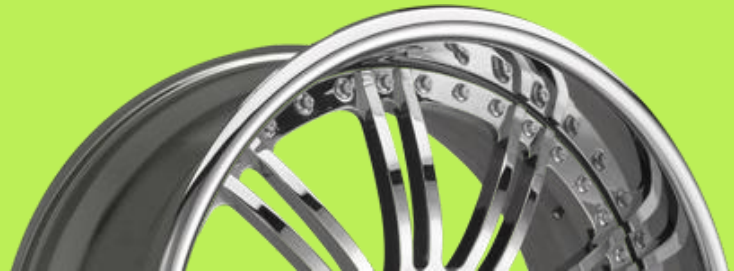
Multimodal Gesture Recognition Based on the ResC3D Network

Qiguang Miao Yunan Li Wanli Ouyang Zhenxin Ma Xin Xu Weikang Shi



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INTRODUCTION

ChaLearn LAP IsoGD

- large-scale
- video-based

C3D model

- 3D ConvNets
- spatiotemporal feature learning
- Auto feature extraction

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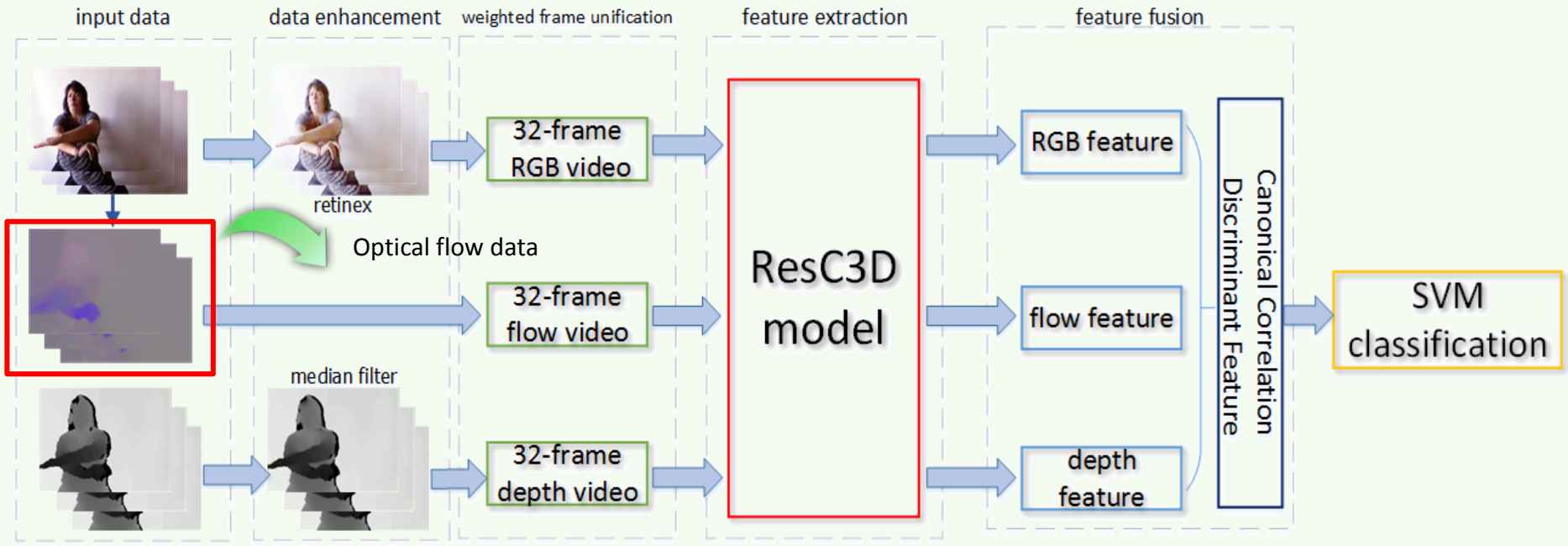
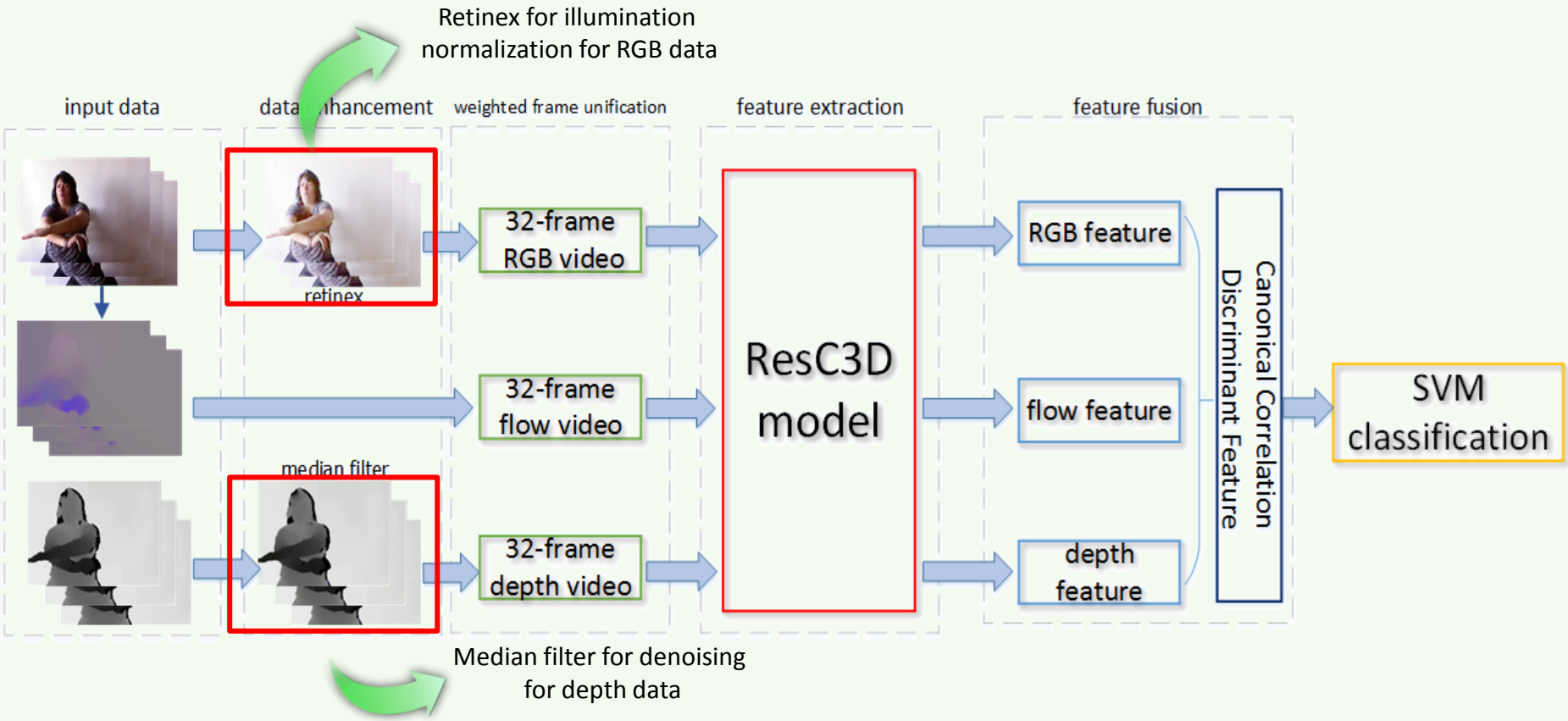
Our Scheme



