A REAL-TIME MULTI-LABEL CLASSIFICATION SYSTEM FOR SHORT VIDEOS

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Problem

Everyday millions of short videos are generated and distributed by users with different interests and cultures. To accurately categorize the video contents in real time has become a practical and challenging demand in industry [1].

Moreover, short videos often have richer semantic information than the single-action clips. And depending on its content, a short video will be labelled with multiple labels from them. Therefore it's also referred to as a multi-label classification problem[2].

Contributions

We propose a new system to achieve both real-time and multi-label classification for short videos.

We develop three modules to improve the multi-label classification accuracy.

- An activation regulating layer is added before the output's sigmoid function, enhancing the CNN's discriminant ability for each label.

- A label imbalance-aware training loss is used to reduce the influence brought by the majority irrelevant labels.

- A label-correlated post-processing is involved to fuse the image-level results adaptively and exploit the label relationship for the multi-label video classification.

REAL-TIME MULTI-LABEL CLASSIFICATION SYSTEM

Activation Regulating layer

Label-correlated post-processing
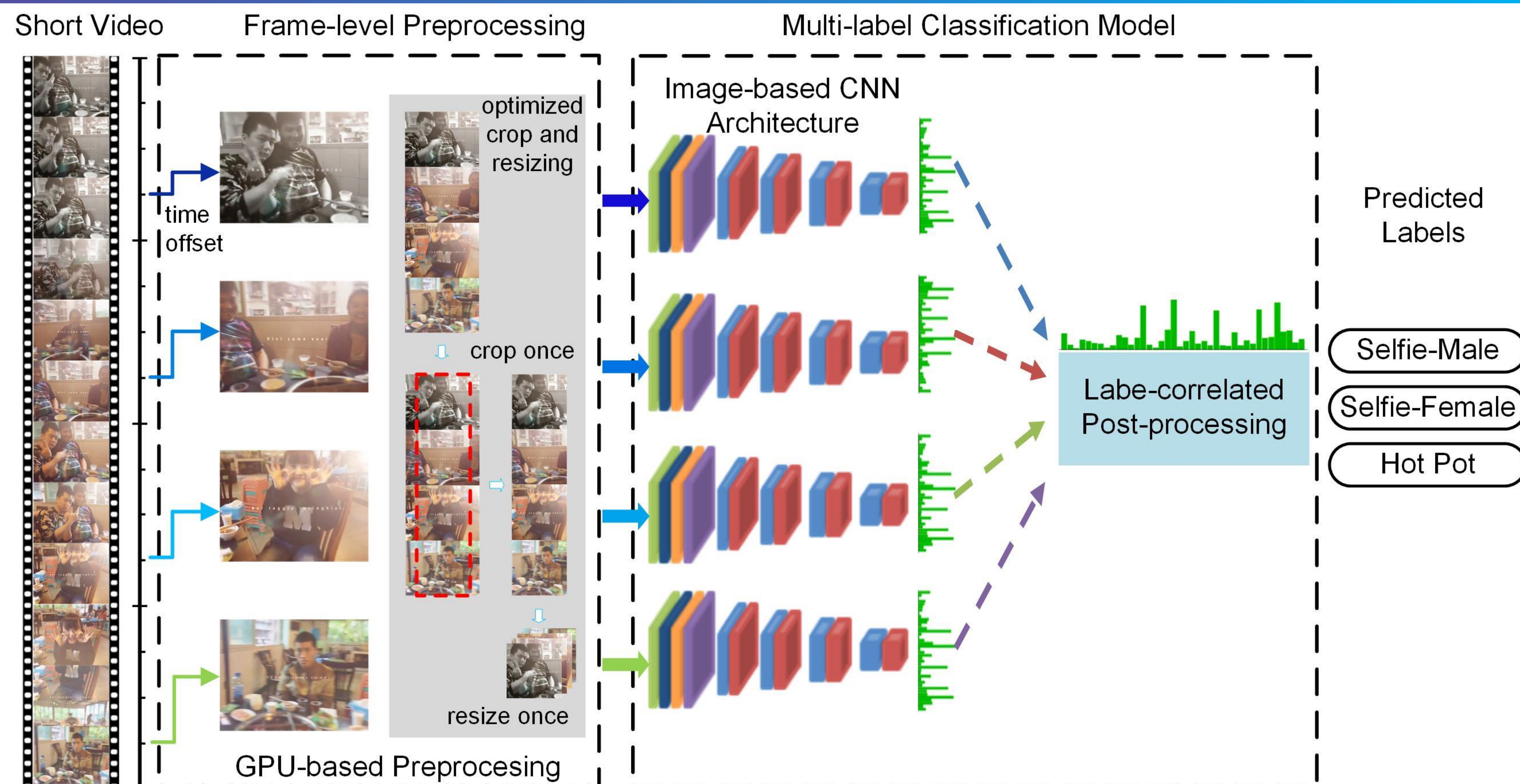
Label imbalance-aware training loss

