UNSUPERVISED OBJECT DETECTION FOR TRAFFIC SCENE ANALYSIS

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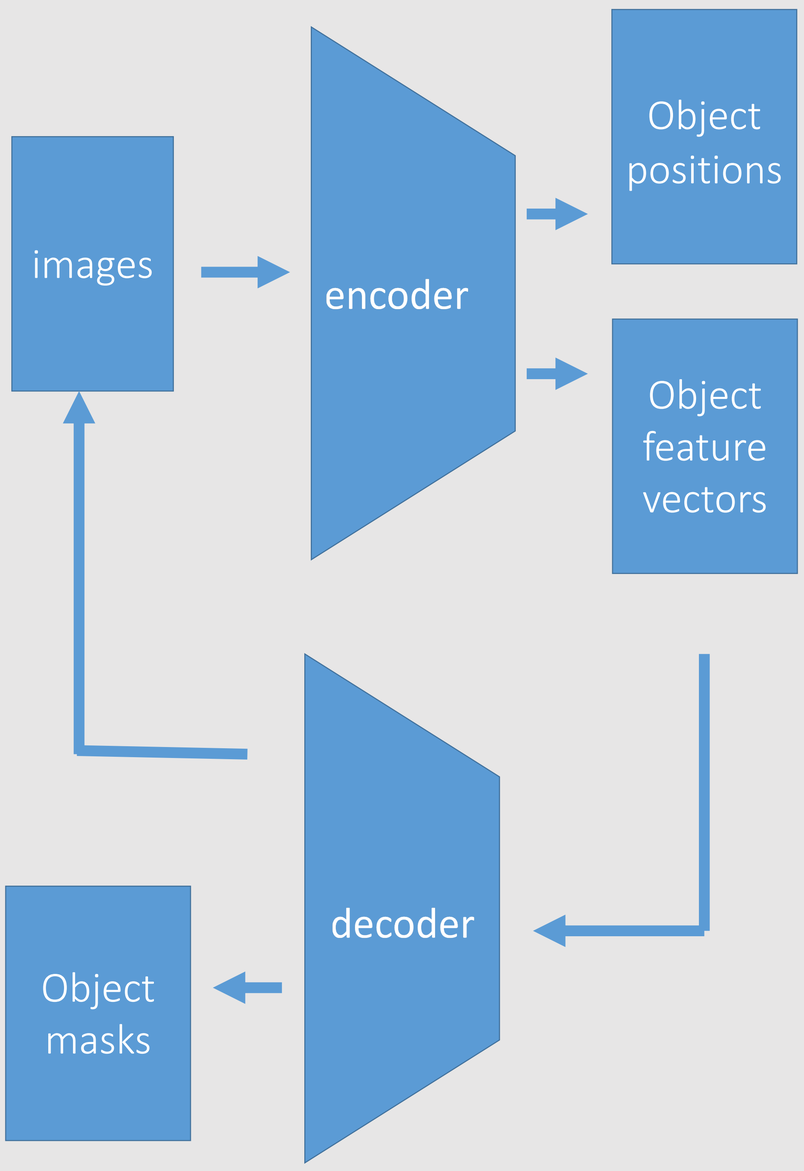
OBJECTIVE

Without any labelled data, using only images of a traffic scene taken by a fixed camera :

- Detect all objects in the scene which are not part of the background
- Associate to each object its mask and a low dimensional feature vector



Why unsupervised ?

- manage all kind of images (thermal, black and white, unusual camera locations..)
- Robustness

CHALLENGES

Scene complexity:

- Changing background (light, moving trees, etc..)
- High number of objects
- Complex object shapes

Specificity of the problem:

- Some objects are very small (pedestrians)
- Cars stopped at traffic lights should not be considered as background

STATE OF THE ART

Background substraction :

SOTA : SemanticBGS, IUTIS, SubSENSE WeSamBE,PAWCS

- Either not differentiable or supervised
- low mask quality
- cannot handle small objects

Unsupervised object detection:

SOTA : SPAIR (2019), SPACE (2020)

- Fails when object sizes vary a lot
- Fails on real images with complex shapes

ACHIEVEMENTS

Background substraction:

- Real-time background reconstruction and substraction of 1280 x720 real-world images using a fully differentiable network

- Input: traffic scene
- Background reconstruction
- Background substraction (normalized)

Differentiability → can be integrated inside any neural network performing vision tasks