

An Empirical Analysis of Visual Features for Multiple Object Tracking in Urban Scenes



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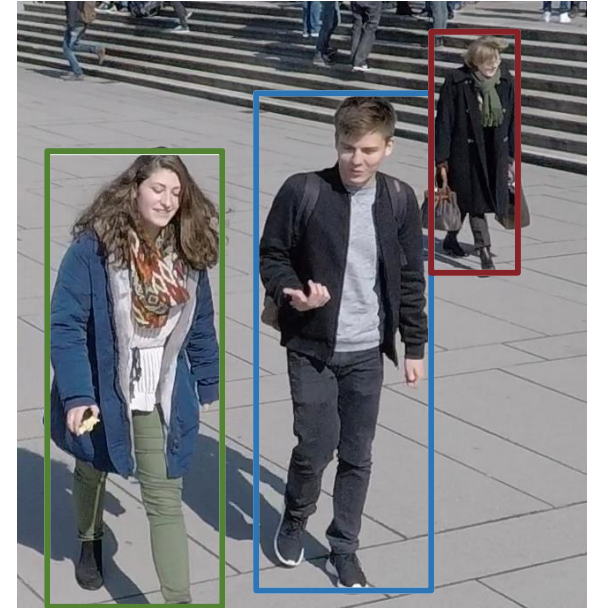
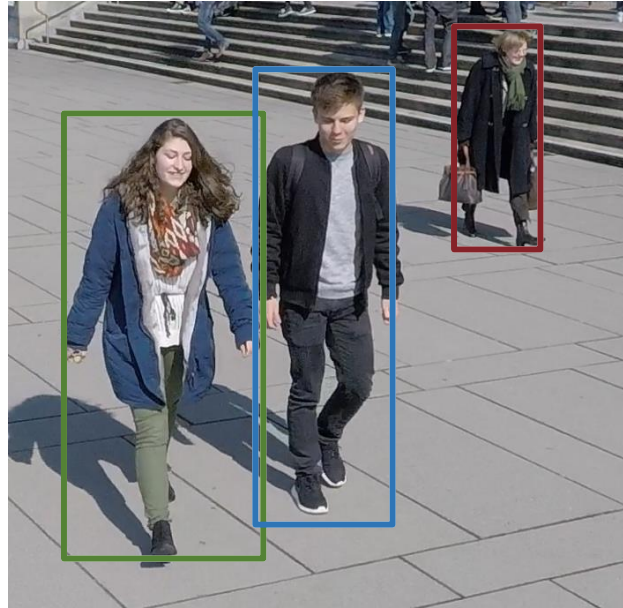
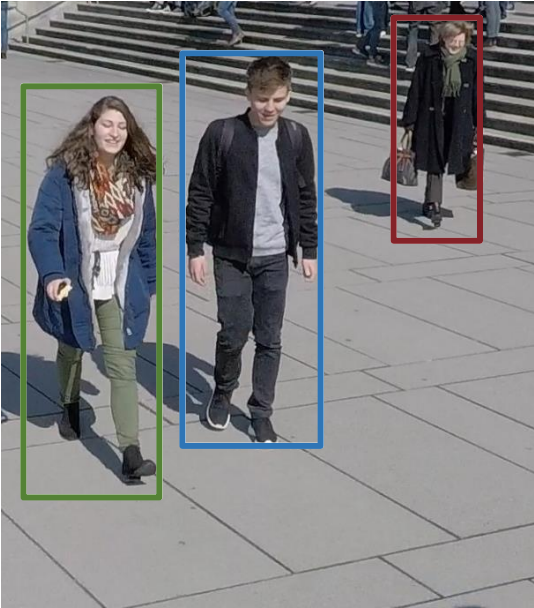


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Tracking-by-detection



Objective : rank several visual features for multiple object tracking focused on urban scenes

