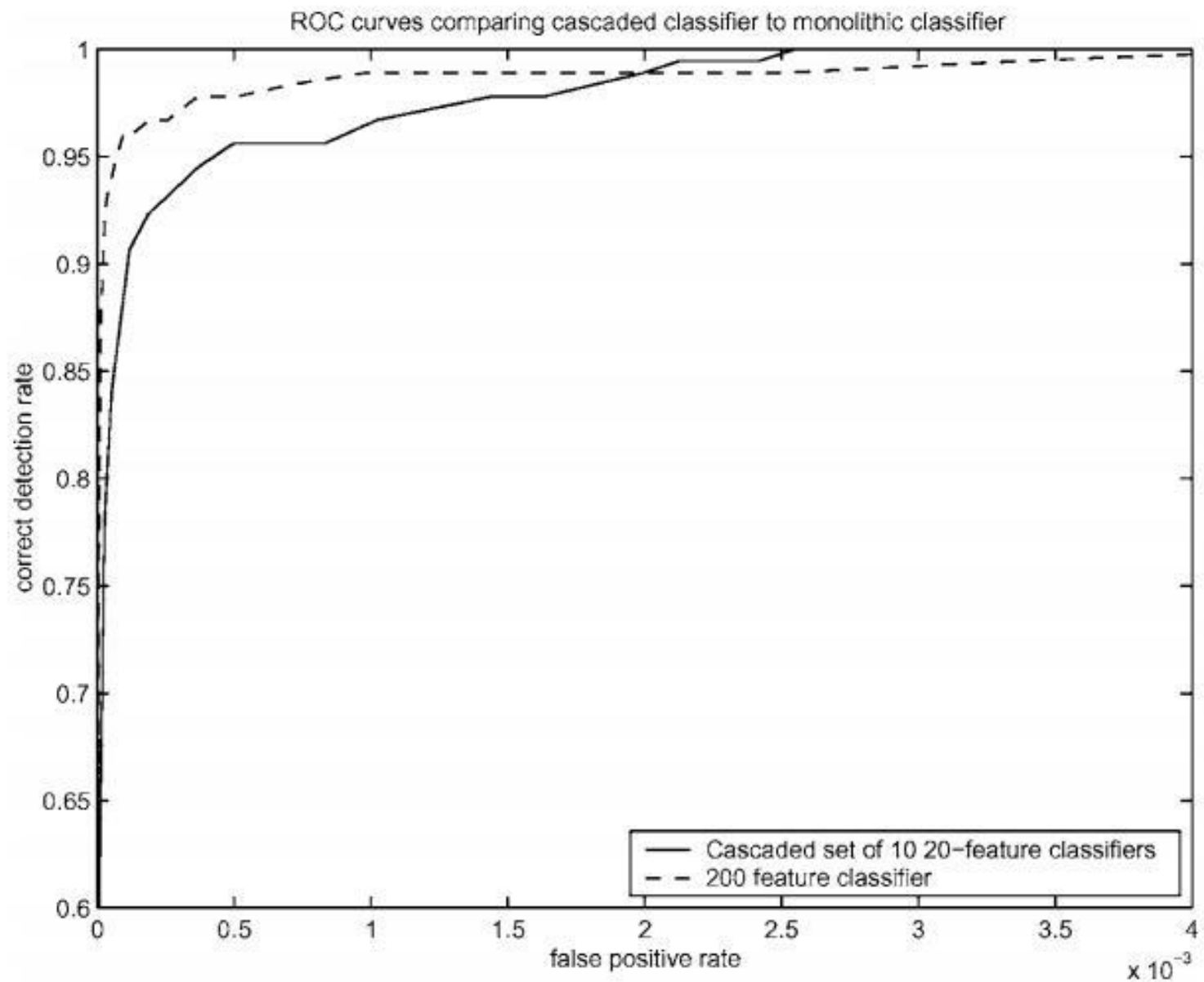
- 相关矩形特征数 > 像素数
- “三个臭皮匠，赛过一个诸葛亮”
- 弱分类器组合 vs 强分类器



Cascade structure

- 连续地组合更复杂的结构
- 只针对可能的区域
- 退化的决策树形态

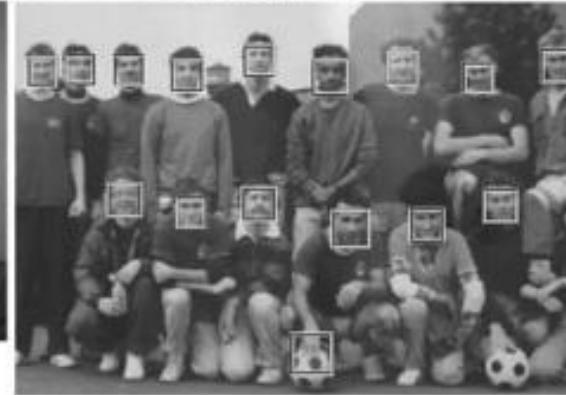






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