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ICPR 2020

Gabriella: An Online System for Real-Time Activity Detection in Untrimmed Security Videos

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Introduction

Detect activities in untrimmed security videos

- Human and Vehicles
- Activity types
    - Single actors
    - Interaction between actors
    - Actor-object interactions

Challenges

- Untrimmed nature
- Multiple activities
- Varying length of activities
- Multiple actors

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- Untrimmed nature
- Multiple activities
- Varying length of activities
- Multiple actors
- Multiple scales

Motivations

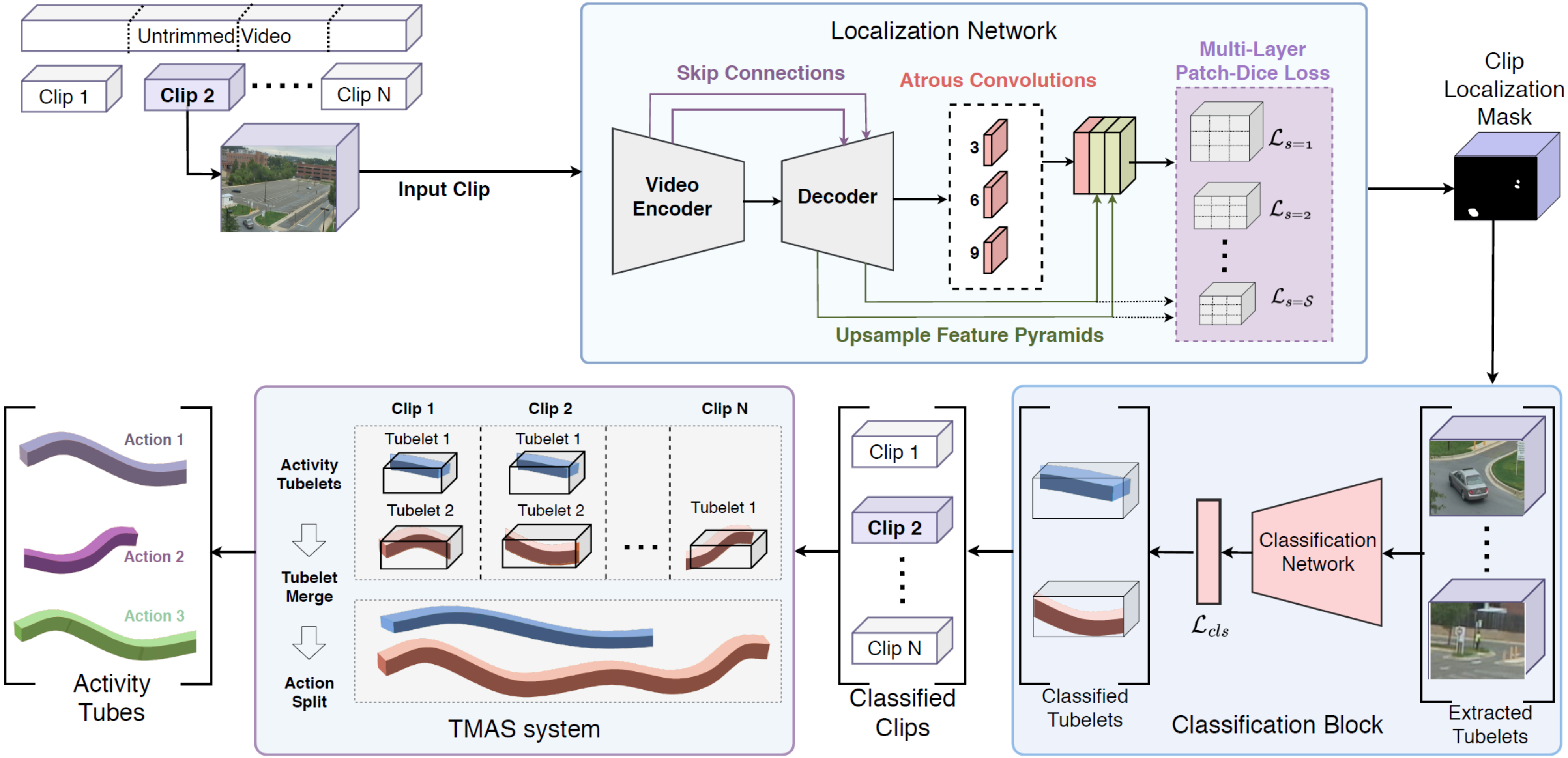
- Region proposal based approach [1, 2]
  - Scaling issue with videos
  - Multiple actors
    - How to pair?
- Object detection [3]
  - Time consuming
  - Multiple actors
    - How to pair?

[1] Hui et al. "Tube convolutional neural network (T-CNN) for action detection in videos." In IEEE international conference on computer vision. 2017.
[2] He et al. "Mask r-cnn." In Computer Vision (ICCV), 2017 IEEE International Conference on, pp. 2980-2988. IEEE, 2017.
[3] Gleason, Joshua, et al. "A proposal-based solution to spatio-temporal action detection in untrimmed videos." 2019 IEEE WACV. IEEE, 2019.