Methodology

Query object at frame t



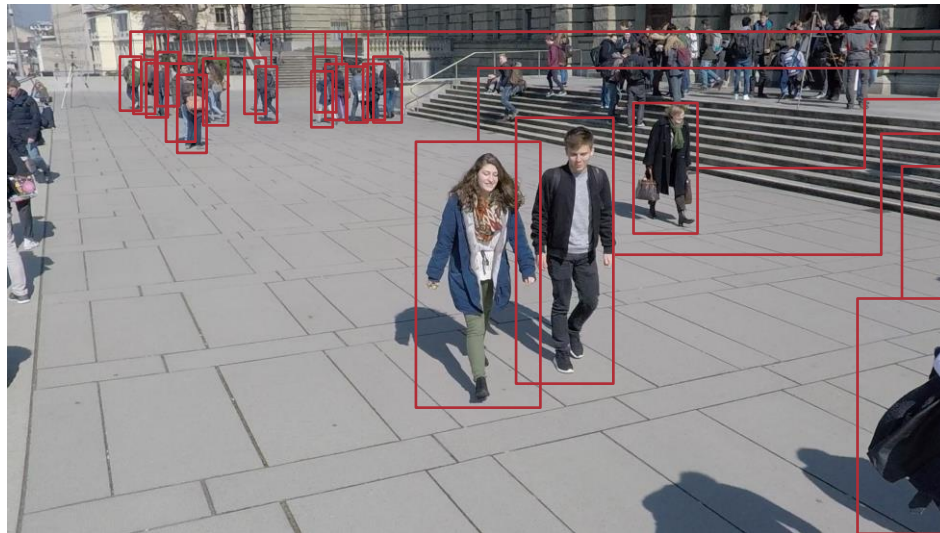
Visual feature of the query object at frame t



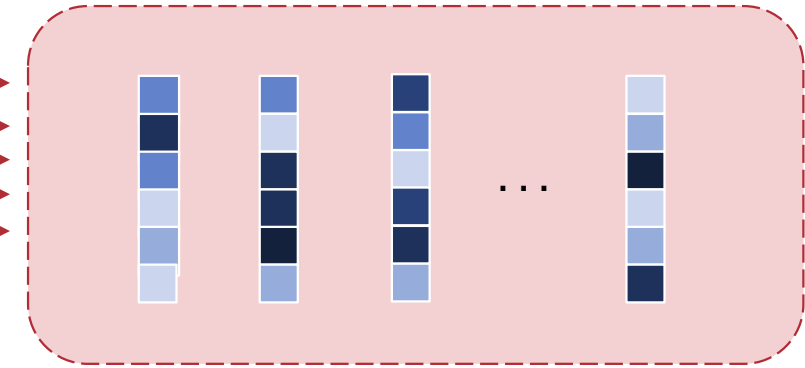
Descriptor

Affinity measure

Returns the object's identity whose feature is the "most similar" to the query's one



