Sarcasm-Sentiment-Emotion Classifier
(Multi-task framework)

Presented by: Team 43

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Problem Statement

- Sarcasm Detection of sentences in a multitask framework with sentiments and emotions.
- **Input**: Text Sentence (With Emoji(s))
- **Output**: Sarcasm, Sentiment and Emotion label
- Motivation: Sentiment, emotions and sarcasm as closely related tasks and can help each other in better classification
- **Ex**: I got fired. This is the best day of my life
- Sarcastic, positive sentiment and angry/sad emotion

Reference Paper

- Dushyant Singh Chauhan, SR Dhanush, Asif Ekbal, and Pushpak Bhattacharyya. 2020. ***Sentiment and emotion help sarcasm? a multi-task learning framework for multi-modal sarcasm, sentiment and emotion analysis***. In Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics, pages 4351–4360.

- Subramanian J., Sridharan V., Shu K., Liu H. (2019) ***Exploiting Emojis for Sarcasm Detection***. In: Thomson R., Bisgin H., Dancy C., Hyder A. (eds) Social, Cultural, and Behavioral Modeling. SBP-BRiMS 2019. Lecture Notes in Computer Science, vol 11549. Springer, Cham.

Data

- **Description**: The dataset was originally taken from the below link and annotated additionally for Emotion labels i)sadness ii)joy iii)love iv)anger v)fear vi)surprise

- **Reference URL**: https://github.com/jsubram/Sarcasm-Detection-Using-Emoji/tree/master/Data
- **Final schema & Statistics**

Comments with emoji	Sarcasm	Sentiment	Emotions	Emotions_label	Emojis

Original Statistics	
Total Sentences	12.9K (Only 20% Sarc)
Labels	Sarcasm, Sentiment

Augmented and Balanced Statistics	
Total Sentences	18,846
Labels	Sarcasm, Sentiment, Emotion

Training Stats	
Train	15912
Test	2934

Technique Used

- Embedding : Glove(Text Encoder) + Emoji2vec(Emoji Encoder)
- Model : Bi-GRU + Attention(Feedforward)
- 7 models: Sarcasm, Emotion, Sentiment, Sarc + Emo, Sarc + Sent, Sent + Emo, Sarc + Emo + Sent
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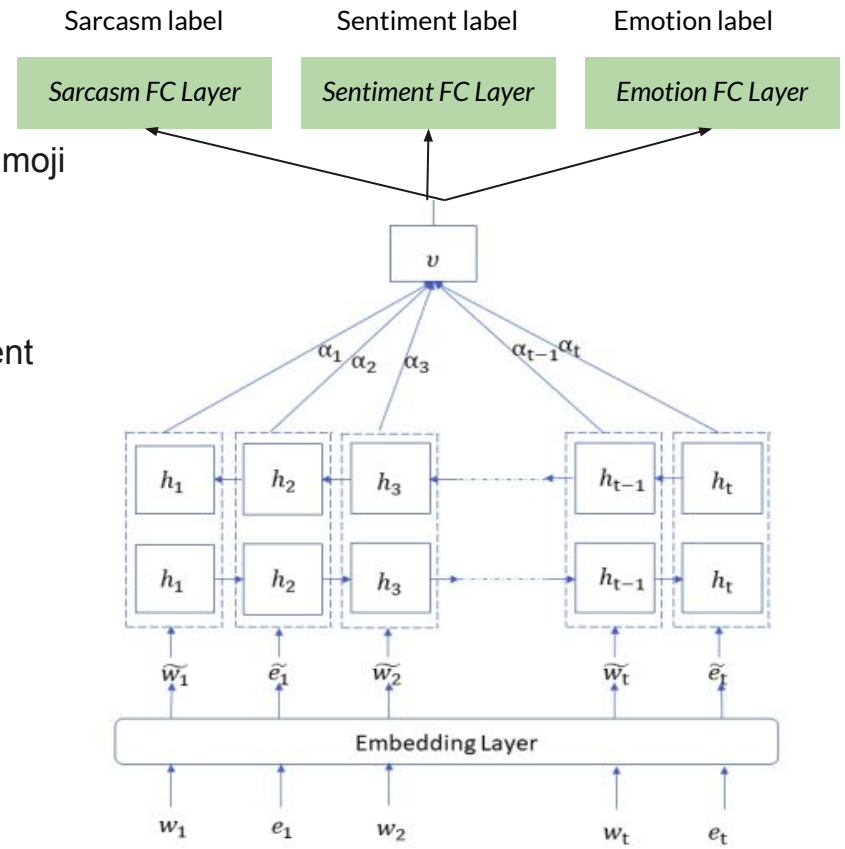
$$w_i \rightarrow GloVe(w_i) \rightarrow \tilde{w}_i$$

