Nighttime Pedestrian Detection Based on Feature Attention and Transformation

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Problem

Nighttime pedestrian detection is a fundamental task for many practical applications. Some works propose to detect pedestrians at night by multi-modal data (e.g. thermal and RGB), but the thermal sensor is expensive and not widely available in robotics or surveillance systems. **Thus detecting only with RGB images is important, and it is also seldom explored in previous literatures.**

Motivation

At daytime, CNN features at pedestrian region show **high responses** at pedestrian regions, with minimal noise at the background.
In contrast, at nighttime, CNN features **fail to trigger high responses** at pedestrian regions while contain much noise at the background, resulting in false negatives and positives, respectively.
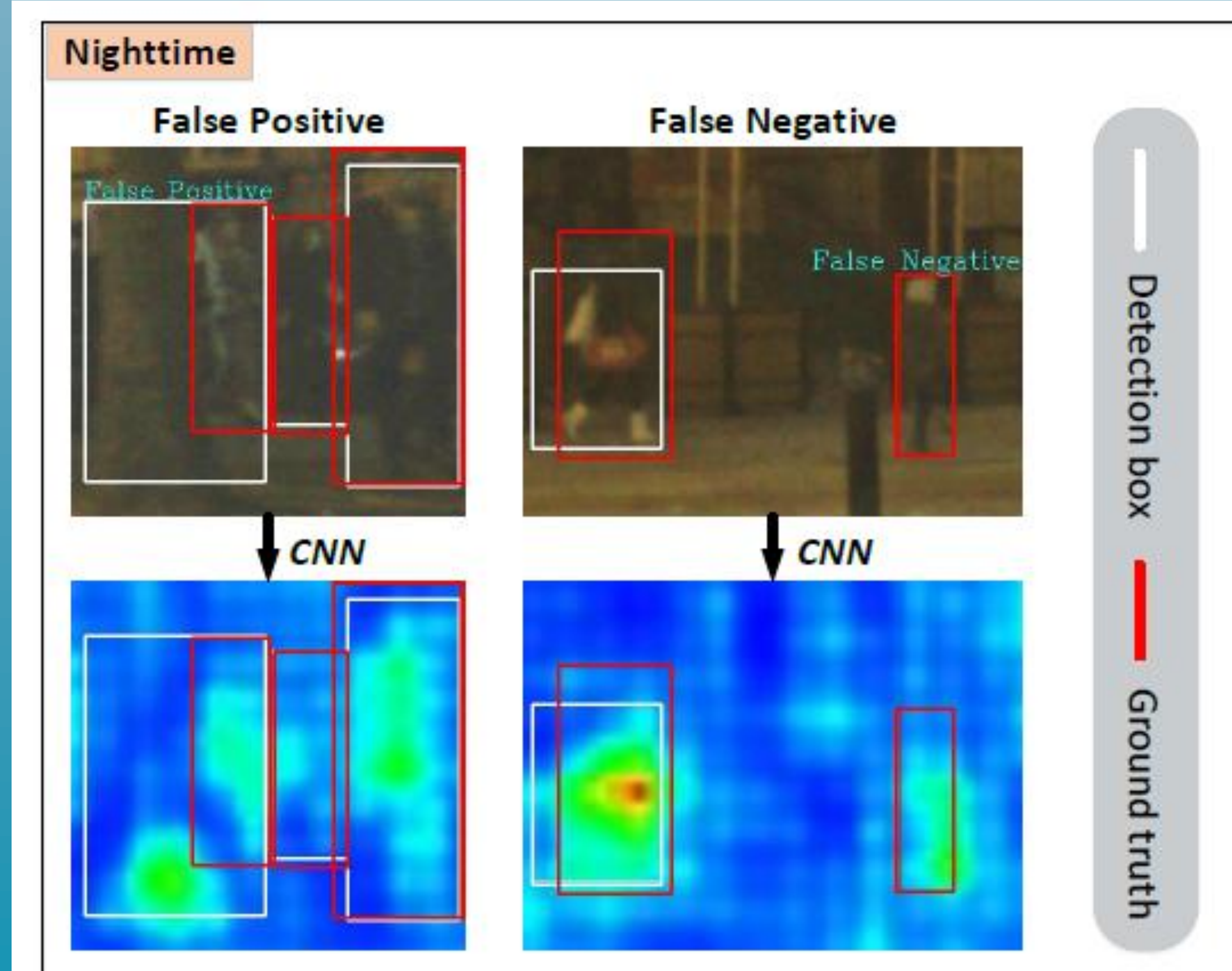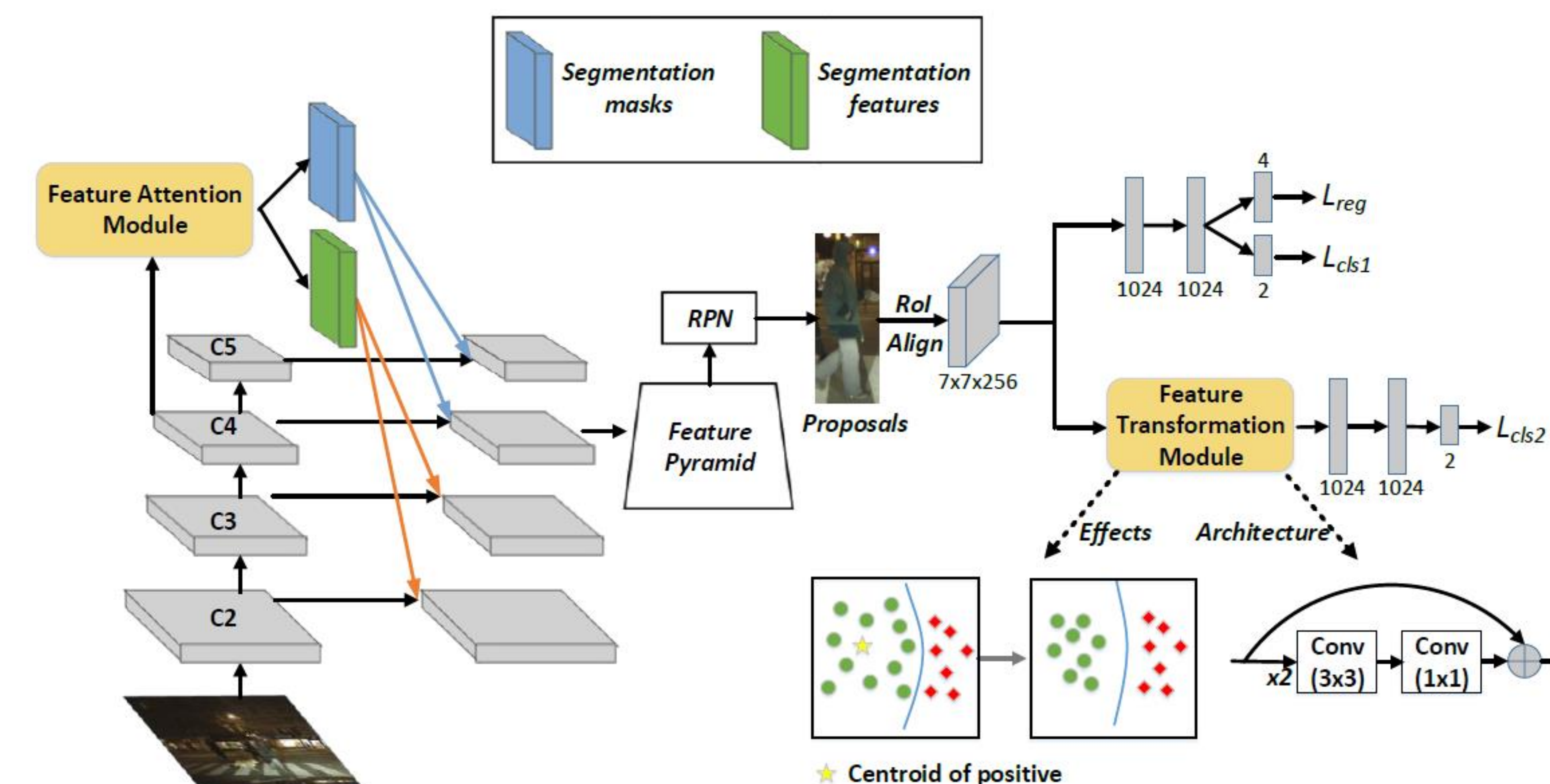

Methods

- Feature Attention Module

  Low- and high- level features usually carry different levels of semantic information. Applying the same attention map to different level features is sub-optimal. Thus we use a light-weight segmentation module to produce two kinds of attention maps: **segmentation masks, segmentation features**. And we also employ progressive supervision to produce precise masks.

- Feature Transformation Module

  we enforce features of dark pedestrians to approach that of bright ones.

Comparison with SOTAs

COMPARISON WITH OTHER METHODS ON NIGHTOWLS VALIDATION SET. THE RESULTS OF OTHER METHODS ARE COLLECTED FROM [19].

Methods	Reference	Backbone	Reasonable
Checkboards [36]	CVPR15	-	39.7
FRCNN [4]	NIPS15	VGG-16	20.0
A-FRCNN [5]	CVPR17	VGG-16	18.8
RPN+BF [16]	ECCV16	VGG-16	23.3
SDS-RCNN [20]	ICCV17	VGG-16	17.8
Our baseline	-	Resnet50+FPN	16.6
Our FATNet	-	Resnet50+FPN	**14.0**

Qualitative Results