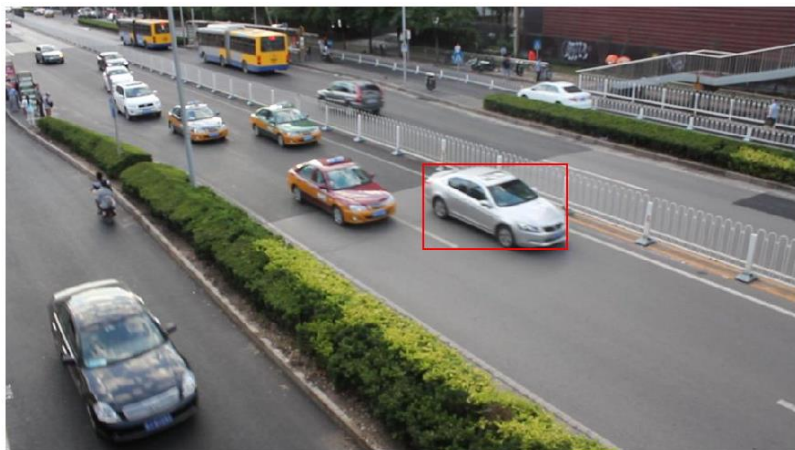
Descriptor



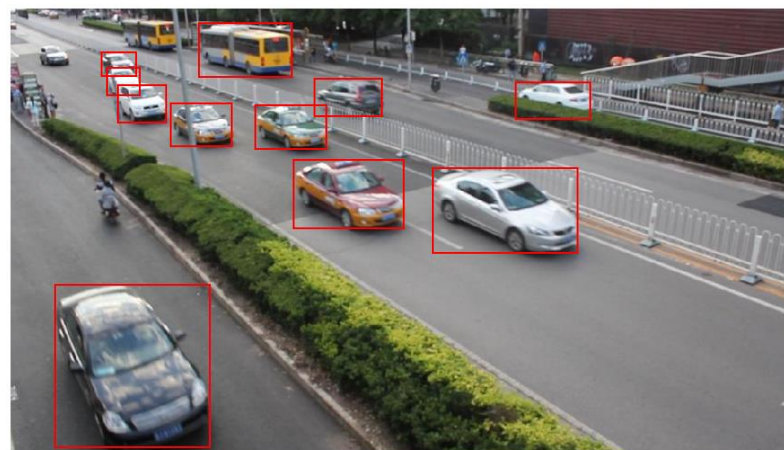
Set of visual features of objects at frame $t+\Delta t$

Candidate objects at frame $t+\Delta t$

Methodology



Query object at frame t



Candidate objects at frame $t+1$

White Gaussian noise parametrized by σ

σ 0 0.05 0.1 0.2
 —————

Skip some frames parametrized by $step$

$step$ 1 2 4 8 16 32
 —————

Methodology

Visual features :

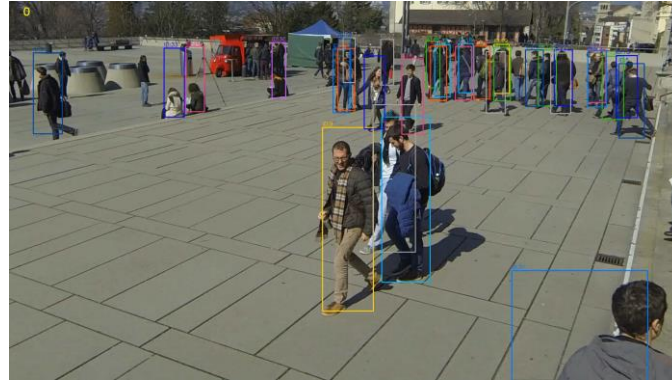
- RGB histogram
- grayscale histogram
- histogram of oriented-gradients
- VGG-19 features
- ResNet-18 features
- DenseNet-101 features
- EfficientNet-B0 features
- re-identification features (persons or vehicles)

Affinity measures :

- L1 distance
- L2 distance
- Rank-1 counts
- Bhattacharyya distance
- cosine similarity

Methodology

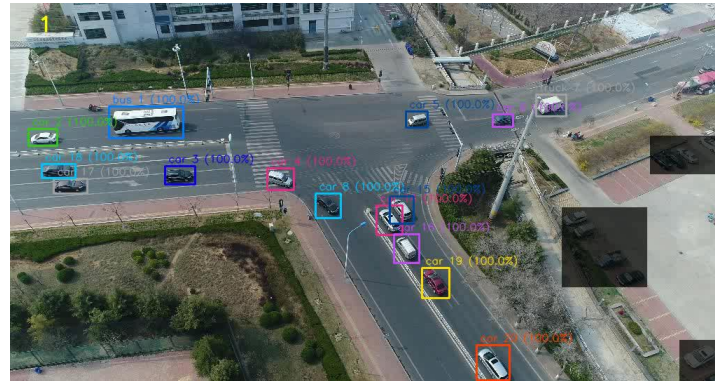
Datasets :



