TRECVID 2022 Activities in Extended Video (ActEV)

Dynamic Interactive Aggregation Network for TRECVID'22 ActEV Task

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Introduction

- In this paper, we present our solutions for the Activities in Extended Video (ActEV) in TRECVID 2022.
- The integration of different types of interaction is beneficial for capturing higher level spatial-temporal features.
- We adopt a Dynamic Interactive Aggregation Network (DIAN) (i.e., AIA [1]), which attempts to (1) integrates different interactive relationships through intensive series connection, and (2) dynamically updates memory features through iterative self-learning.

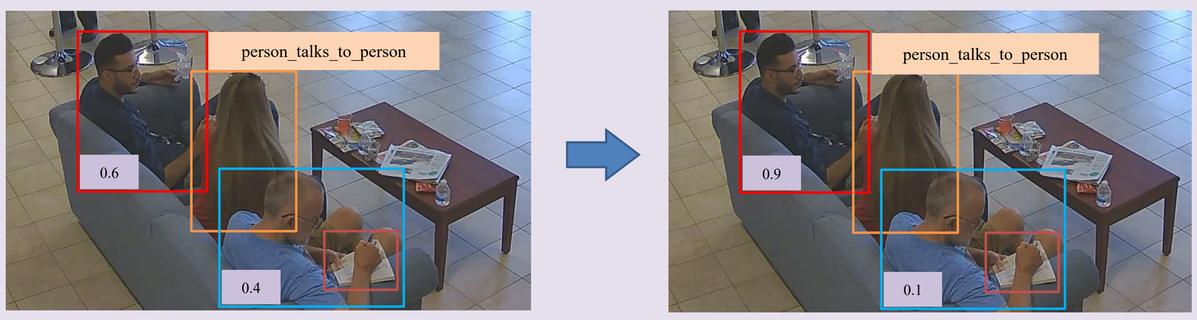


Figure 1: The motivation of the Dynamic Interactive Aggregation Network (DIAN)

Framework

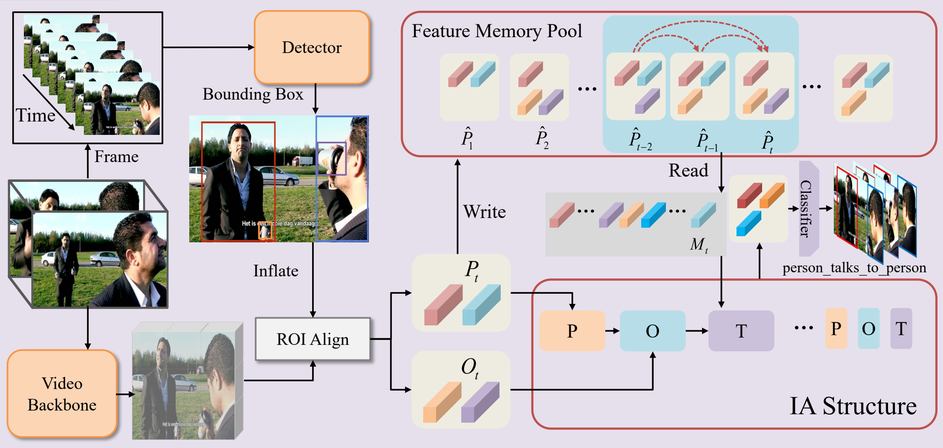
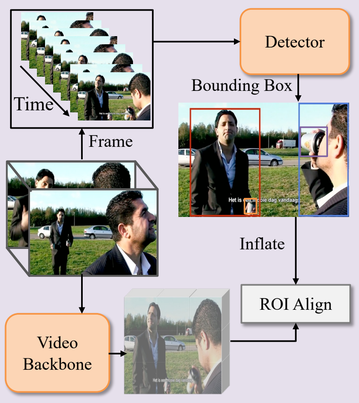


Figure 2: The framework of DIAN

The DIAN contains of (a) Interactive aggregation module: Person features, object features and memory features from the feature pool Ω in c are fed to IA in order to integrate multiple interactions. The output of IA is passed to the final classifier for predictions; (b) Iterative memory update module: read memory features from feature pool and writes fresh person features to it.

