Artificial

MuCDN: Mutual Conversational Detachment Network for Emotion Recognition in Multi-Party Conversations

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Code： https://github.com/circle-hit/MuCDN

2023.3.23 • ChongQing

COLING 2022

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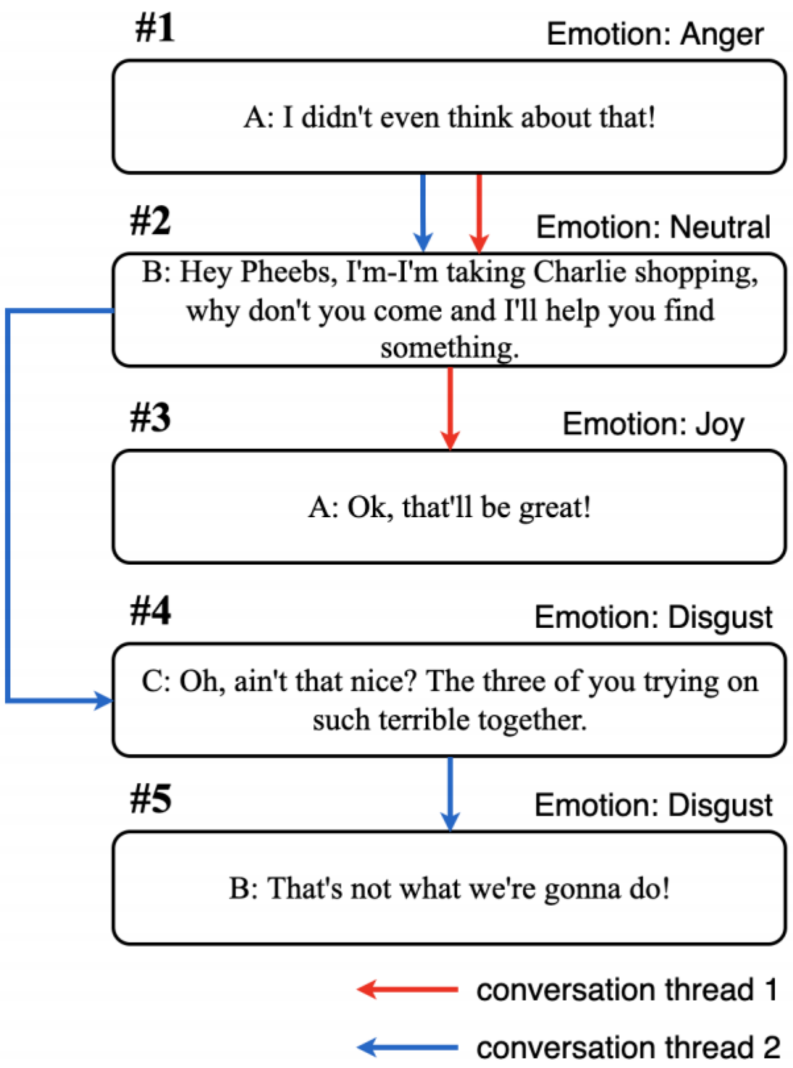
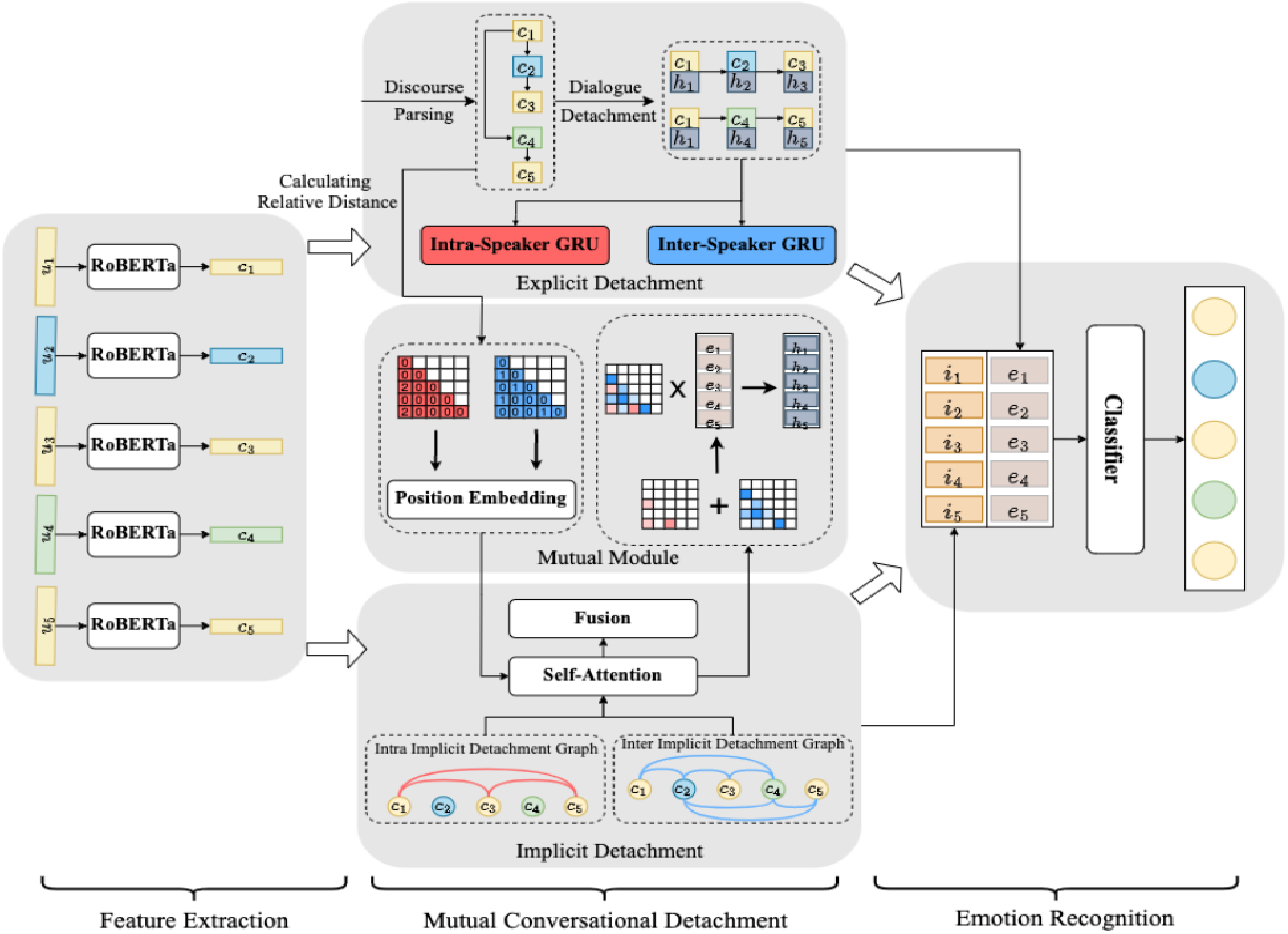
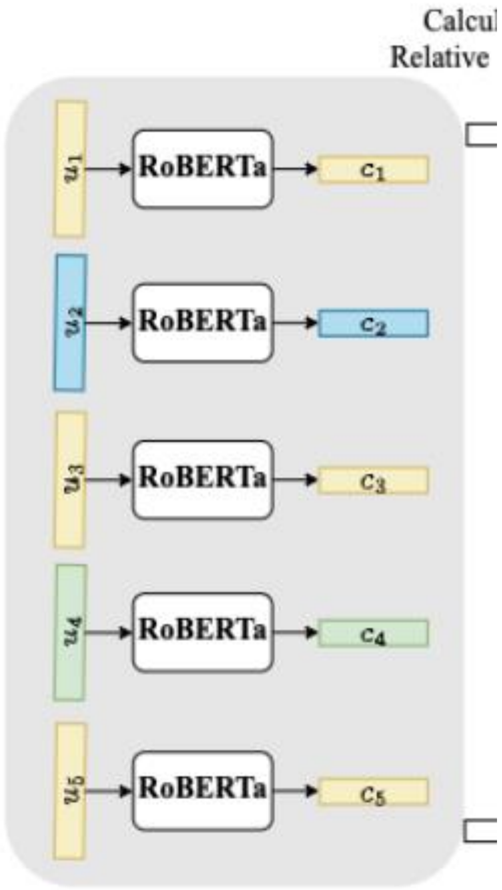
Introduction