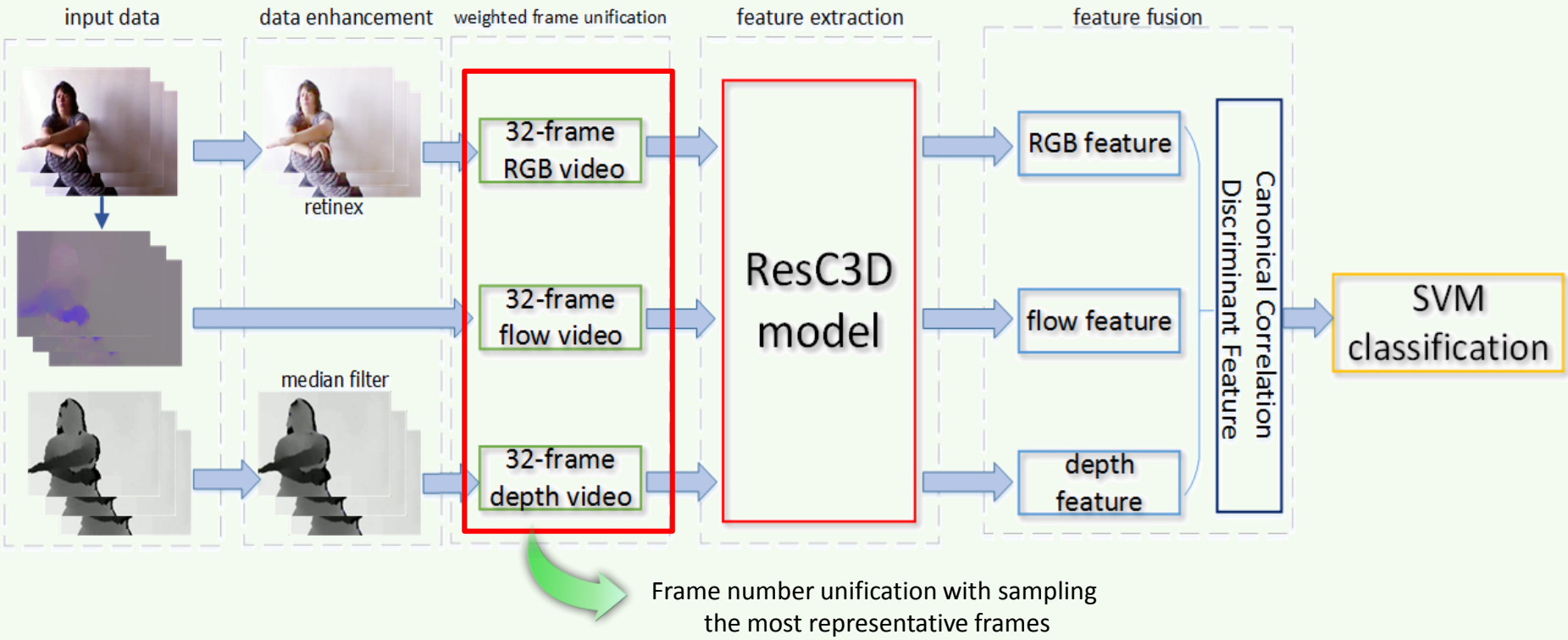
- ✓ Generating optical flow data from the RGB one