Video encoder



- Given an input video V, N frames $\{f_i\}_{i=1}^{N}$ and clips $\{c_i\}_{i=1}^{N}$ are uniformly sampled where each clip v_i consists of consecutive frames around each sampled frame f_i.
- We use Faster-RCNN[1], SlowFast[2] as video encoder to generate iteration features $\mathrm{P}^t, \mathrm{O}^t$

Interactive aggregation module

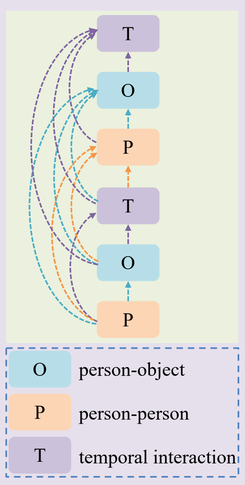
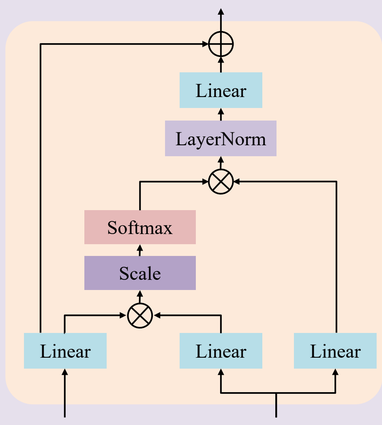


Figure 4: The structure of visual encoder

- In Dense Serial IA, each interaction block takes all the outputs of previous blocks and aggregates them using a learnable weight. Formally, the query of the i^{th} block can be represented as

$$Q_{t,i} = \sum_{j \in \mathbf{C}} W_j \odot E_{t,j}$$

Iterative memory update module



READ: At the beginning of each iteration, given a video clip $V_i^{(t)}$ of the i^{th} video, the memory features are read from the memory pool Ω, which is $[\hat{P}_{\mathrm{t-L}}^{(i)}, \dots, \hat{P}_{\mathrm{t-1}}^{(i)}]$.

WRITE: At the end of each iteration, personal features for the target clip $\mathrm{P}_t^{(i)}$ are written back to the memory pool Ω as estimated memory features $\widehat{P}_{\mathrm{t}}^{(i)}$, tagged with the current loss value.

Competition Results

Organization(s)	AOD mean Pmiss@0.1rfa	AOD mean nMODE@0.1rfa	AOD mean nAUDC@0.2rfa
Beijing University of Posts and Telecommunications	0.6309	0.0538	0.6705
UMD	0.8131	0.1620	0.8300
Ours	0.9921	0.0303	0.9922
Waseda University, Meimei University, SoftBank Corpotation	0.9961	0.1080	0.9964
M4D_team	-	-	-

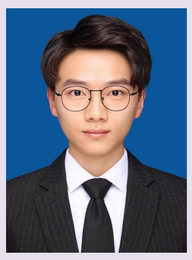
Organization(s)	AD mean Pmiss@0.1rfa	AD mean nAUDC@0.1rfa
Beijing University of Posts and Telecommunications	0.5805	0.6231
UMD	0.7789	0.7995
Ours	0.9728	0.9732
Waseda University, Meimei University, SoftBank Corpotation	0.9829	0.9850
M4D_team	0.9823	0.9819

- Our model ranks the **third** in the overall evaluation of Activities in Extended Video task. Among the five metrics, ours ranks the **first** in terms of AOD mean nMODE@0.1rfa on TRECVID 2022 ActEV task.

Conclusion

In this poster, we adopt a Dynamic Interactive Aggregation Network (DIAN), which integrates different types of interactions in the same segment in a dense serial manner to adjust the weights indicating the object relations. The memory features are dynamically updated to obtain long-term temporal interaction dependency by iterative self-learning. Experimental results on ActEV dataset show that our proposed model has excellent performance.

Member Introduction



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