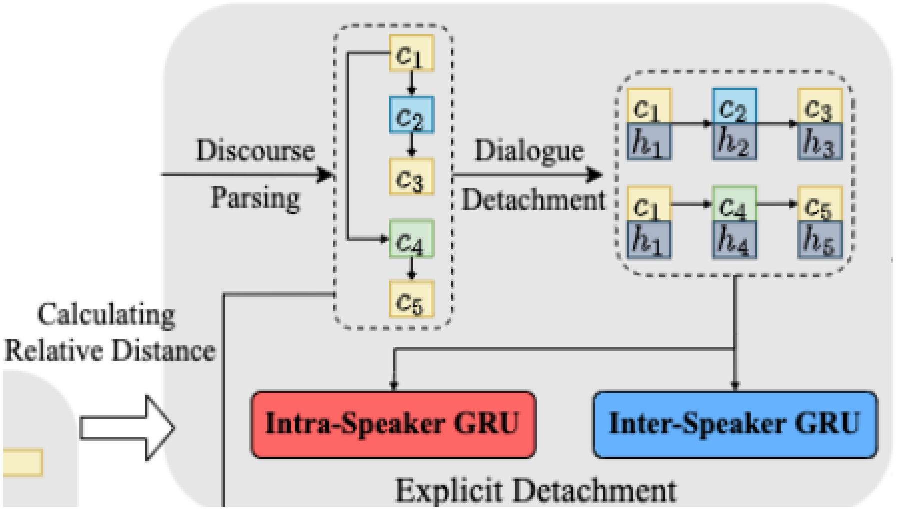

Discourse
Parsing
Dialogue
Detachment
Calculating
Relative Distance
RoBERTa
Intra-Speaker GRU
Inter-Speaker GRU
Explicit Detachment
Position Embedding
Mutual Module
Fusion
Self-Attention
Intra Implicit Detachment Graph
Inter Implicit Detachment Graph
Implicit Detachment
Classifier
Feature Extraction
Mutual Conversational Detachment
Emotion Recognition

Method



$$c_i = \text{RoBERTa}(\,[CLS], w_1, w_2, \cdots, w_L\,) \quad (1)$$

Method

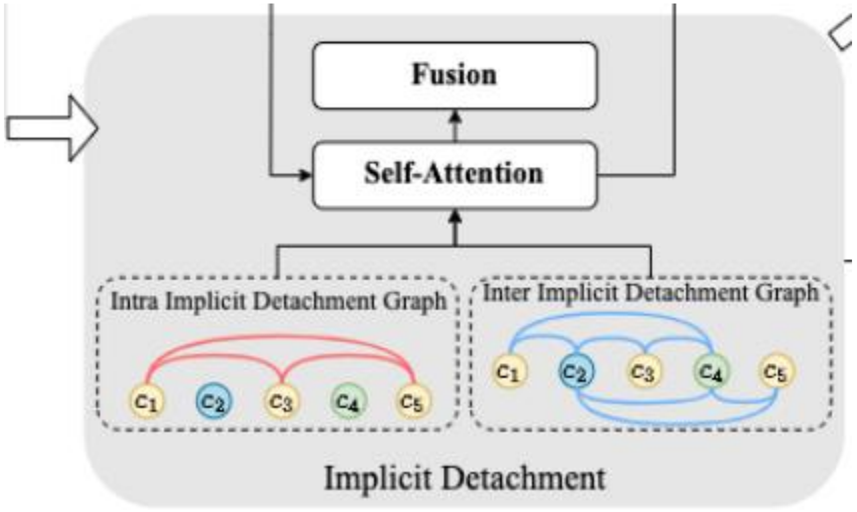


$$\{(i, j, e_{ij}), \cdots\} = \text{Parser}(\{u_1, u_2, \cdots, u_N\}) \tag{2}$$