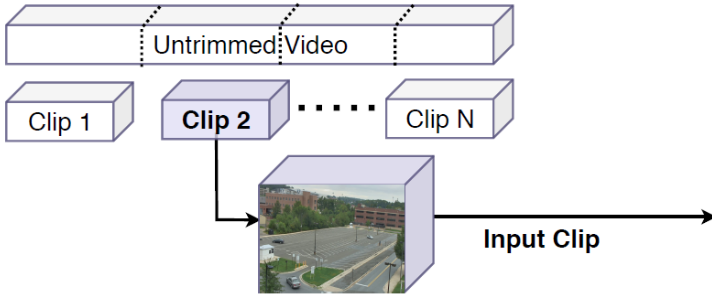
Approach

- A two-stage process
  - Detect activity tubelets from long untrimmed videos
  - Recognize activities in the detected tubelets
- Encoder-decoder architecture
  - No region proposal
- Video level detection
  - No object detection

Our Approach



Our Approach



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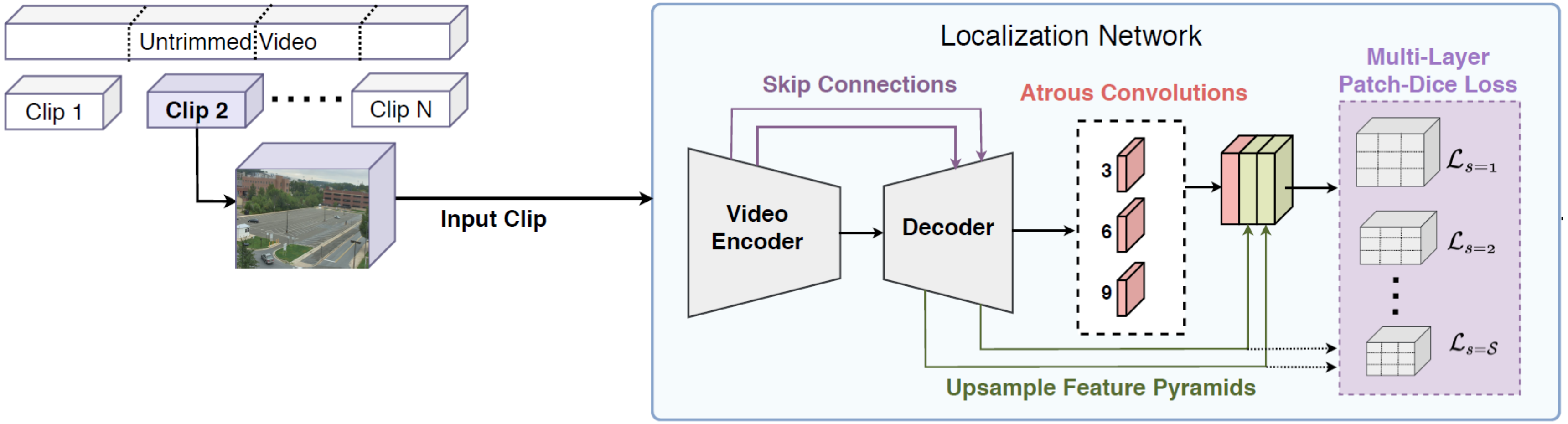

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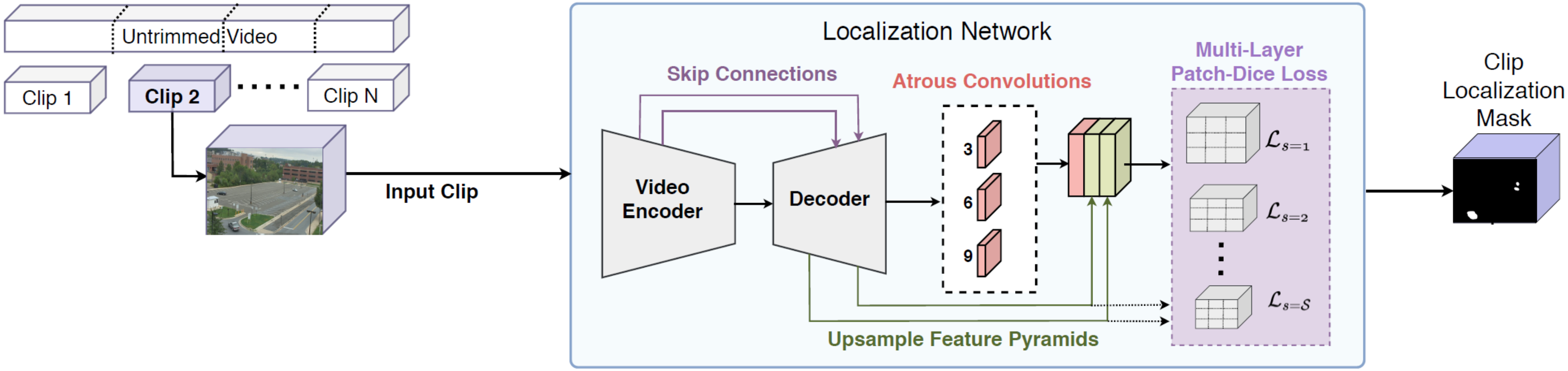