Our Scheme



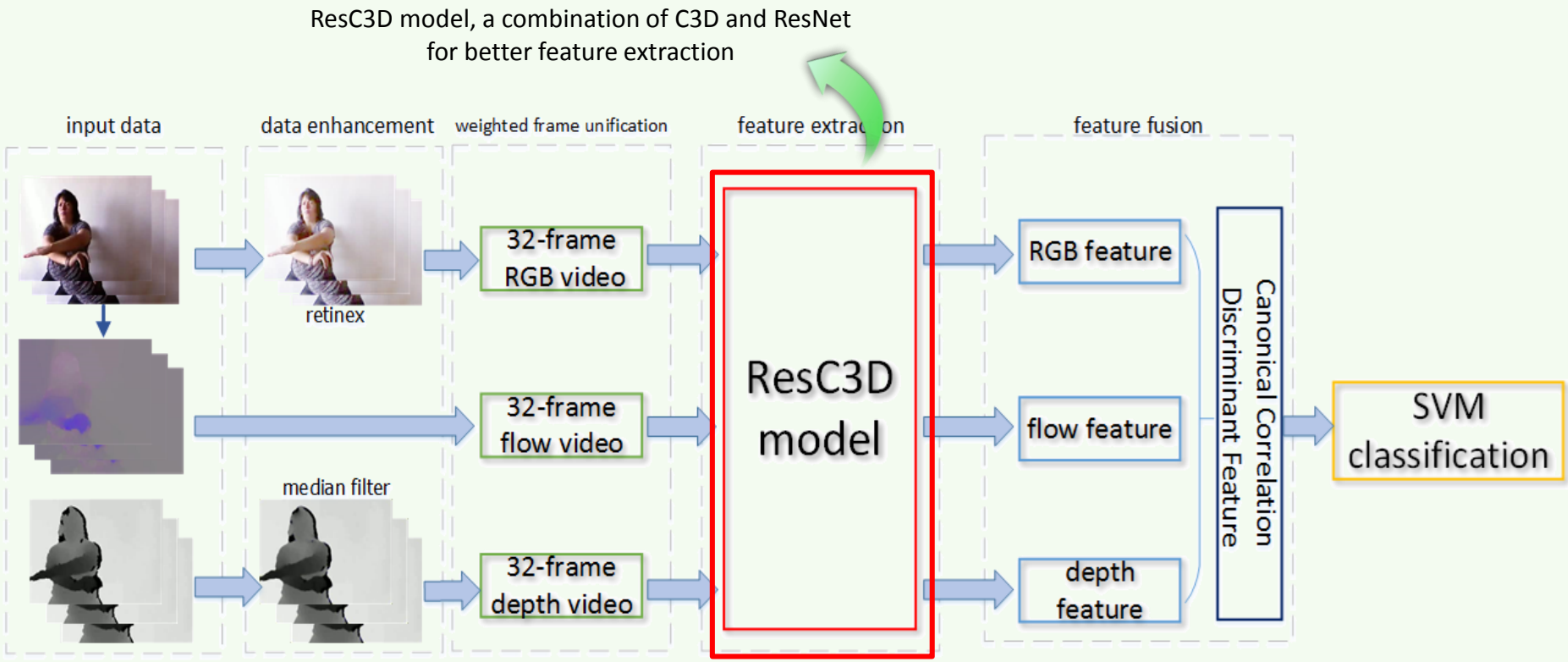
- ✓ Generating optical flow data from the RGB one
- ✓ Different strategies for video enhancement

Our Scheme



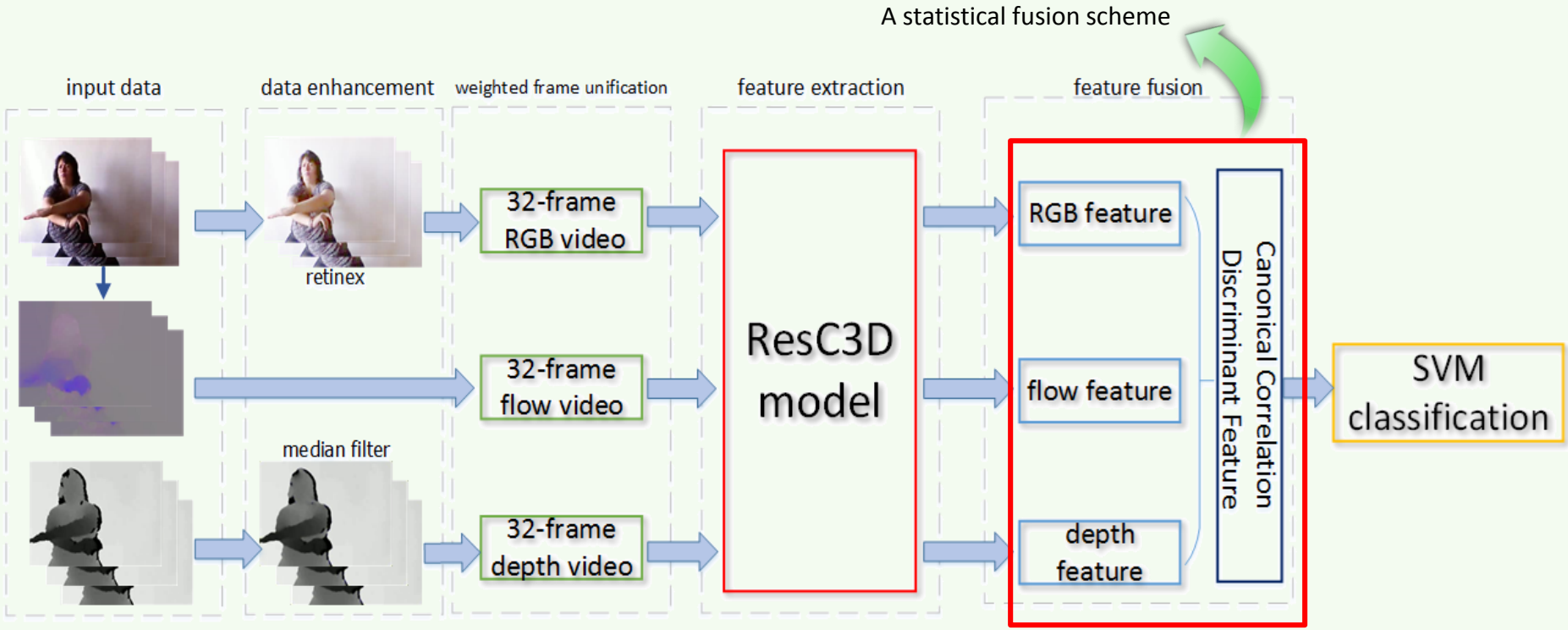
- ✓ Generating optical flow data from the RGB one
- ✓ Different strategies for video enhancement
- ✓ A weighted frame number unification strategy to sample the most representative frames