$$D_{i,j} = \begin{cases} 1, & \text{if } e_{ij} \text{ exists in discourse tree} \\ 0, & \text{otherwise} \end{cases} \tag{3}$$

$$e_i = \begin{cases} \text{GRU}^{intra}(c_i,\ e_p), & \text{if } \phi(u_i) = \phi(u_p) \\ \text{GRU}^{inter}(c_i,\ e_p), & \text{otherwise} \end{cases} \tag{4}$$

Method



$$IDG_{i,j}^{intra} = \begin{cases} 0, & \text{if } j <= i \text{ and } \phi(u_i) = \phi(u_j) \\ -\infty, & \text{otherwise} \end{cases} \quad (5)$$

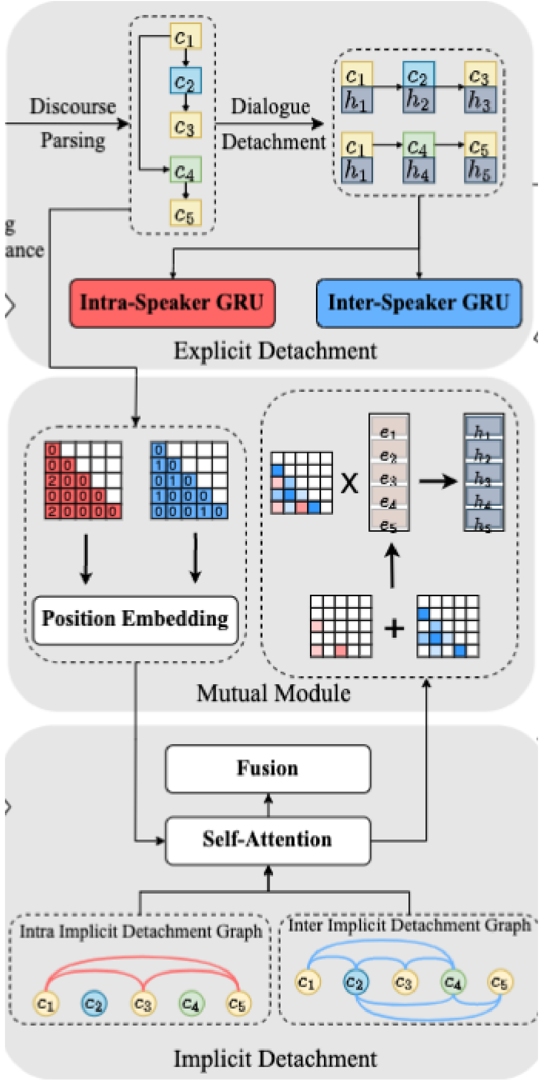
$$IDG_{i,j}^{inter} = \begin{cases} 0, & \text{if } j < i \text{ and } \phi(u_i) \neq \phi(u_j) \\ -\infty, & \text{otherwise} \end{cases} \quad (6)$$

$$G = \mathrm{MHSA}(C,\ IDG^t),$$

$$\mathrm{Att}(Q, K, V, IDG^t) = \mathrm{Softmax}(\frac{QK^T}{\sqrt{d_k}} + IDG^t)V \quad (7)$$

$$F^t = \mathrm{ReLU}(\mathrm{FC}([C, G^t, C - G^t, C \odot G^t])),$$
$$g = \mathrm{Sigmoid}(\mathrm{FC}[F^{intra}, F^{inter}]),$$
$$I = g \odot F^{intra} + (1 - g) \odot F^{inter} \quad (8)$$

Method



$$h_i = A_{i,<i}^{joint} \times E_{<i} \tag{9}$$

$$e_i = \begin{cases} \mathrm{GRU}^{intra}([c_i, h_i],\ e_p), & \text{if } \phi(u_i) = \phi(u_p) \\ \mathrm{GRU}^{inter}([c_i, h_i],\ e_p), & \text{otherwise} \end{cases} \tag{10}$$