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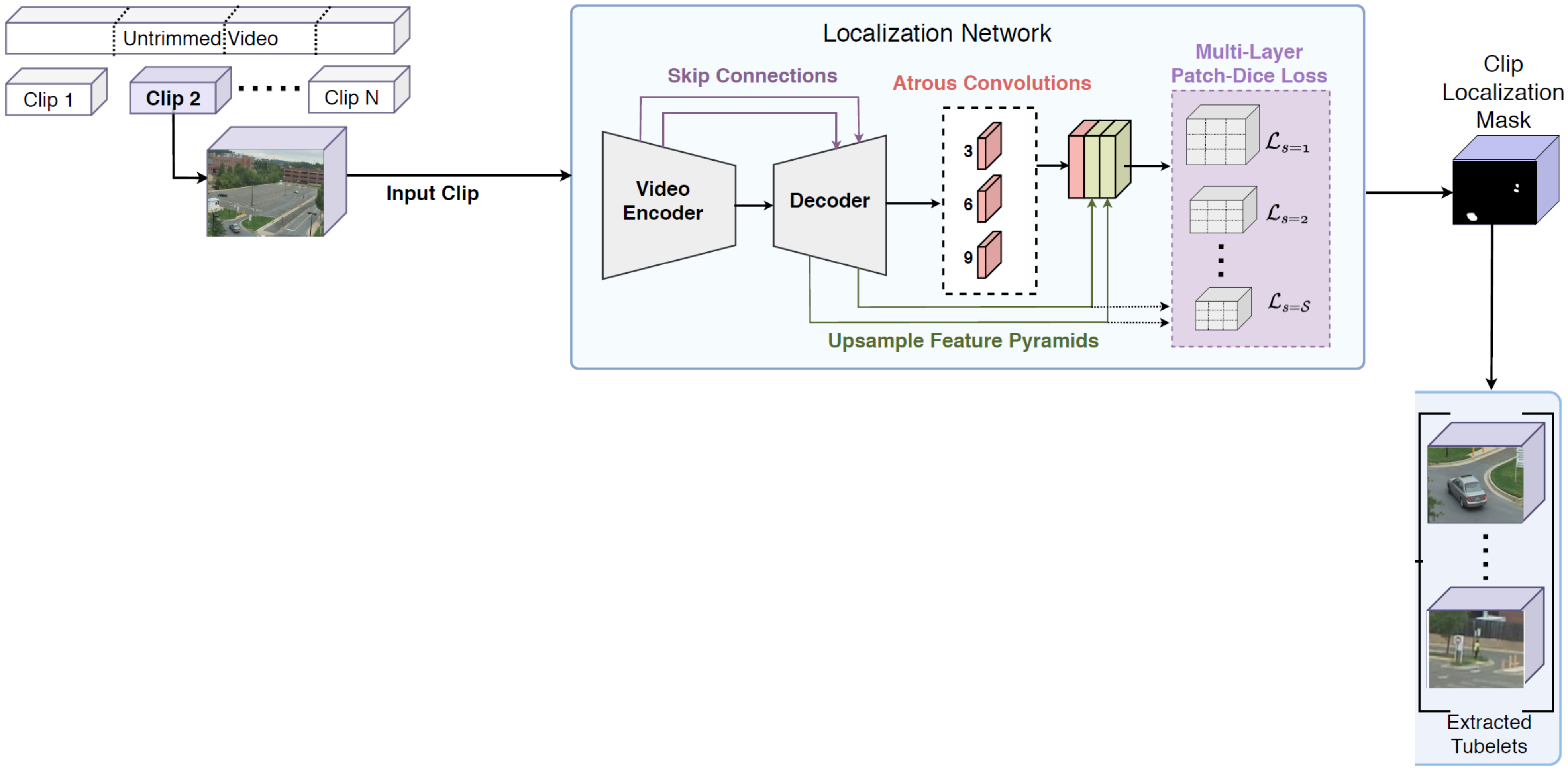