Our Scheme



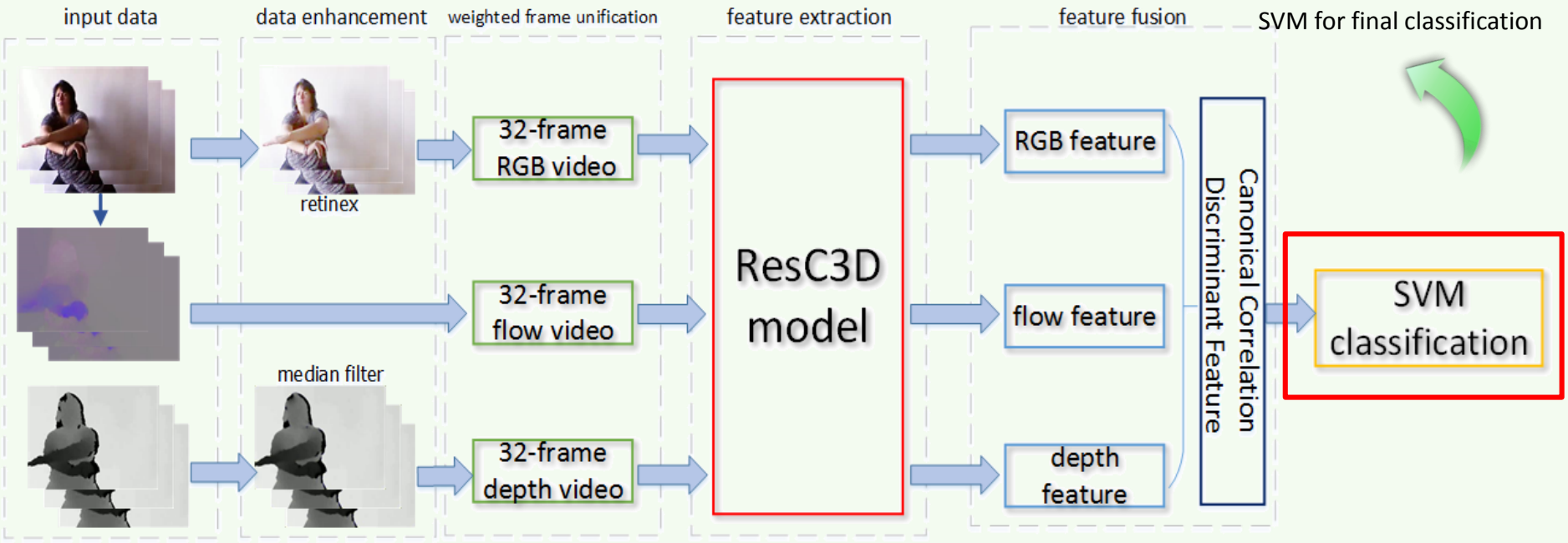
- ✓ Generating optical flow data from the RGB one
- ✓ Different strategies for video enhancement
- ✓ A weighted frame number unification strategy to sample the most representative frames
- ✓ A ResC3D model for feature extraction

Our Scheme



- ✓ Generating optical flow data from the RGB one
- ✓ Different strategies for video enhancement
- ✓ A weighted frame number unification strategy to sample the most representative frames
- ✓ A ResC3D model for feature extraction
- ✓ Using Canonical Correlation Analysis for feature fusion

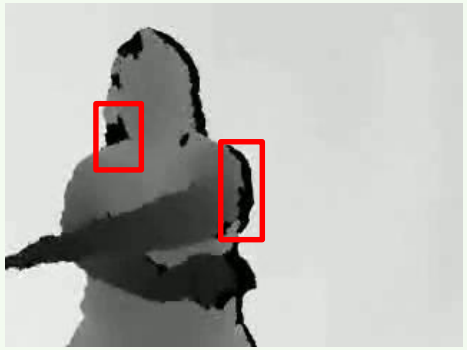
Our Scheme



- ✓ Generating optical flow data from the RGB one
- ✓ Different strategies for video enhancement
- ✓ A weighted frame number unification strategy to sample the most representative frames
- ✓ A ResC3D model for feature extraction
- ✓ Using Canonical Correlation Analysis for feature fusion
- ✓ SVM classifier for the final score