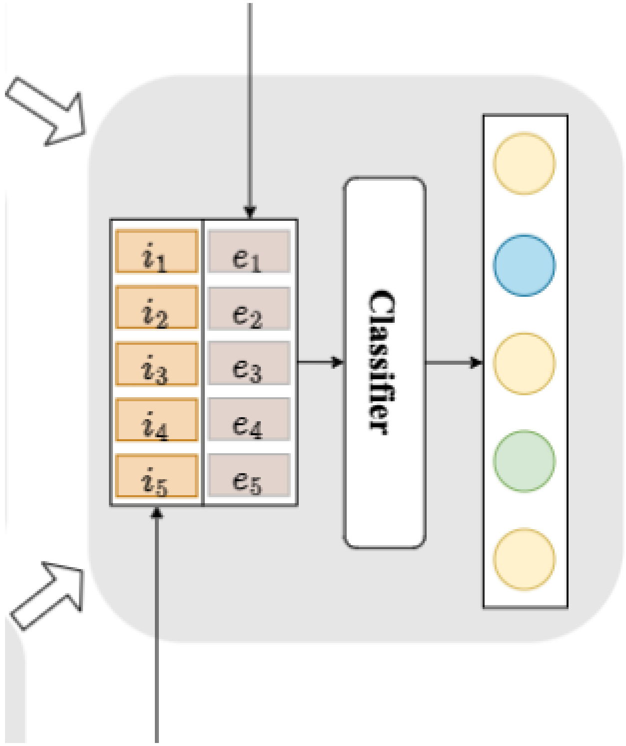
$$Pos^t = \mathrm{Embedding}(P^t),$$

$$G = \mathrm{MHSA}(C,\ IDG^t, Pos^t),$$

$$\mathrm{Att}(Q, K, V, IDG^t, Pos^t) = \mathrm{Softmax}(\frac{QK^T}{\sqrt{d_k}}$$

$$+IDG^t + Pos^t)V \tag{11}$$

Method



$$\hat{y} = \mathrm{Softmax}(W_e[C, E, I] + b_e) \qquad (12)$$

$$L = -\frac{1}{N}\sum_{i=1}^{N}\sum_{j=1}^{Emo} \hat{y}_i{}^j \cdot log(y_i^j) \qquad (13)$$

Experiments

Dataset	Dialogues			Utterances		
	Train	Val	Test	Train	Val	Test
EmoryNLP	713	99	85	9,934	1,344	1,328
MELD	1,039	114	280	9,989	1,109	2,610

Table 1: Dataset statistics

Experiments

Model	EmoryNLP	MELD
ERMC Methods		
ConGCN	-	57.40
DialogXL	34.73	62.41
ERMC-DisGCN	36.38	64.22
ERC Methods with CSK		
KET	34.39	58.18
KAITML	35.59	58.97
KI-Net	-	63.24
SKAIG	38.88	65.18
COSMIC	38.11	65.21
COSMIC w/o CSK	37.10	64.28
ERC Methods without CSK		
DialogueRNN	31.7	57.03
DialogueGCN	-	58.1
IEIN	-	60.72
RGAT	34.42	60.91
DialogueCRN	-	58.39
DAG-ERC	39.02	63.65
MuCDN (Ours)	**40.09**	**65.37**

Experiments

Model	EmoryNLP	MELD
MuCDN	**40.09**	**65.37**
w/o explicit detachment	38.45	64.45
w/o implicit detachment	38.84	64.47
w/o E2I interaction	39.28	64.61
w/o I2E interaction	39.54	64.56

Experiments

Model	EmoryNLP	MELD
MuCDN	**40.09**	**65.37**
sequence	39.05	64.51
randomness	38.72	64.71

Experiments

Model	EmoryNLP	MELD
MuCDN	**40.09**	**65.37**
w/o intra and inter GRU	39.42	64.49
w/o intra and inter graph	38.91	64.46

Thanks!