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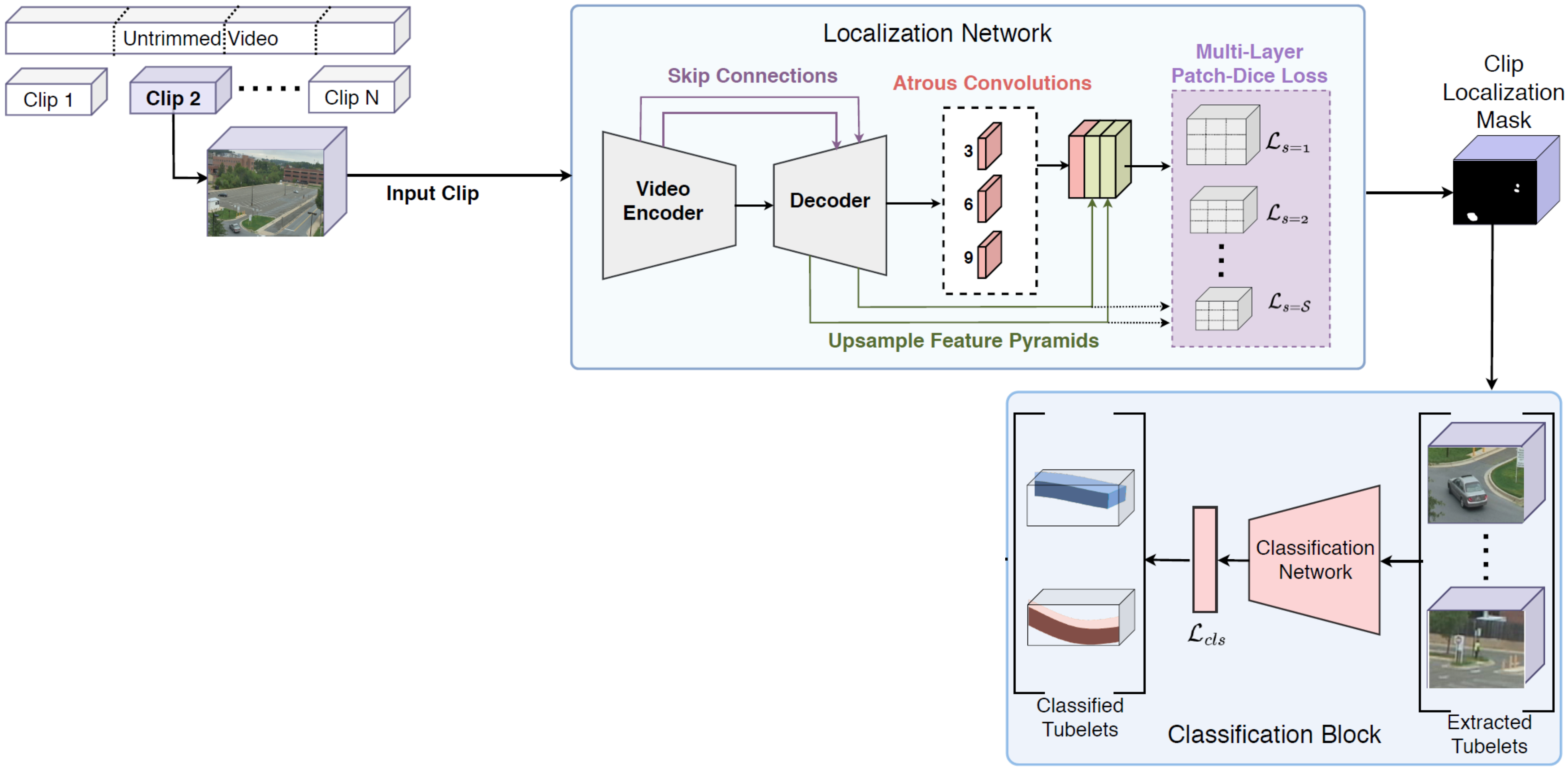