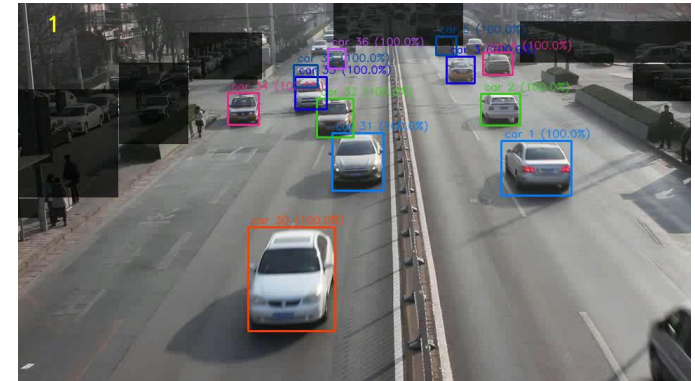
WildTrack



MOT17



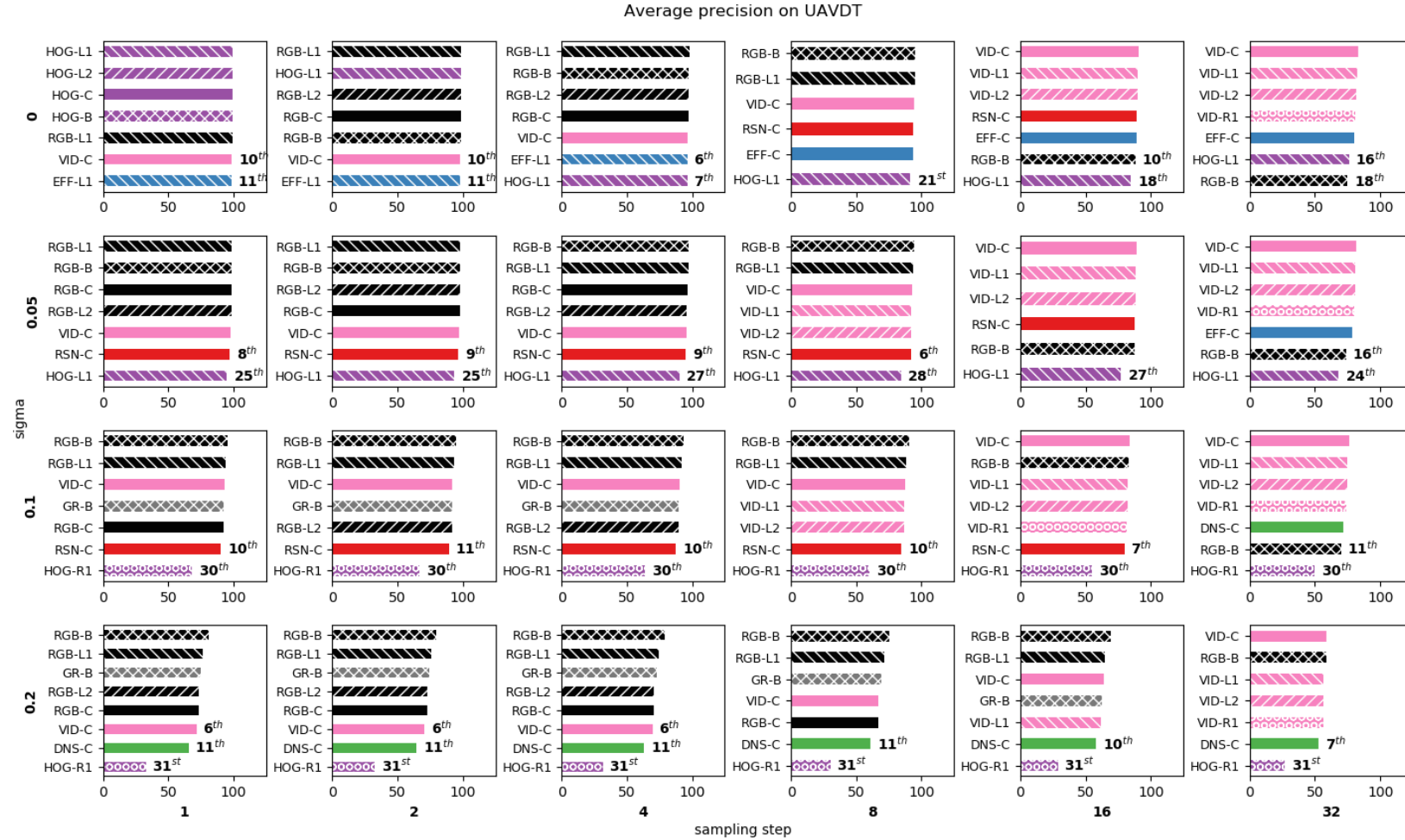
UAVDT



DETRAC

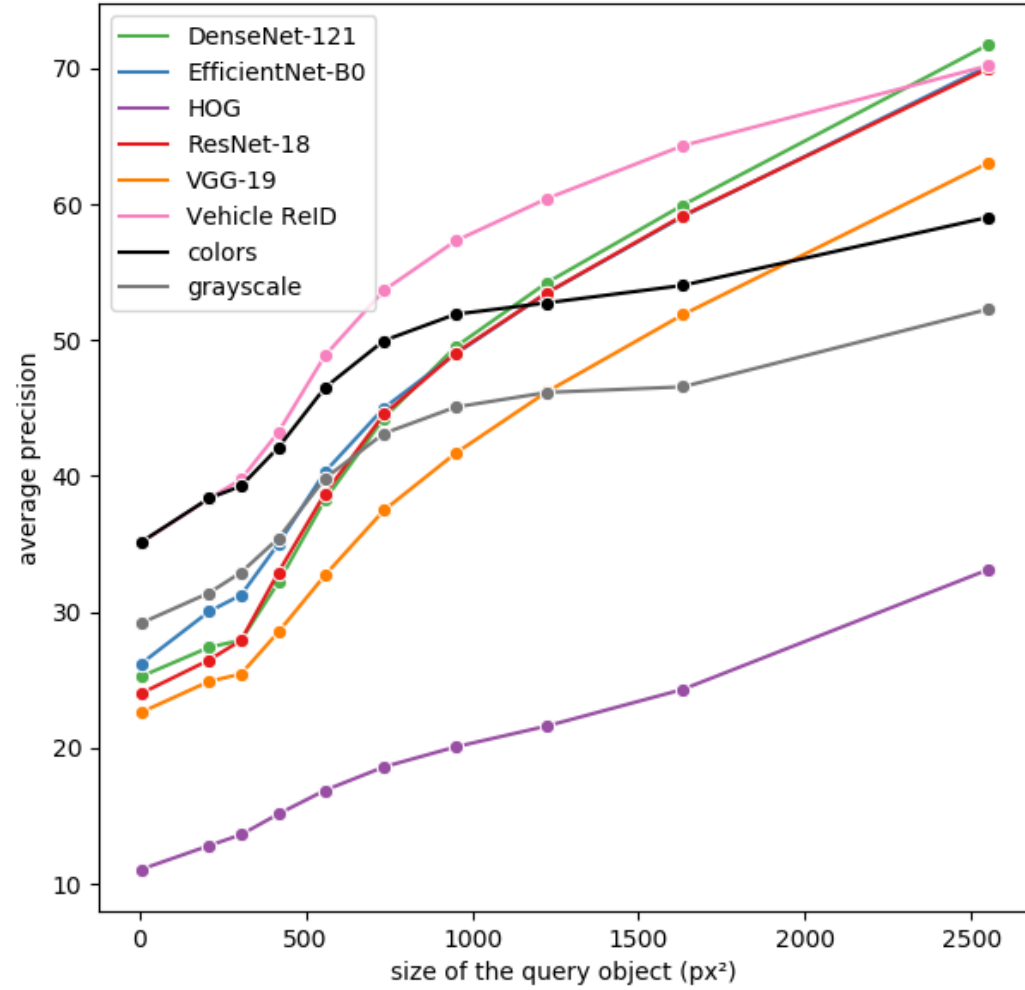
Results : average precision of 35 pairs visual features-affinity, over 24 configurations and 4 datasets

Results on ranking



Results on size effect

Average precision with regard to BBs size on UAVDT at sigma-step = 0.2-32



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More information available on www.mehdimiah.com/visual_features