Illumination-aware hallucination based domain adaptation for thermal pedestrian detection

Dr. Qian Xie

Cyber-physical Systems Group

Department of Computer Science

University of Oxford

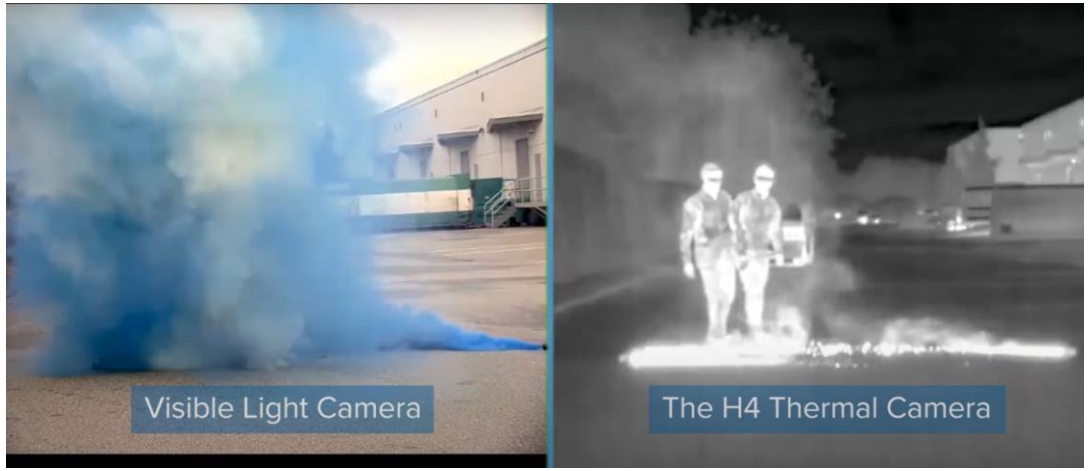
Background

Computer-aided scene understanding for firefighters could be important during their duties. However, in adverse environment this is challenged by:

- Fire and Smoke
- Glare or poor illumination




Background



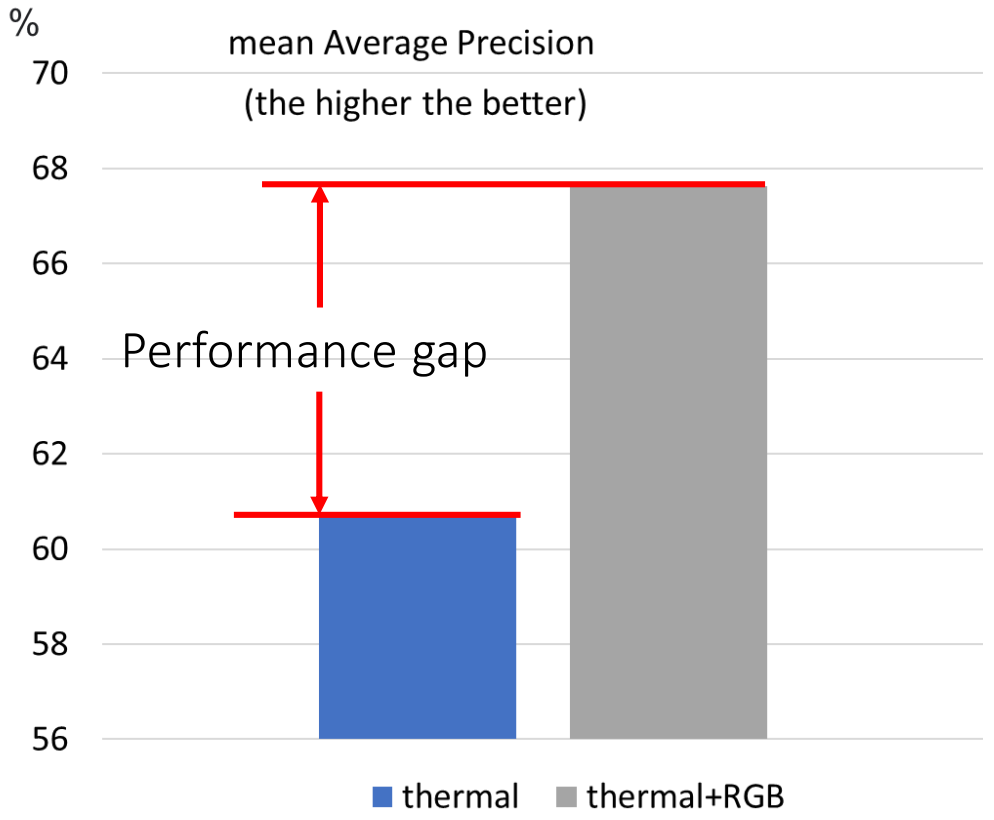
Visible images Thermal images

Thermal-based pedestrian detections

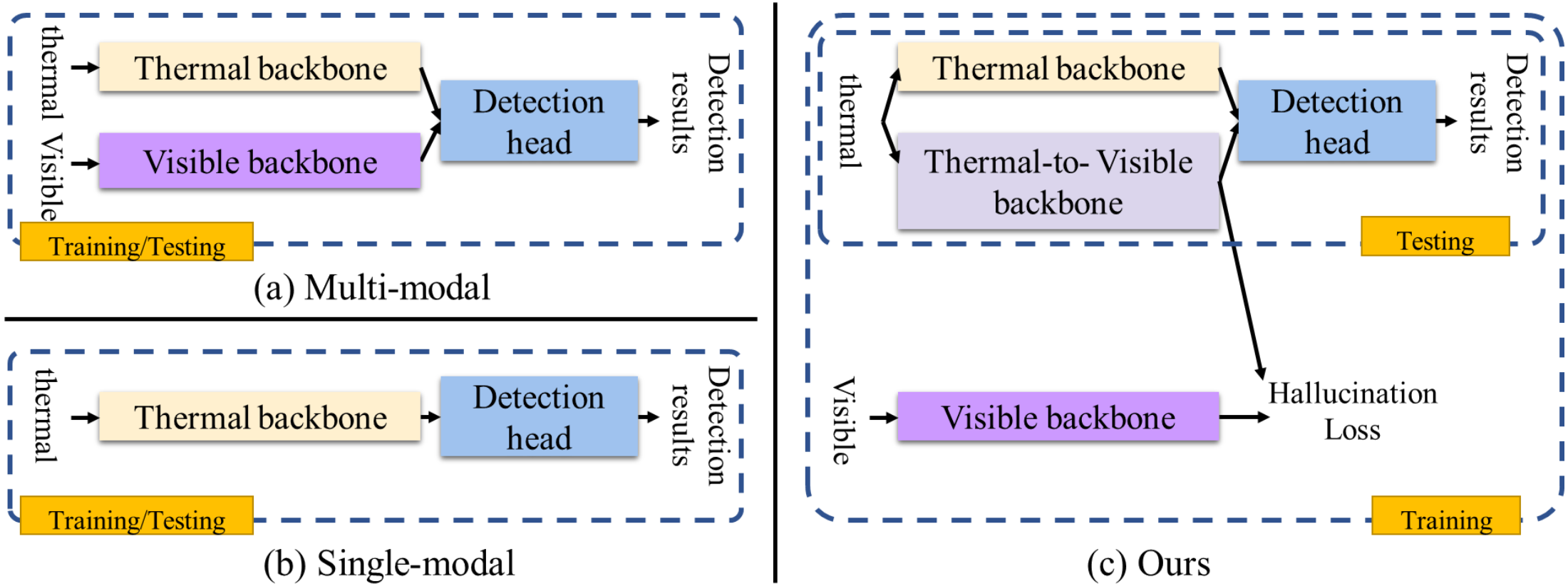
Motivation

- Thermal sensors can work well under smoke or bad-weather conditions;
- Thermal+visible can achieve better performance than thermal-only;
- Thermal-only equipment is easier to deploy for firefighter.

- Can we achieve thermal-visible's performance while using thermal-only equipment?