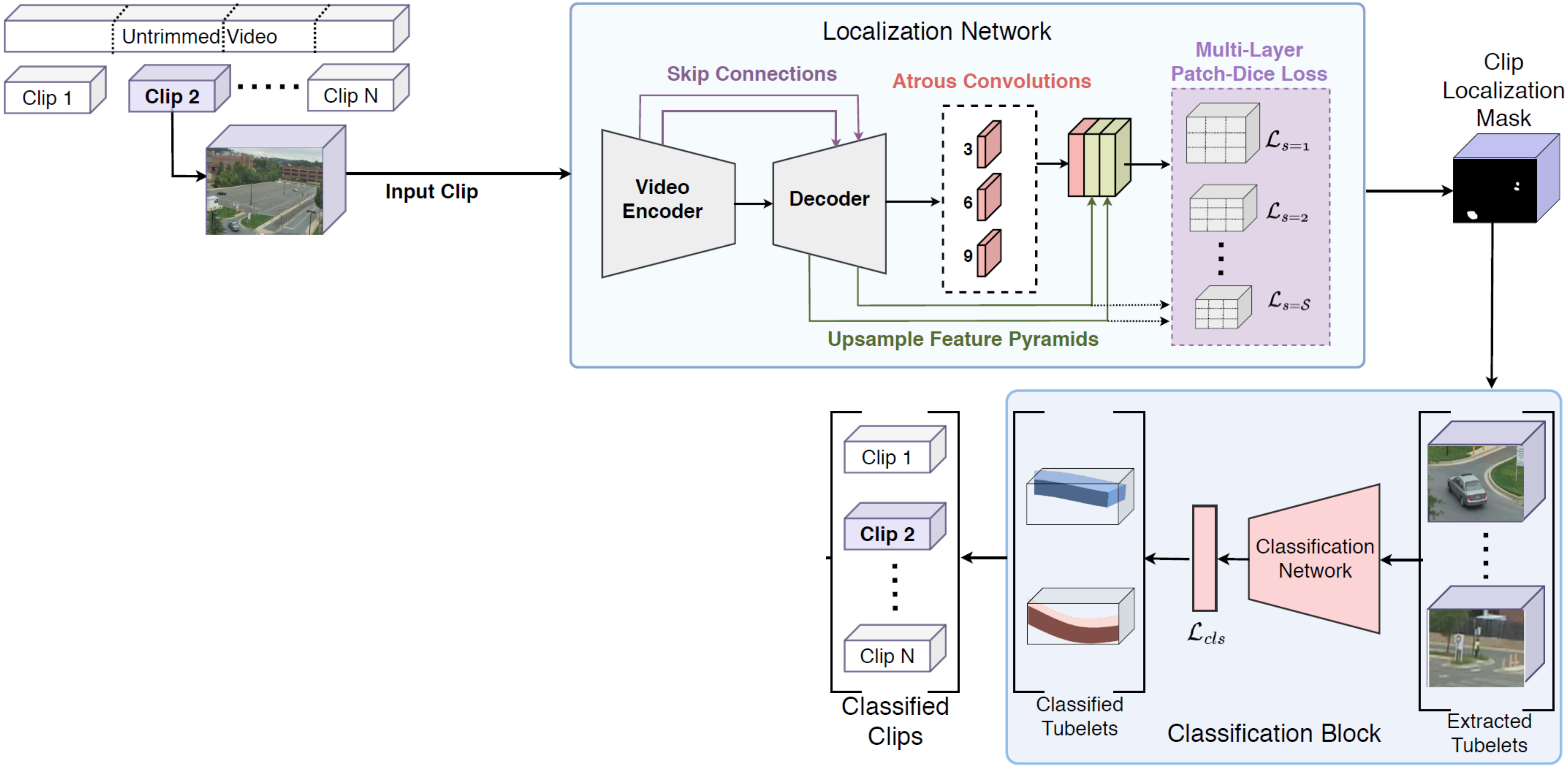
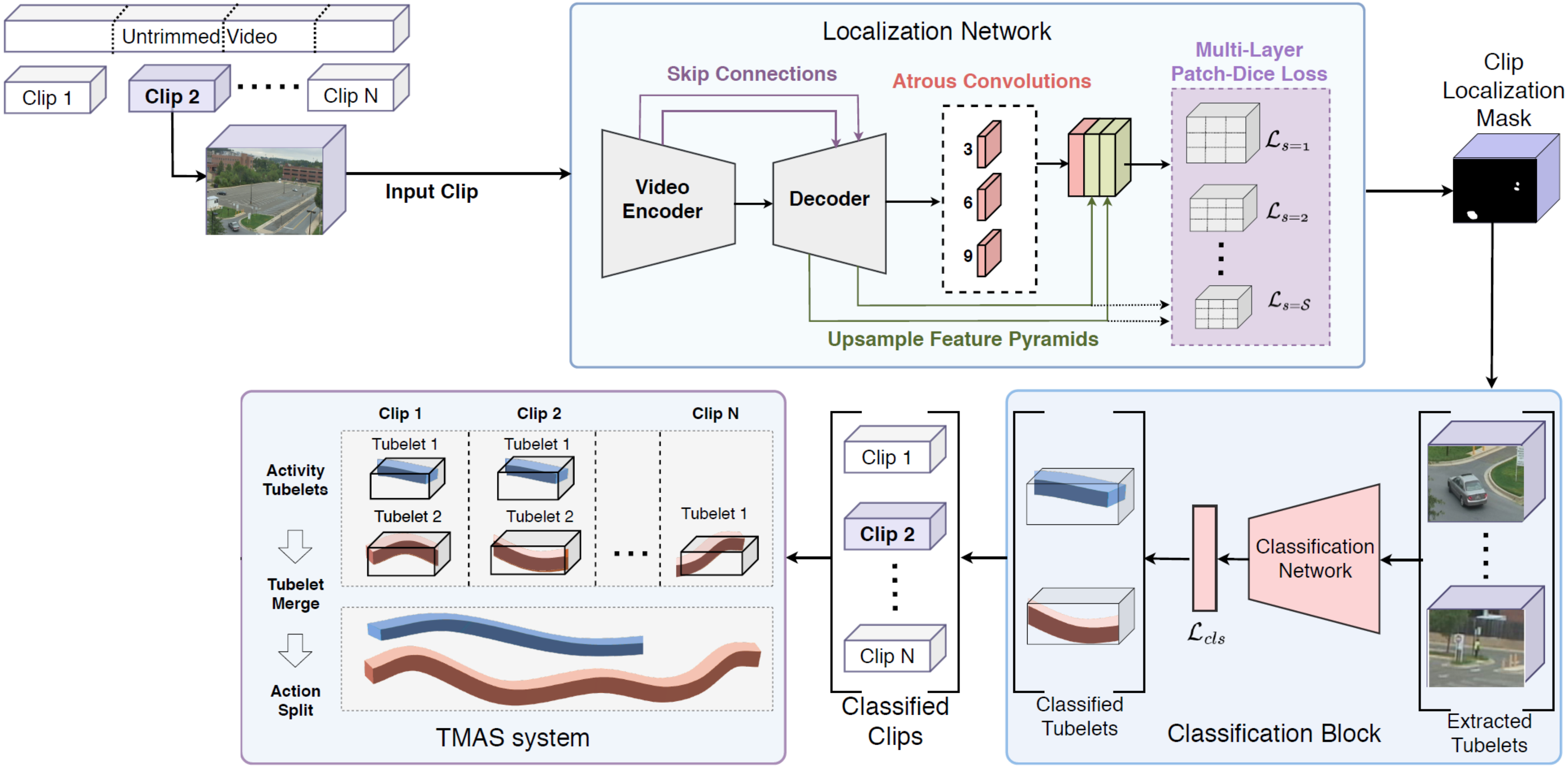
Our Approach



