
MultiEmo: multi-task framework for emoji prediction

Knowledge-Based Systems (2022)

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1. Background (1)

- **Emojis** act as a new **visual language**.
 - enrich the meaning of social media content
- **Emoji prediction** is a task of predicting an upcoming emoji based on the given text.



1. Background (2)

- **Multi-task learning** aims to learn multiple different tasks simultaneously.
 - improves overall performance of different tasks by **sharing information**
- In sentiment analysis...
 - Chauhan et al. : sarcasm detection + sentiment detection + emotion detection
 - Singh et al. : complaint identification + sentiment classification

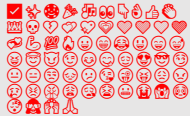
→ To predict emojis, we assume that **combining semantically similar tasks** would improve prediction performance!

2. Method - dataset

- Multi-task framework for emoji prediction
 - Task 1. emoji prediction
 - Task 2. emotion detection

- Data description
 - Emoji prediction - Twitter dataset
 - Emotion detection - GoEmotion

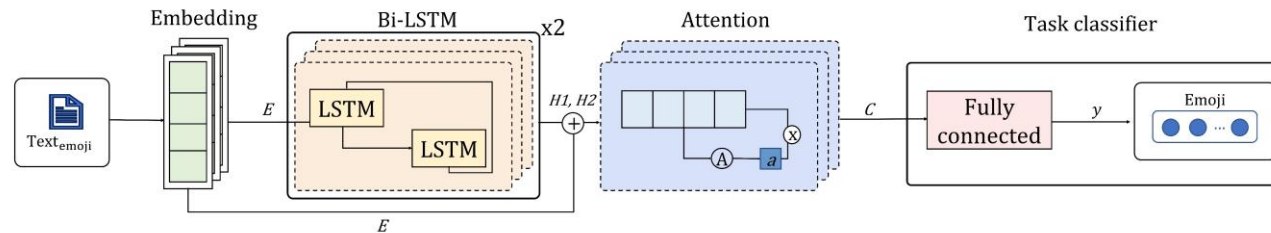
Task	Dataset	Size	# of labels
Emoji prediction	Twitter dataset	567,758	64
Emotion detection	<i>GoEmotion_{emo}</i>	20,898	27
	<i>GoEmotion_{Ekman}</i>	20,898	6
	<i>GoEmotion_{sent}</i>	20,898	3

emoji	emotion	Ekman emotion	sentiment
	confusion admiration annoyance gratitude ...	surprise anger disgust fear joy sadness	ambiguous positive negative

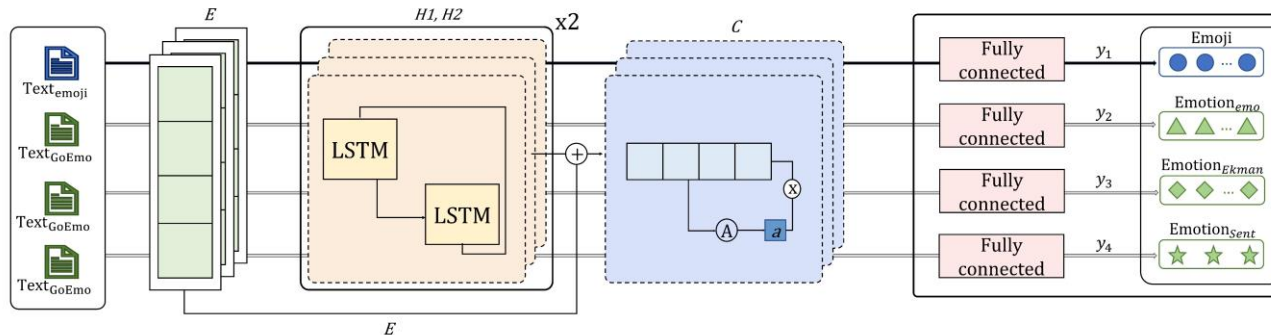
2. Method – proposed framework

- Multi-task framework for emoji prediction
 - Task 1. emoji prediction
 - Task 2. emotion detection

(a) Single-task model



(b) Multi-task model



- $Multi^a$: emoji prediction + 1 emotion detection task
- $Multi^b$: emoji prediction + 2 emotion detection tasks
- $Multi^c$: emoji prediction + 3 emotion detection tasks

3. Experiments – metrics

1) $ACC_{single}@K$

- If one of the top K predictions is **the correct label**, this prediction is regarded as accurate one.
- $ACC_{single}@1$, $ACC_{single}@5$

2) $ACC_{cate}@K$

- If one of the top K predictions is **included in the same category** with the correct emoji, this prediction is regarded as accurate one.
- $ACC_{cate}@1$, $ACC_{cate}@5$

3) $ACC_{sent}@K$

- If one of the top K predictions **represents same sentiment** with the correct emoji, this prediction is regarded as accurate one.
- $ACC_{sent}@1$

3. Experiments – results

Table 3

Emoji prediction results of MultiEmo and baseline models.