A. Data enhancement

RGB data
Suffering from different illumination condition



depth data
The noise exists around the edges

A. Data enhancment

- The results of enhancement with Retinex

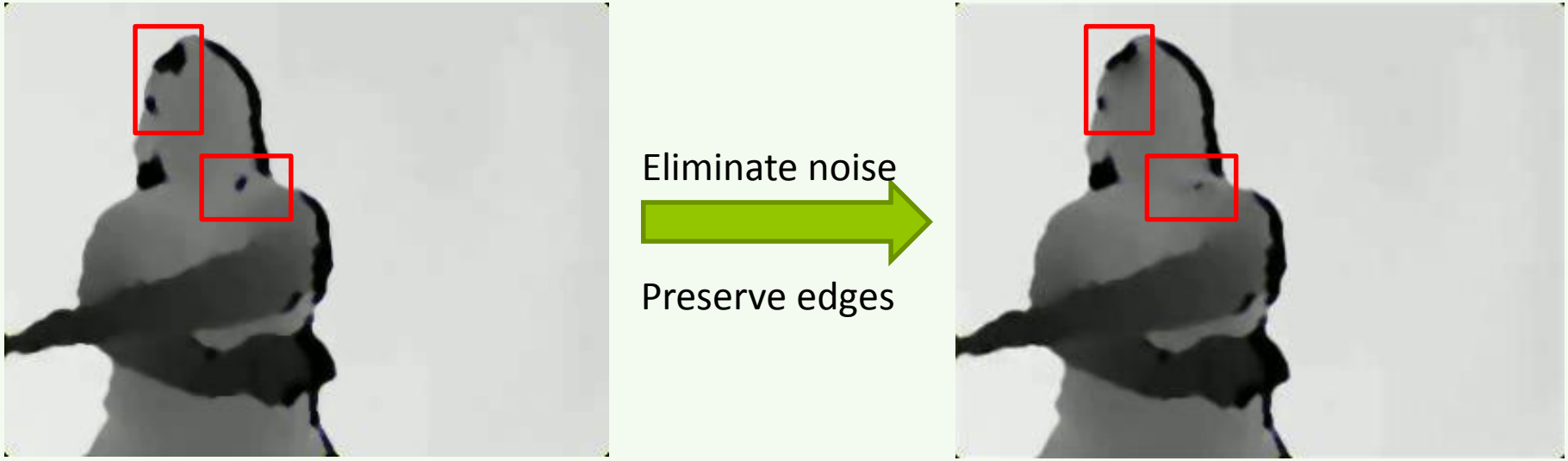




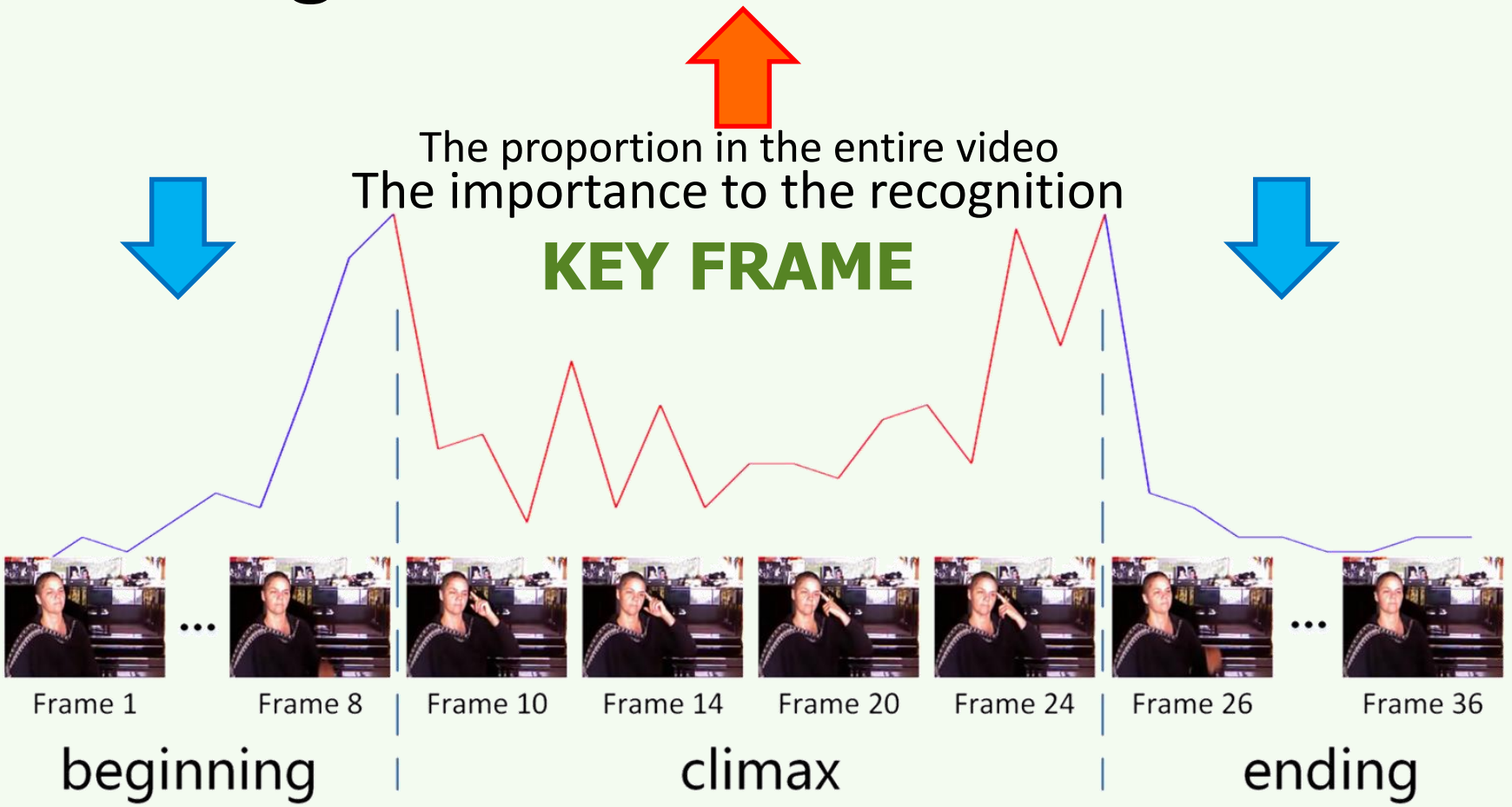



A. Data enhancment

- Denoising with median filter



B. Weighted frame unification

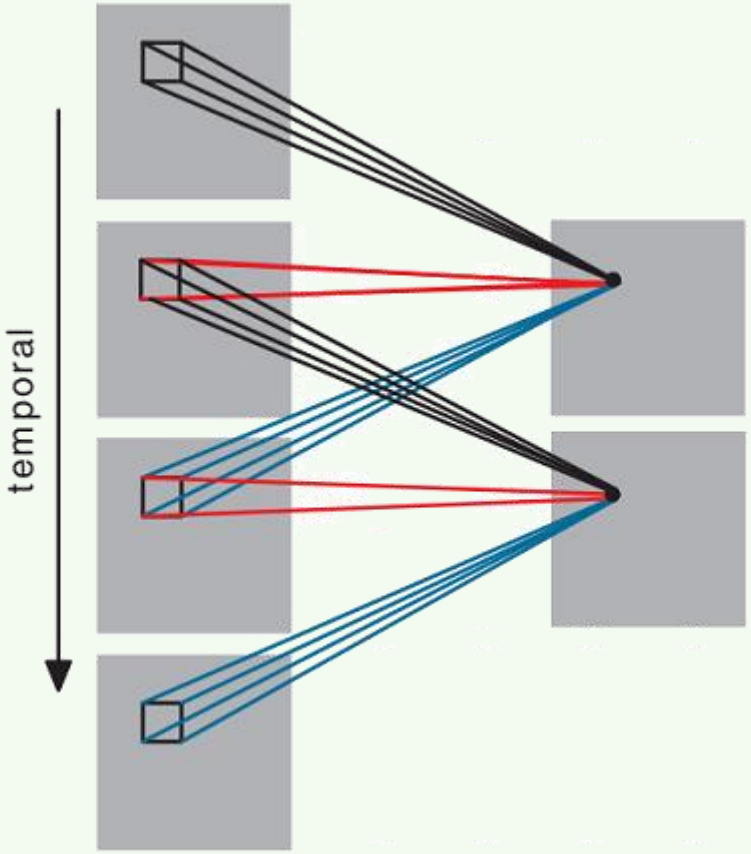


B. Weighted frame unification

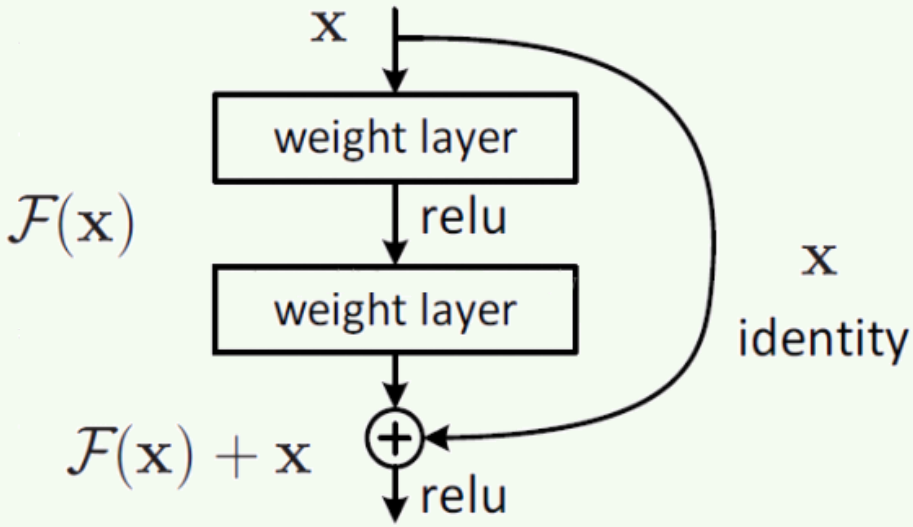
- Key frame
  - Divide the video into *n* sections
  - Calculate the average optical flow for each section
  - The frame numbers of each section are calculated by the proportion of optical flow value of the section and the whole video