Our Approach



Our Approach



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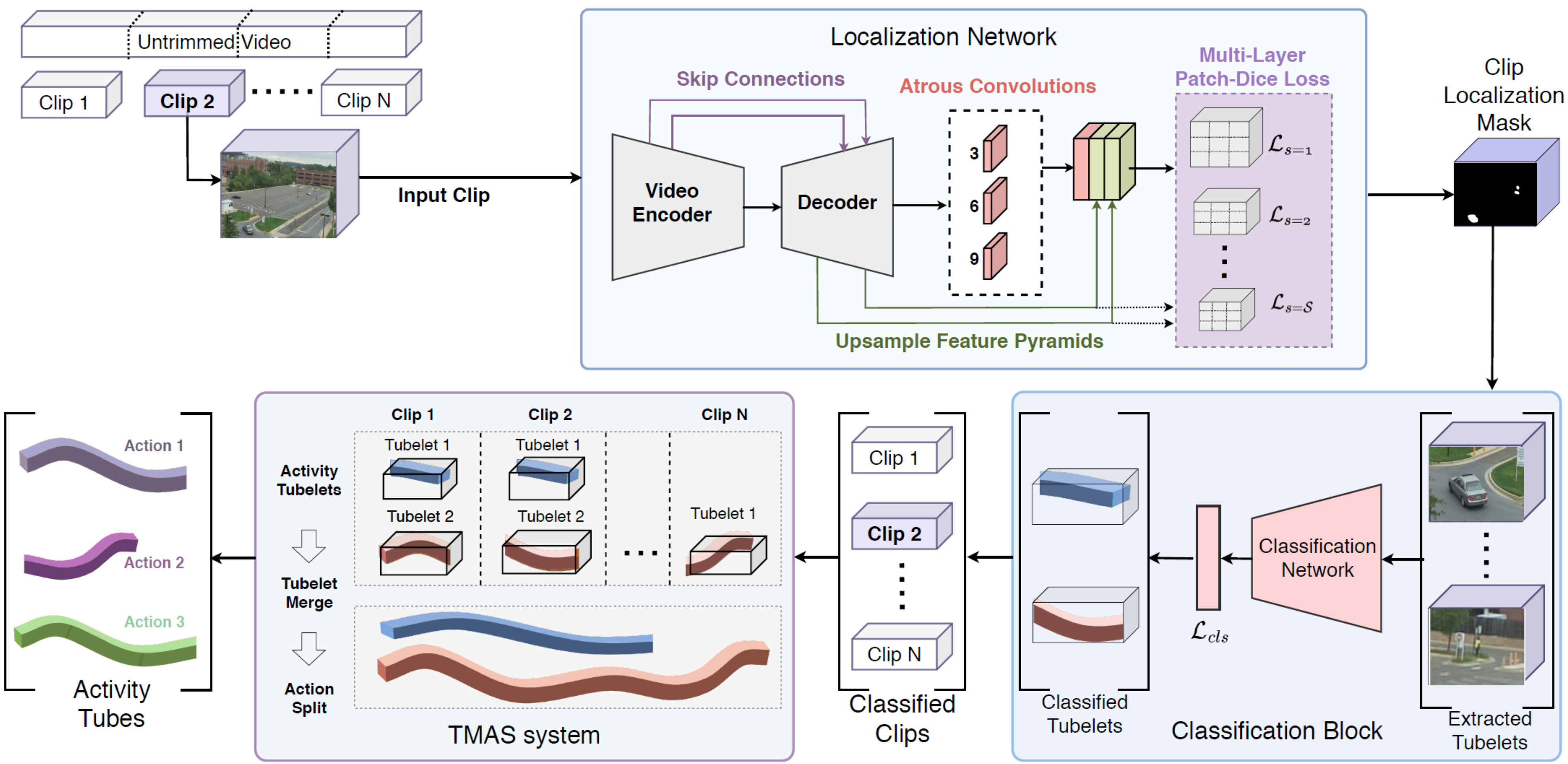
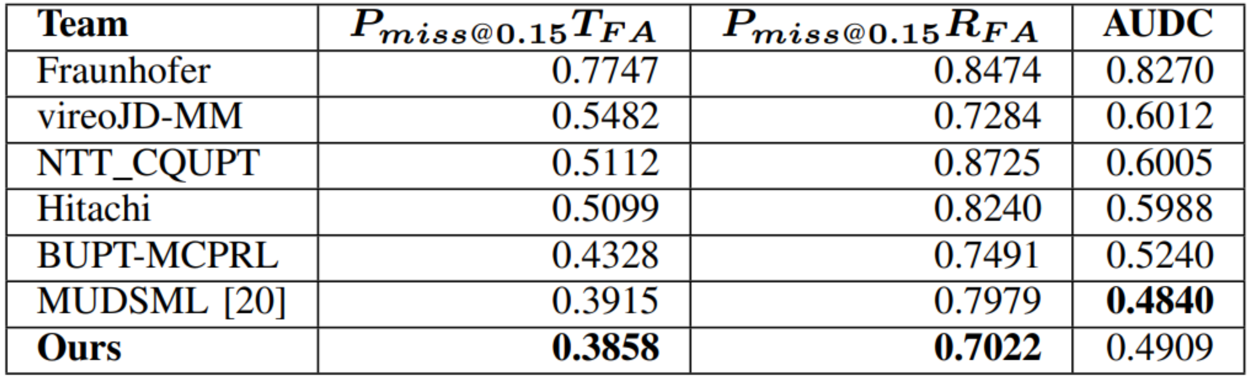