64 emoji labels

20 emoji category labels

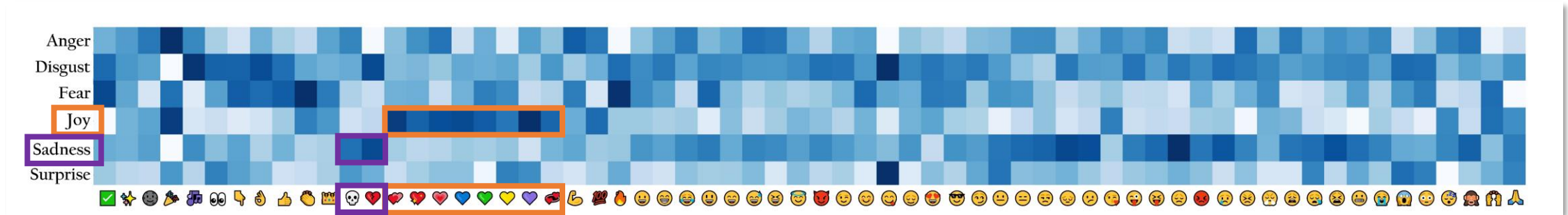
2 emoji sentiment labels

Models	Single		Category		Sentiment
	$ACC_{single}@1$	$ACC_{single}@5$	$ACC_{cate}@1$	$ACC_{cate}@5$	$ACC_{sent}@1$
Bi-LSTM	22.40 ± 4.68	49.05 ± 7.63	42.60 ± 1.29	62.23 ± 12.11	55.93 ± 15.03
Bi-LSTM+Attention	27.46 ± 0.19	57.49 ± 0.16	44.08 ± 0.19	72.22 ± 0.07	69.99 ± 0.15
Seq2Emoji	22.88 ± 4.07	50.49 ± 5.06	42.66 ± 0.50	66.09 ± 4.53	66.39 ± 2.29
BERT	20.83 ± 0.03	48.74 ± 0.04	41.97 ± 0.00	65.78 ± 0.19	56.79 ± 0.49
Single-task	26.86 ± 0.12	58.03 ± 0.20	44.28 ± 0.05	72.76 ± 0.16	69.32 ± 0.12
$Multi^a_{emo}$	27.77 ± 0.01	59.38 ± 0.03	44.62 ± 0.06	73.80 ± 0.19	70.21 ± 0.15
$Multi^a_{Ekman}$	27.73 ± 0.04	59.42 ± 0.10	44.60 ± 0.05	73.78 ± 0.09	70.24 ± 0.10
$Multi^a_{sent}$	27.78 ± 0.02	59.41 ± 0.08	44.69 ± 0.11	73.97 ± 0.31	70.40 ± 0.36
$Multi^b_{emo,Ekman}$	27.76 ± 0.03	59.35 ± 0.01	44.64 ± 0.03	73.85 ± 0.09	70.46 ± 0.09
$Multi^b_{Ekman,sent}$	27.82 ± 0.04	59.40 ± 0.05	44.69 ± 0.08	73.83 ± 0.14	70.42 ± 0.12
$Multi^b_{emo,sent}$	27.77 ± 0.05	59.34 ± 0.06	44.61 ± 0.06	73.75 ± 0.07	70.26 ± 0.15
$Multi^c_{emo,Ekman,sent}$	27.74 ± 0.05	59.40 ± 0.03	44.63 ± 0.02	73.79 ± 0.06	69.99 ± 0.05

- Multi-task models outperforms other baseline models!
- Incorporating the emotion task assists in improving the performance of emoji prediction.

3. Experiments - correlation analysis

- **Why** does learning the emotion task simultaneously help the emoji prediction task?
 - For each emoji, we obtained the **softmax value** of the predicted **emotion outputs**.



- ‘💕’, ‘💖’, ‘💞’, ‘💗’, ‘💘’, ‘💙’, ‘💜’, ‘💞’ have high correlation with emotion ‘joy’.
- ‘💀’, ‘💔’ have high correlation with emotion ‘sadness’.

4. Conclusion

Summary

- Proposed **multi-task models** ($Multi^a$, $Multi^b$, $Multi^c$) that incorporate emotional information for emoji prediction.
- Three models achieved better performance than baseline models for emoji prediction.
- Found high relevance between each emoji and emotion by analyzing correlation between emojis and emotions.

Future work

- Extend our work to consider other contextual information (i.e., demographic information)
- Predict multiple emojis for a given text.

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Thank you 😊