Our Scheme

C. Feature extraction



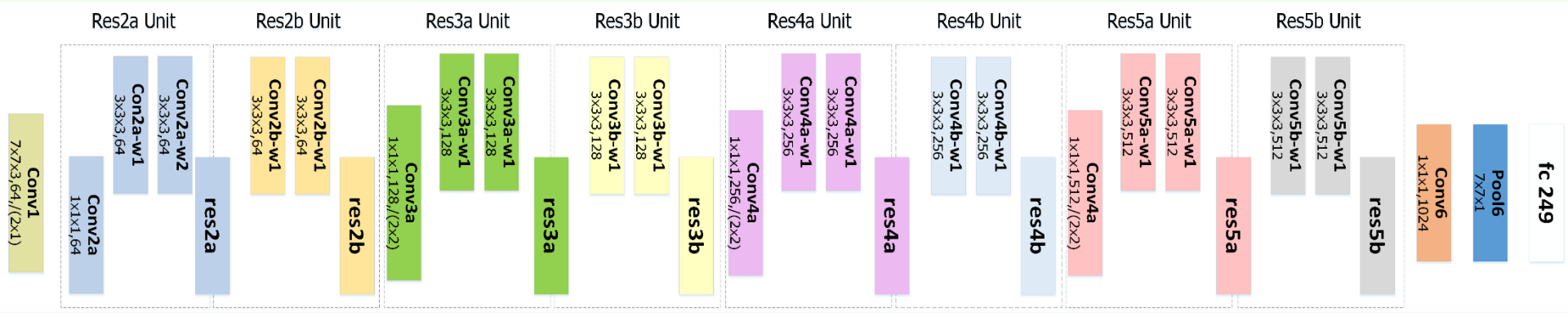
C3D



ResNet

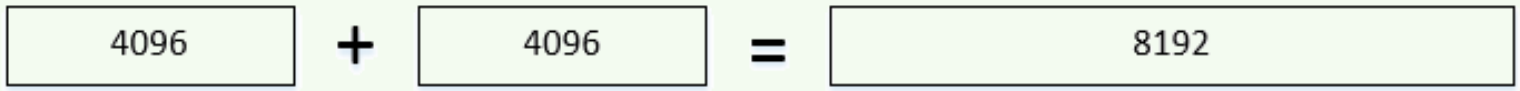
Our Scheme

C. Feature extraction



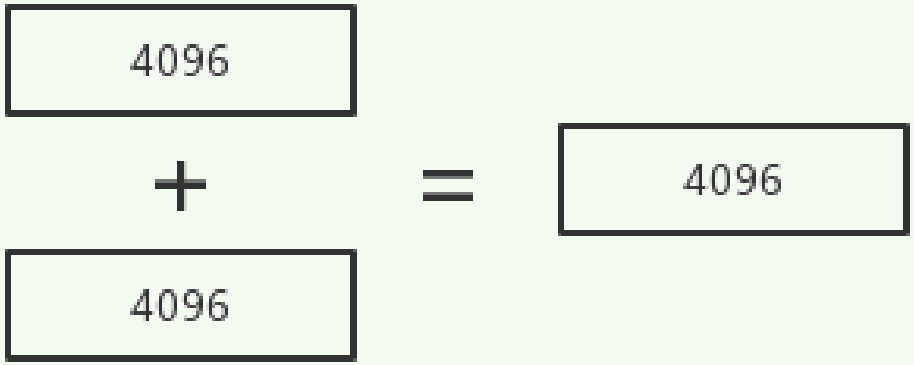
D. Feature fusion

- Traditional methods
  - Parallel (averaging)



D. Feature fusion

- Traditional methods
  - Parallel (averaging)
  - Serial (concatenating)



D. Feature fusion

- Canonical Correlation Analysis
  - a way of inferring information from cross-covariance matrices
  - CCA tries to maximize the pair-wise correlations across features with different modalities.