Datasets

- VIRAT [1]
  - 64 (2.47 hours) videos for training
  - 54 videos (1.93 hours) for validation
  - 40 activities
- MEVA [2]
  - 1056 videos (88 hours)
  - 37 activities

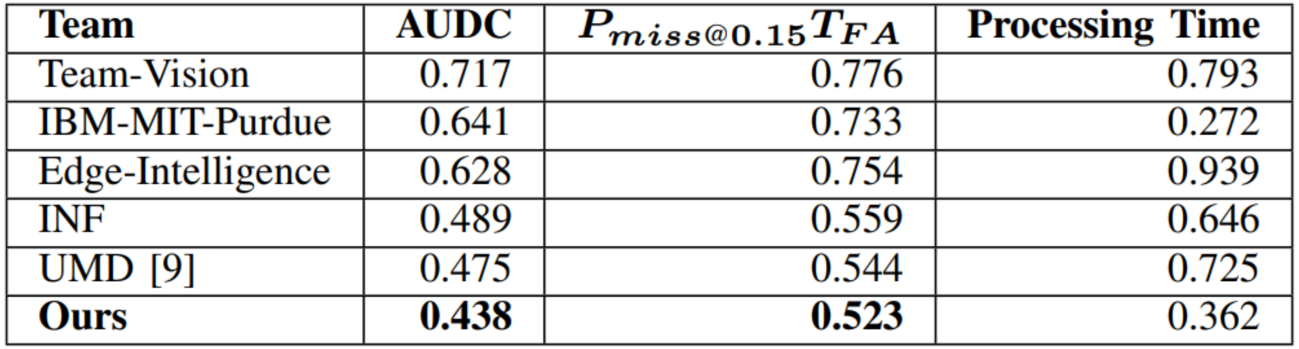
[1] Oh et al. "A Large-scale Benchmark Dataset for Event Recognition in Surveillance Video." In IEEE international conference on computer vision. 2011.
[2] Kitware inc, the multiview extended video with activities (meva) dataset.

Quantitative Results (VIRAT Dataset)

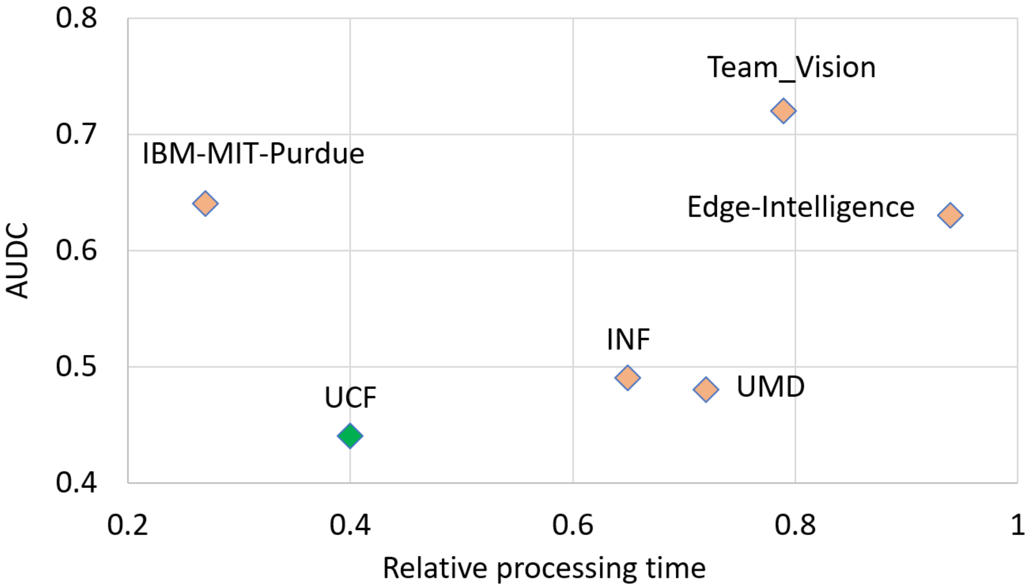


Team	$P_{miss@0.15}T_{FA}$	$P_{miss@0.15}R_{FA}$	**AUDC**
Fraunhofer	0.7747	0.8474	0.8270
vireoJD-MM	0.5482	0.7284	0.6012
NTT_CQUPT	0.5112	0.8725	0.6005
Hitachi	0.5099	0.8240	0.5988
BUPT-MCPRL	0.4328	0.7491	0.5240
MUDSML [20]	0.3915	0.7979	**0.4840**
Ours	**0.3858**	**0.7022**	0.4909