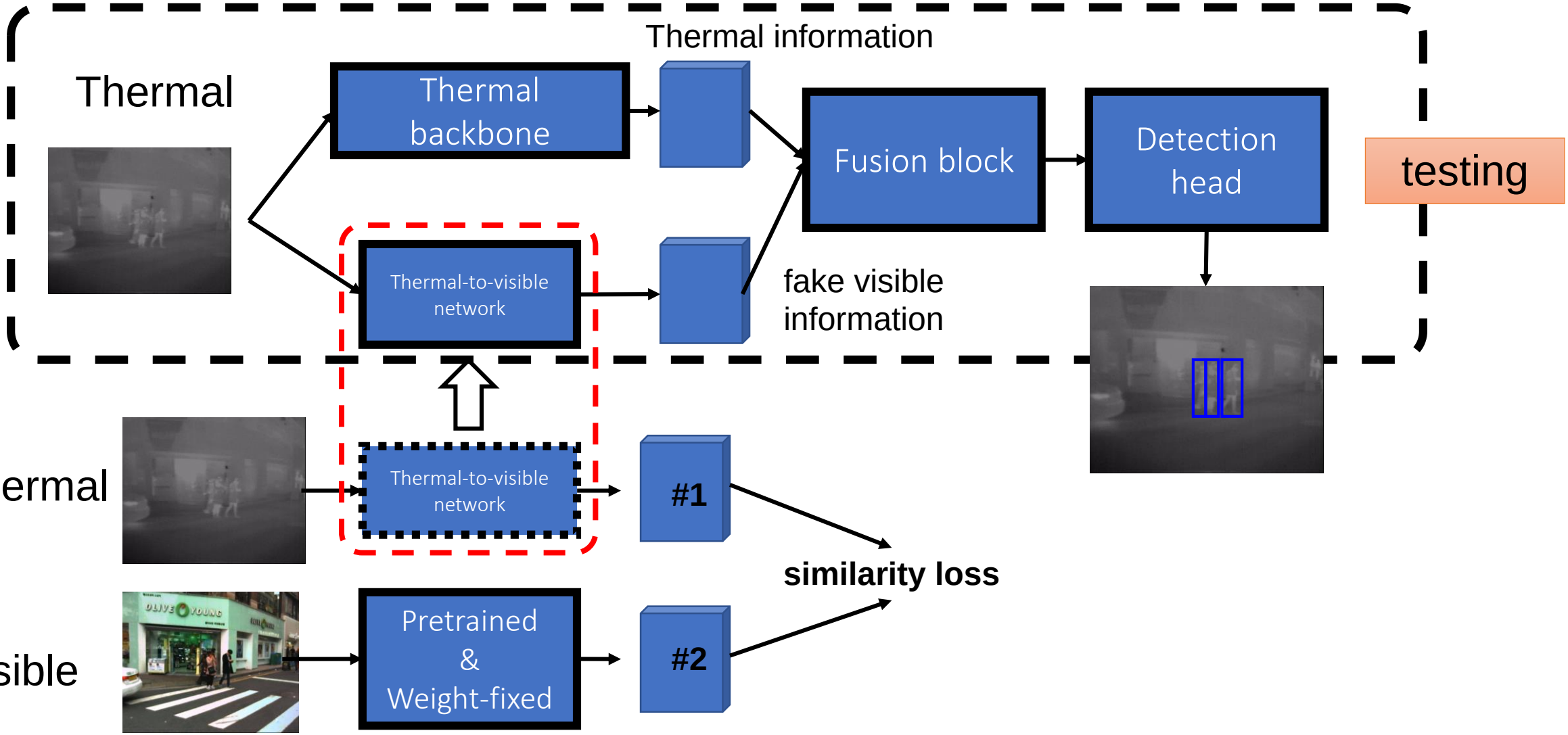


Method

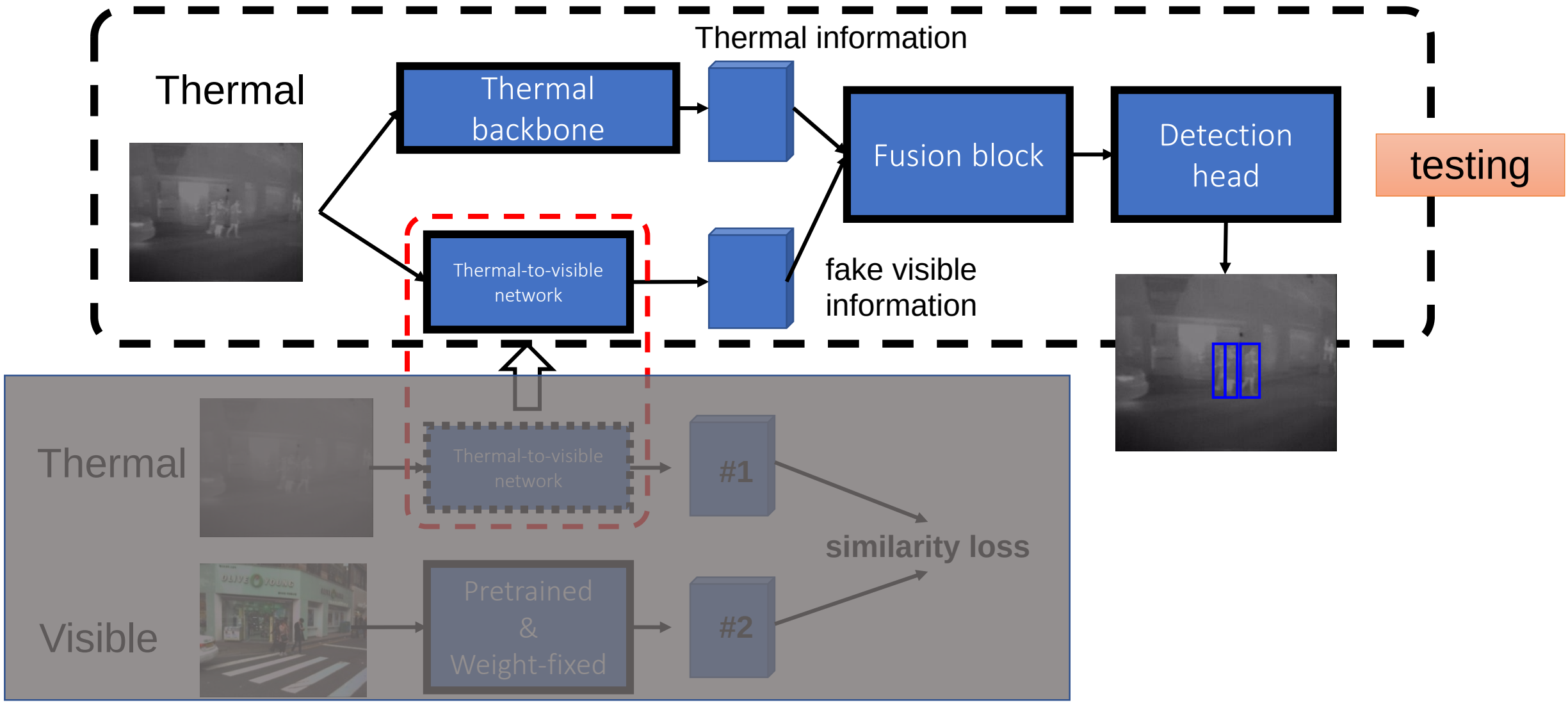


- Use visible modality hallucination to boost the pedestrian detection performance, with only thermal images as input in the testing stage.

