

Attentive Hybrid Feature with Two-Step Fusion for Facial Expression Recognition

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- Attentive Region Module: aim to extract attentive hybrid features.
- Two-Step Fusion Module: aim to capture the correlations among different regions.
- A new end-to-end network, named Attentive Hybrid Architecture (AHA), aiming to extract attentive hybrid features.
- □ Two novel ways of constructing the structures
 - Employing separate feature losses to encourage high attention weights for the most important regions and a large margin cosine loss for discriminative features in the whole network.
 - Introducing a two-step fusion strategy to capture the hidden relations among different face regions.



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State-of-the-art performance on RAF-DB, SFEW 2.0, FER-2013 and CK+ datasets

TABLE I

THE ANALYSIS OF ATTENTIVE REGION MODULE ON RAF-DB AND SFEW 2.0. GLOBAL(G), LOCAL(L), MIXTURE FEATURE(M), SPATIAL ATTENTION(A), SOFTMAX LOSS(S) AND COSFACE LOSS(C).

Branch	RAF-DB		SFEW 2.0	
	S	С	S	С
G	88.01	88.17	54.04	55.43
G+A	88.17	88.23	54.27	56.81
G+L	88.1	88.49	55.2	57.74
G+L+A	88.14	88.53	55.89	57.27
G+L+M	88.72	88.92	57.27	58.20
G+L+M+A	88.85	88.98	58.2	58.89

TABLE II The analysis of two-step fusion modules on RAF-DB and SFEW 2.0. Simple full feature concatenation(concat) and two-step fusion(two-step).

Network	RAF-DB		SFEW 2.0	
	concat	two-step	concat	two-step
G+C+A	87.84	88.23	56.35	56.81
G+L+C+A	87.91	88.53	56.58	57.27
G+L+M+C+A	88.27	88.98	56.81	58.89

TABLE III THE COMPARISONS ON RAF-DB, SFEW 2.0, FER-2013 AND CK+.

Model	RAF	SFEW 2.0	FER-2013	CK+
DLP-CNN [24]	74.2	51.05	1	95.78
LTNET [28]	86.77	58.29		92.45
Conv. Pooling [3]	87.0	58.14	-	-
DAM-CNN [4]	÷	42.3	66.2	95.88
Shao et al. [5]	-	-	71.14	95.29
Gan et al. [6]	86.31	55.73	73.73	
ACNNs [10]	85.07	52.59		97.03
RAN [33]	86.90	56.4	5 .	-
Our Model	88.98	58.89	73.84	97.86



Visualizations of the attention maps generated on RAF-DB



Fig. 5. Visualization of the attention maps generated on the RAF-DB.