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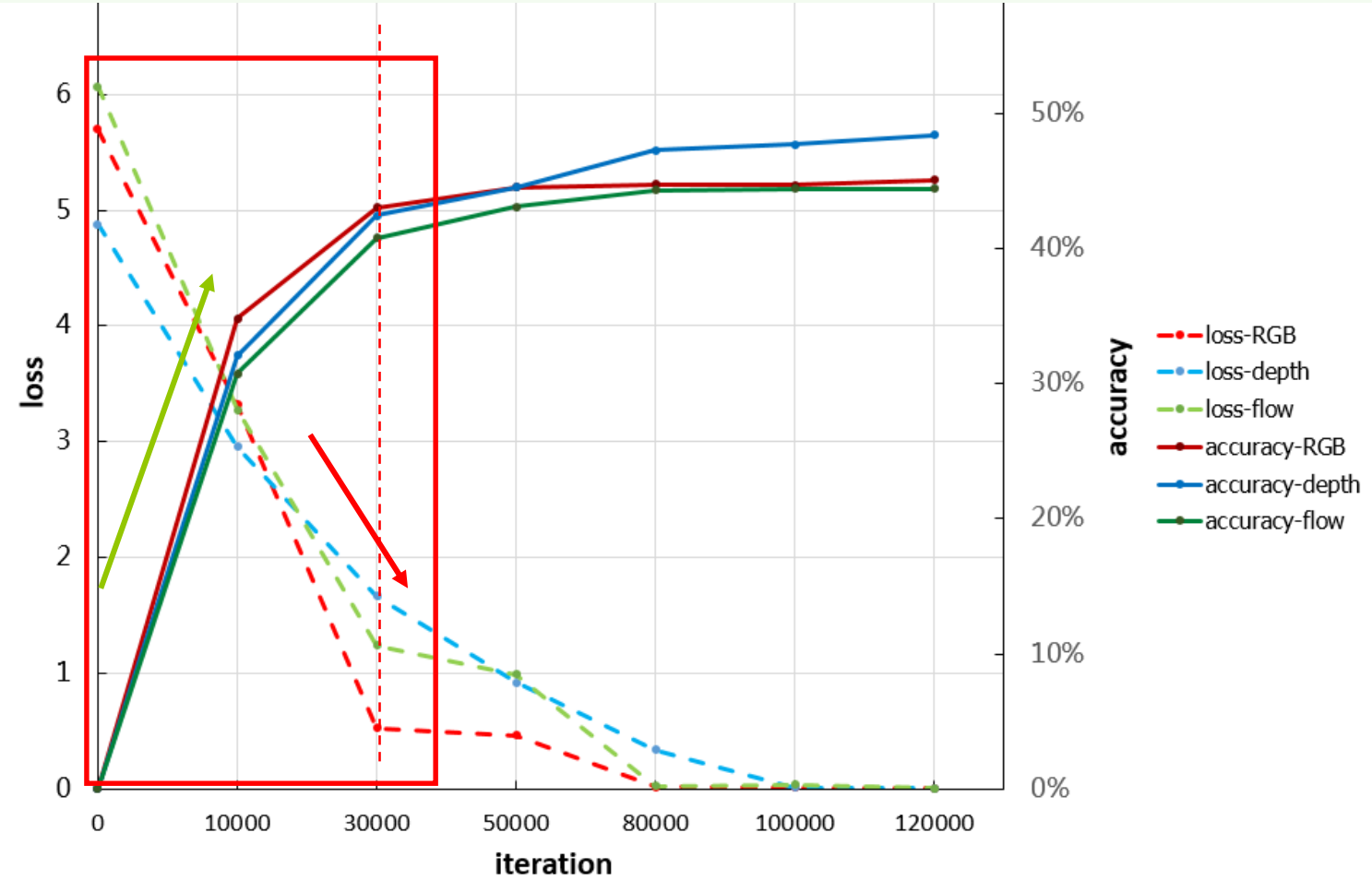
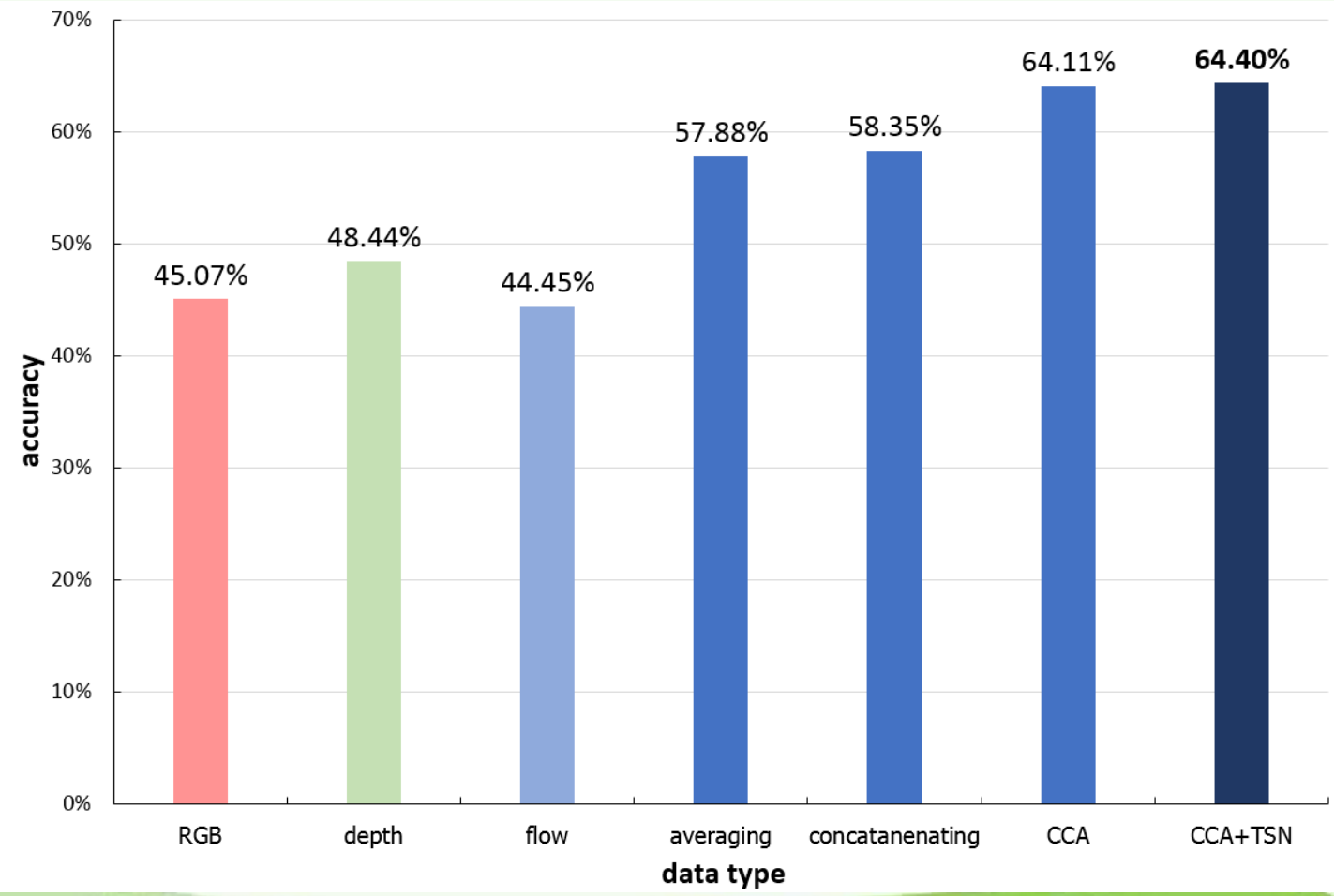
EXPERIMENTAL RESULTS