◆ BCE Weighted Loss:

$$L_{aBCE}(X) = \frac{1}{|C|}\sum_{i=1}^{C}\omega_{Y,i}[y_i \log z_i + (1-y_i)\log(1-z_i)]$$

$$w_{Y,i} = \begin{cases} \dfrac{|C| - \sum_{i=1}^{C} Y_i}{\alpha \sum_{i=1}^{C} Y_i} &, \quad if \ Y_i == 1 \\ 1 &, \quad if \ Y_i == 0 \end{cases}$$
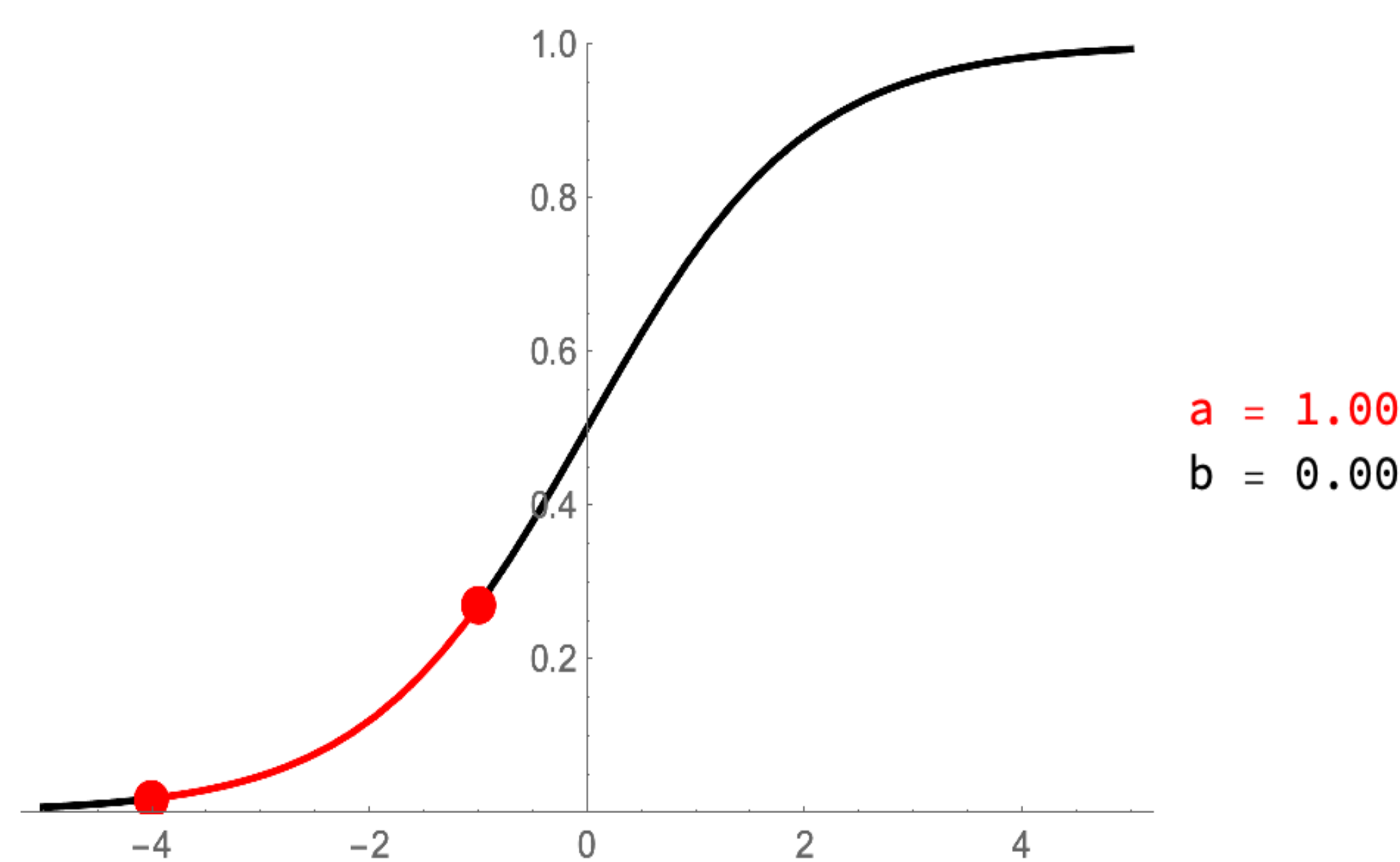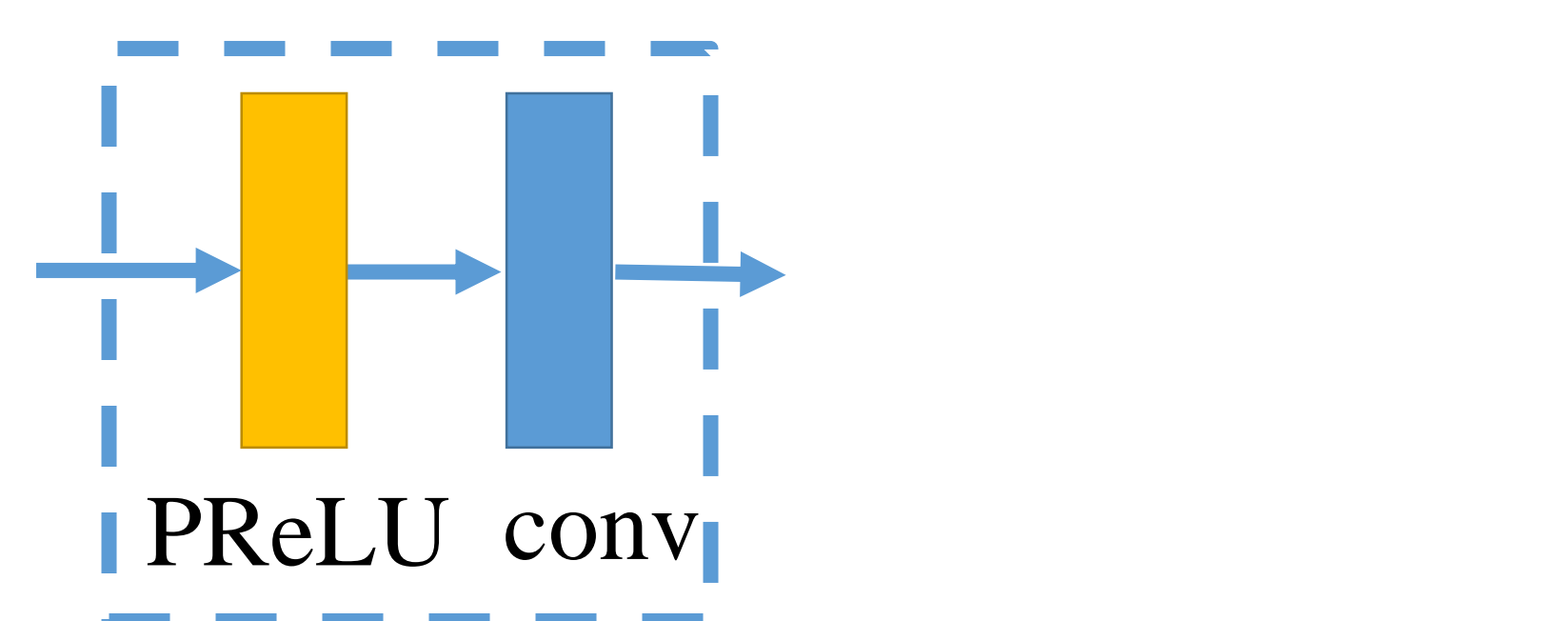
◆ Dice Loss:

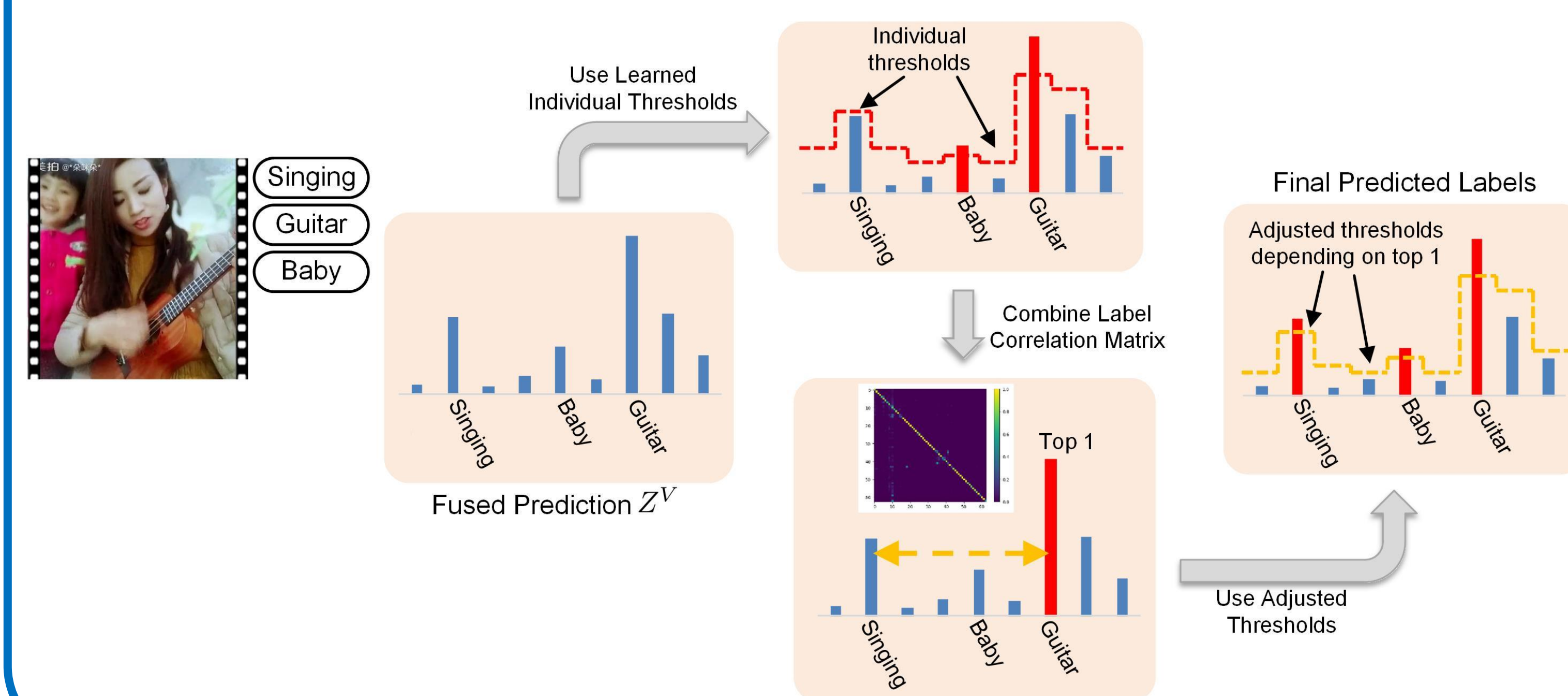$$L_{DC}(X) = -\frac{2\sum_{i=1}^{C} y_i z_i}{\sum_{i=1}^{C} y_i{}^2 + \sum_{i=1}^{C} z_i{}^2}$$

◆ Final Loss:

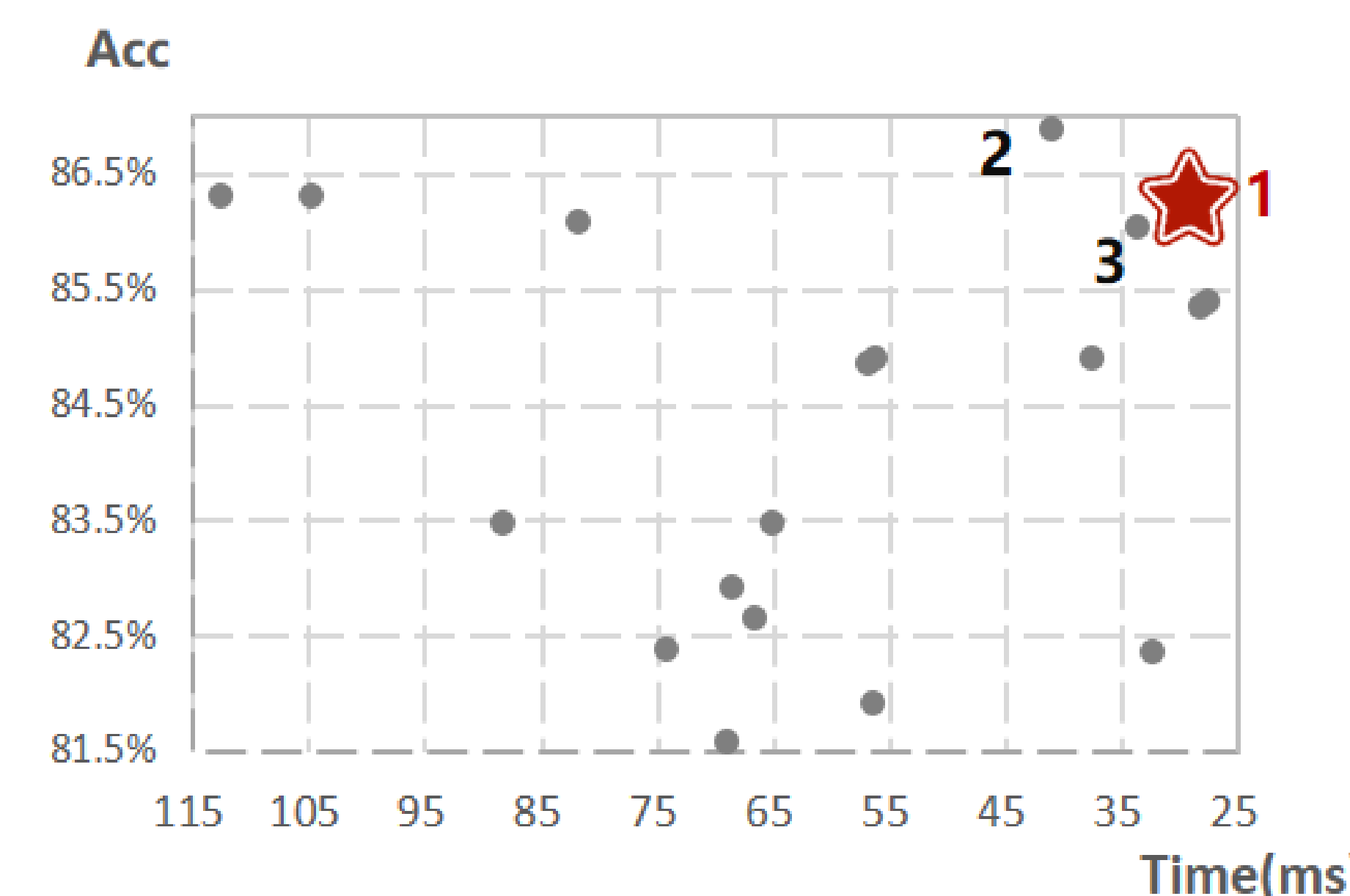$$L(X) = L_{aBCE}(X) + \lambda * L_{DC}(X)$$

Results

Acc=**86.2%**, Time=**29.7ms/Video**

Reference

[1] "Short video real-time classification," https://challenger.ai/competition/mlsv2018, accessed 15 January 2019.

[2] Min-Ling Zhang and Zhi-Hua Zhou, "A review on multi-label learning algorithms," IEEE transactions on knowledge and data engineering, vol. 26, no. 8, pp. 1819–1837, 2014.