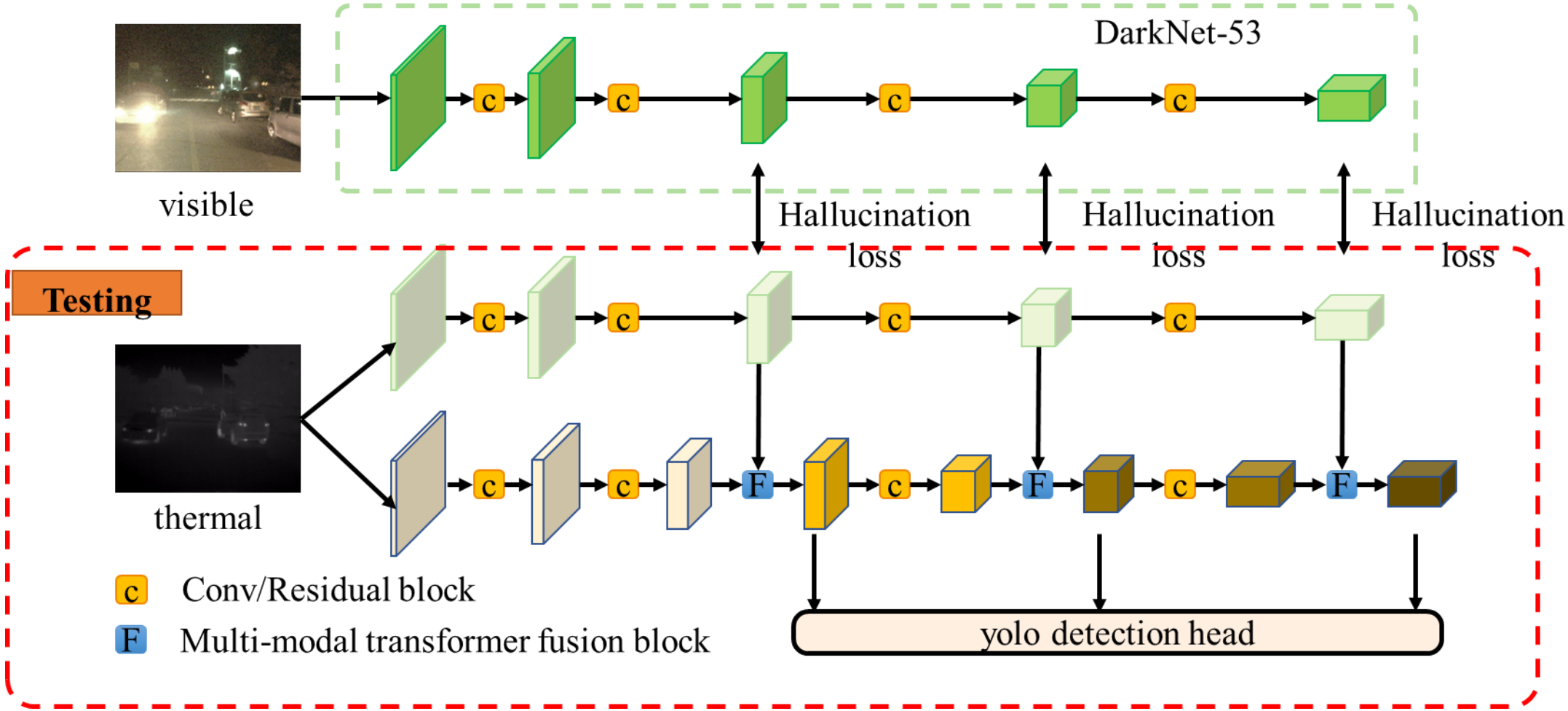
Network-hallucination



Network-hallucination

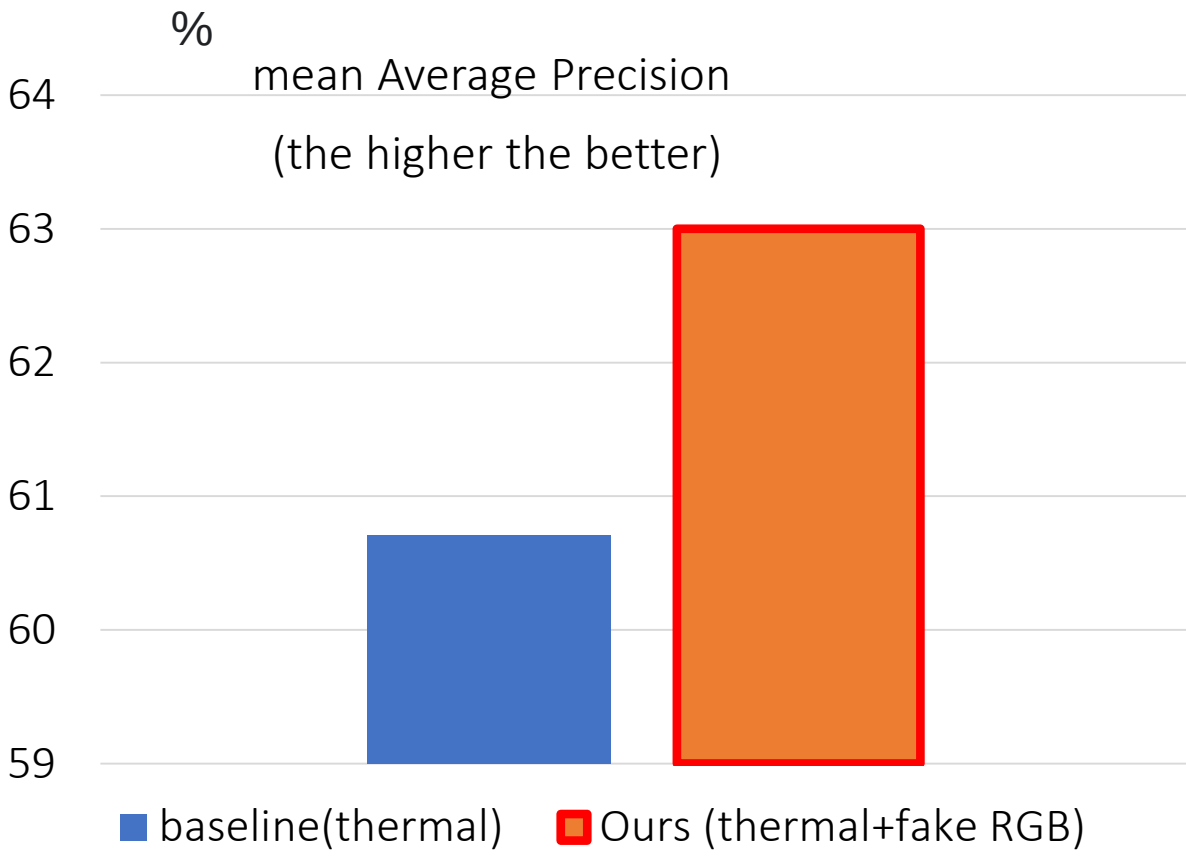


Network

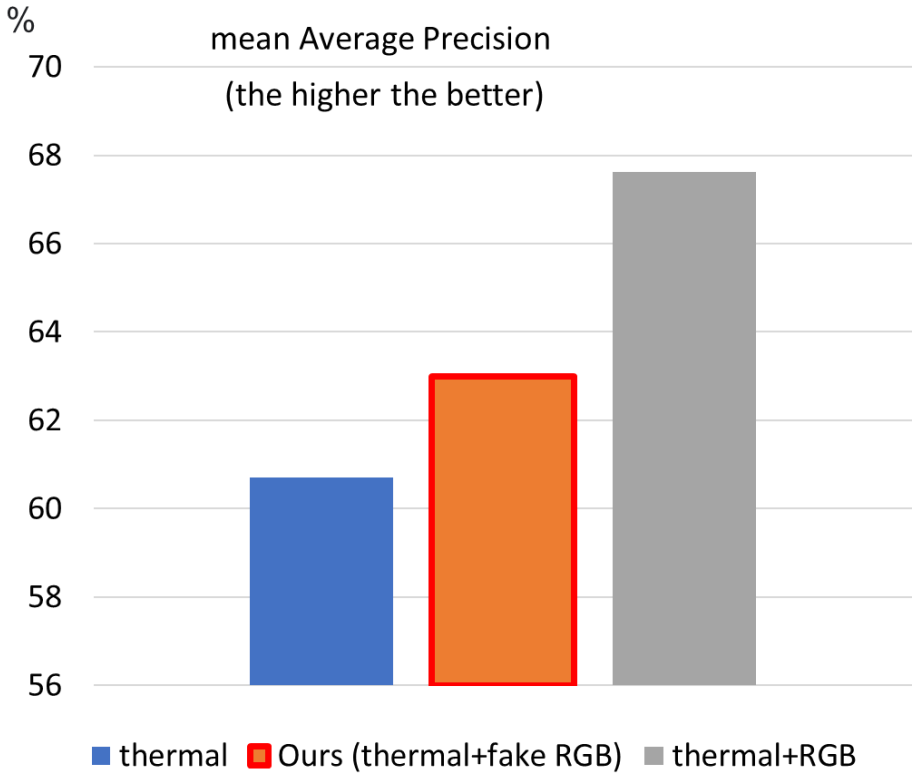

DarkNet-53
visible
Hallucination loss
Hallucination loss
Hallucination loss
Testing
thermal
c Conv/Residual block
F Multi-modal transformer fusion block
yolo detection head

Results

(a) Visible image (b) Baseline (c) Ours (d) Ground truth



Possible Future Directions



- There is still performance gap between our method with real thermal+visible based detectors.
- Real firefighter collected thermal image dataset