Iteration Times



EXPERIMENTAL RESULTS

Fusion



EXPERIMENTAL RESULTS

Comparison

Method	Accuracy
MFSK+BoVW [34]	18.65%
SFAM (Multi-score Fusion) [37]	36.27%
CNN+depth maps [38]	39.23%
Pyramidal C3D [45]	45.02%
2SCVN+3DDSN [5]	49.17%
32-frame C3D [19]	49.20%
C3D+LSTM [46]	51.02%
proposed method	**64.40 %**

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EXPERIMENTAL RESULTS

Comparison

Team	Accuracy (validation)	Accuracy (testing)
baseline [5]	49.17%	67.26 %
XDETVP	58.00%	60.47%
AMRL	60.81%	65.59%
Lostoy	62.02%	65.97%
SYSU_ISEE	59.70%	67.02%
ASU (our)	**64.40 %**	**67.71 %**

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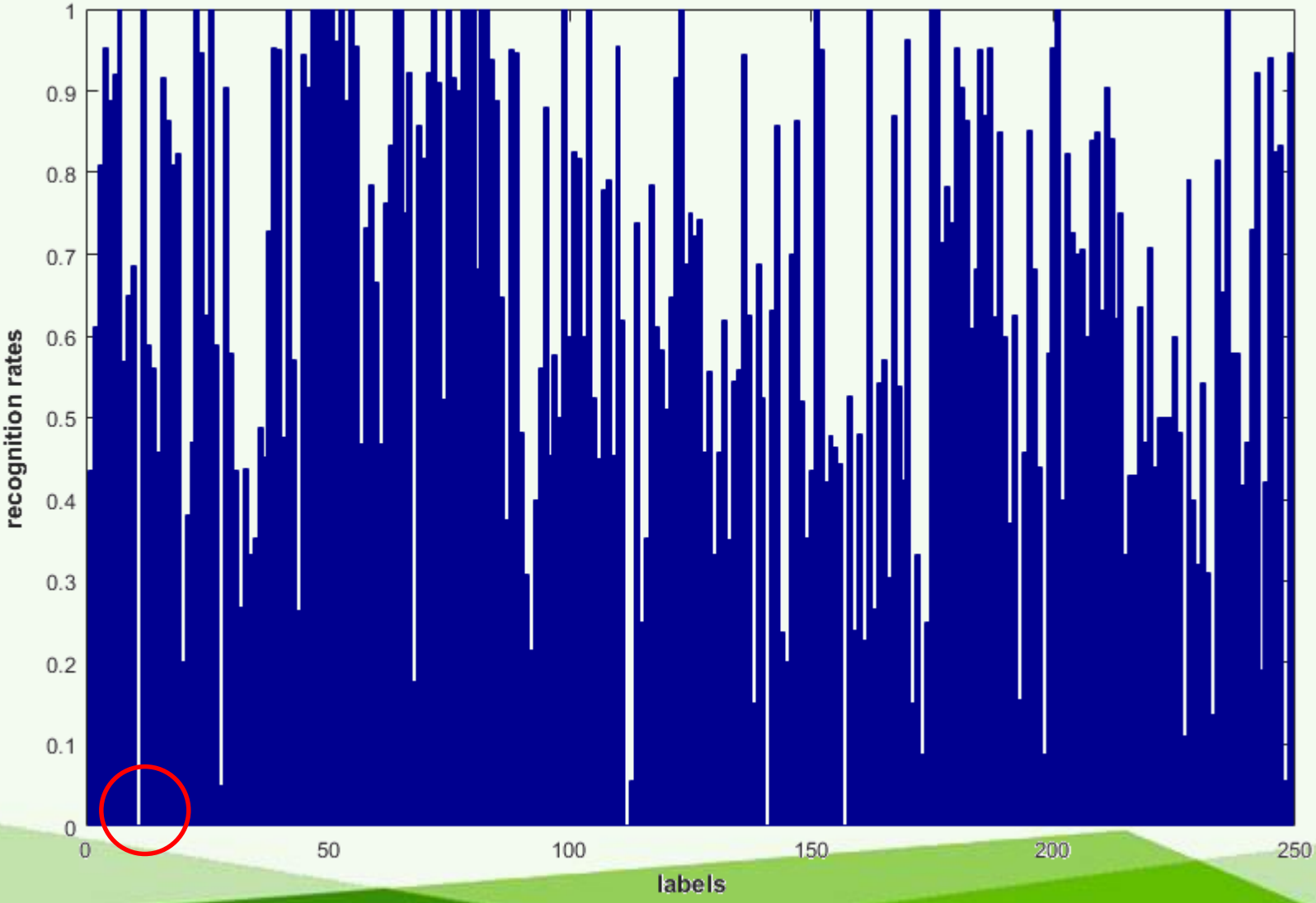
FUTURE WORK


recognition rates
labels
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
50
100
150
200
250

FUTURE WORK

Thank you !