Effective Context Modeling Framework for Emotion Recognition in Conversations

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Challenges & Proposals

Existing SOTA methods are GNN-based, which:

- Rely on **fixed window size** ➡ "Multi-scale" GNNs (IGM).
- Assume **pairwise relationships** ➡ Hypergraph Module.
- Use **naive pooling mechanism** on fine-grained features.

  ➡ Perform cross-attention to fuse representations:

$$\mathrm{CA}_i^{\tau \to t} = \mathrm{Softmax}\left(\frac{(\mathbf{W}_Q \mathbf{f}_i^{\tau})^\top (\mathbf{W}_K \mathbf{f}_i^{t})}{\sqrt{d_h}}\right)\mathbf{W}_V \mathbf{f}_i^{t}$$

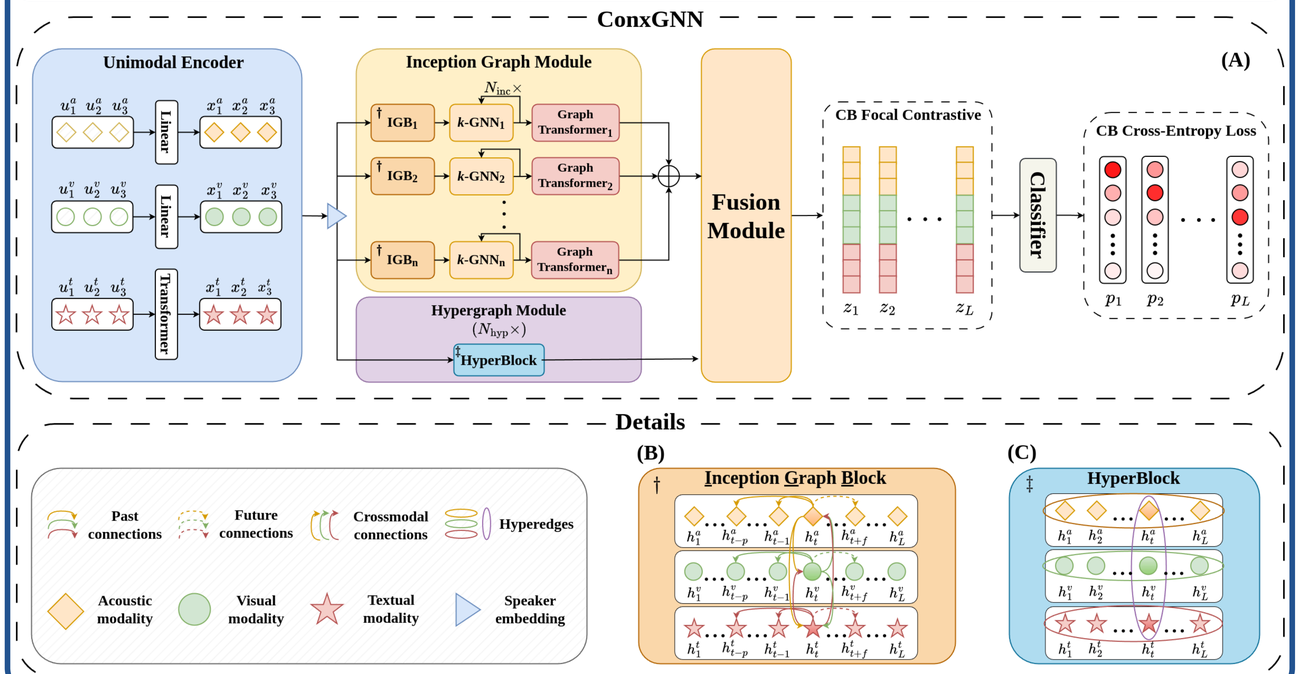
$$\hat{\mathbf{f}}_i^{t} = \mathbf{f}_i^{t} + \mathrm{CA}_i^{v \to t} + \mathrm{CA}_i^{a \to t}$$

- Overlook the issue of **class imbalance.**

  ➡ Inject a weighting factor to loss functions.

$$w_c(i) = (1-\beta)/(1-\beta^{n_i}); \quad \beta \in [0,1)$$

Methodology



Experimental Results

Main results. ConxGNN outperforms SOTA methods in MELD and IEMOCAP

	Method	Network	Acc (%)	w-F1 (%)
IEMOCAP	DialogueGCN [6]	GNN-based	55.29	55.16
	DialogueRNN [5]	Non-GNN	57.22	55.29
	ICON [3]	Non-GNN	63.10	63.8
	COGMEN [23]	GNN-based	64.02	63.78
	CORECT [9]	GNN-based	66.20	66.39
	ConxGNN *(ours)*	GNN-based	**68.52**	**68.64**
MELD	DialogueGCN [6]	GNN-based	42.75	41.67
	DialogueRNN [5]	Non-GNN	61.88	61.63
	MM-DFN [24]	GNN-based	66.09	64.16
	M^3Net [25]	GNN-based	65.75	65.00
	ConxGNN *(ours)*	GNN-based	**66.28**	**65.69**

Ablation Studies. Components Analysis

Method	IEMOCAP		MELD	
	Acc (%)	w-F1 (%)	Acc (%)	w-F1 (%)
ConxGNN	**68.52**	**68.64**	**66.28**	**65.69**
– w/o IGM	38.48	25.68	50.84	40.21
– w/o HM	64.06	63.92	65.11	64.87
– w/o crossmodal	64.21	64.31	66.15	65.69
– w/o re-weight	63.13	63.90	65.30	65.10

Ablation Studies. Impact of Inception Graph Module with different number of branches

# Blocks	IEMOCAP		MELD	
	Acc (%)	w-F1 (%)	Acc (%)	w-F1 (%)
1	65.27	65.34	64.36	62.61
	65.29	65.31	64.27	62.65
	65.37	**65.55**	**64.70**	**62.86**
2	66.30	66.64	65.34	63.49
	66.02	65.88	65.40	63.44
	66.74	**66.91**	**65.81**	**63.88**
3	**68.52**	**68.64**	**66.28**	**65.69**