Quantitative Results (MEVA Dataset)

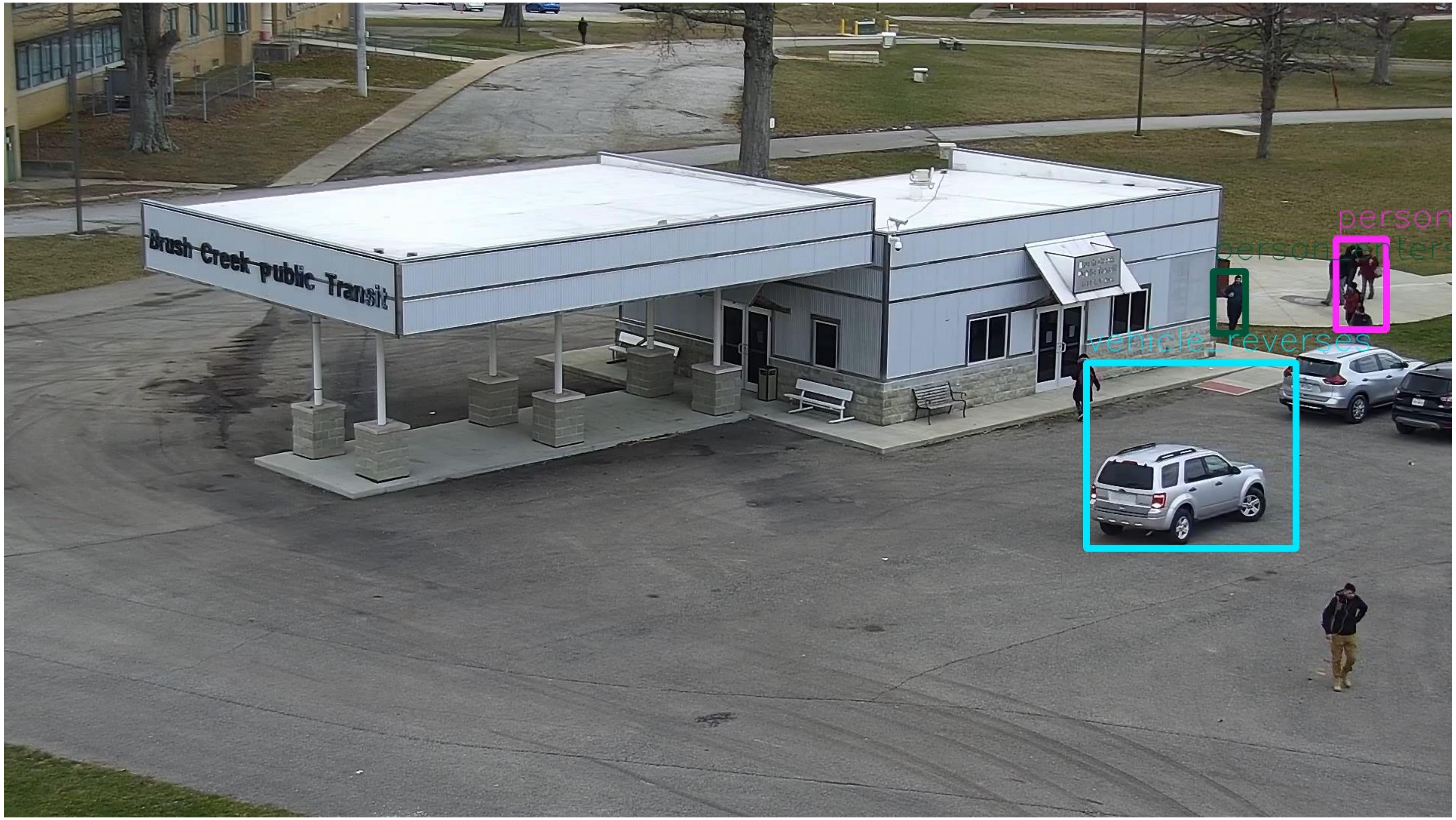


Team	AUDC	$P_{miss@0.15}T_{FA}$	Processing Time
Team-Vision	0.717	0.776	0.793
IBM-MIT-Purdue	0.641	0.733	0.272
Edge-Intelligence	0.628	0.754	0.939
INF	0.489	0.559	0.646
UMD [9]	0.475	0.544	0.725
Ours	**0.438**	**0.523**	0.362



Qualitative Results (Localization)

Qualitative Results



Thank You

Project Page:
https://tinyurl.com/y6gv8dpl