$$e_i \rightarrow emoji2vec(e_i) \rightarrow \tilde{e}_i$$

$$u_i = tanh\left(Wh_i + b_w\right)$$

$$\alpha_i = \frac{\exp(u_i^T u_w)}{(\sum_i \exp(u_i^T u_w)}$$

$$v = \sum_i \alpha_i h_i$$



Results: Sarcasm

	Tasks	Precision	Recall	F1	Accuracy
STL	Sarcasm	0.98	0.99	0.98	0.99
MTL	Sarcasm + Sentiment	0.97	0.99	0.98	0.99
	Sarcasm + Emotion	0.98	0.98	0.98	0.99
	Sarcasm + Sentiment + Emotion	0.97	0.98	0.98	0.98

Sarcasm performance on Augmented Dataset

	Tasks	Precision	Recall	F1	Accuracy
STL	Sarcasm	0.57	0.53	0.54	0.53
MTL	Sarcasm + Sentiment	0.70	0.55	0.60	0.55
	Sarcasm + Emotion	0.55	0.54	0.54	0.54
	Sarcasm + Sentiment + Emotion	0.64	0.54	0.57	0.54

Sarcasm performance on news headline Dataset

Results: Sarcasm

	Tasks	Precision	Recall	F1	Accuracy
STL	Sarcasm	0.68	0.62	0.64	0.62
MTL	Sarcasm + Sentiment	0.82	0.77	0.79	0.77
	Sarcasm + Emotion	0.59	0.64	0.61	0.64
	Sarcasm + Sentiment + Emotion	0.70	0.72	0.71	0.72

Sarcasm performance on twitter dataset

Results: Sentiment

	Tasks	Precision	Recall	F1	Accuracy
STL	Sentiment	0.52	0.43	0.47	0.43
MTL	Sentiment + Sarcasm	0.86	0.49	0.61	0.49
	Sentiment+ Emotion	0.46	0.28	0.32	0.28
	Sentiment + Sarcasm + Emotion	0.92	0.50	0.64	0.50

Sentiment performance on Augmented dataset

Results: Emotions

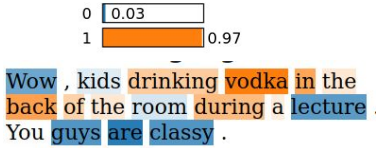
	Tasks	Precision	Recall	F1	Accuracy
STL	Emotion	0.24	0.23	0.22	0.23
MTL	Emotion + Sarcasm	0.68	0.62	0.64	0.62
	Emotion + Sentiment	0.25	0.26	0.25	0.26
	Emotion+ Sentiment + Sarcasm	0.66	0.64	0.65	0.64

Emotion performance on Augmented dataset

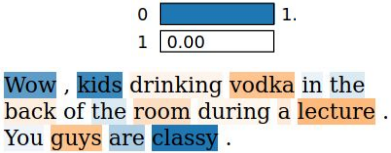
Qualitative Examples

STL vs MTL

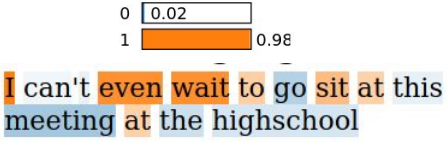
- "Wow , kids drinking vodka in the back of the room during a lecture . You guys are classy .
  - Multi task Sarcasm: 1
  - Single task : 0
- I can't even wait to go sit at this meeting at the highschool
  - Multi task Sarcasm: 1
  - Single task Sarcasm 0



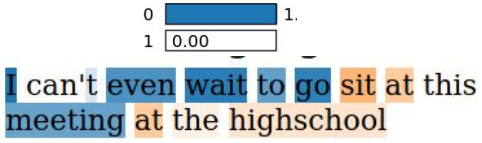
Multi task framework



Single task framework



Multi task framework



Single task framework

Qualitative Examples

Emojis

- Wow! This is a great phone with no utility
  - Not Sarcastic
- Wow! This is a great phone with no utility😡
  - Sarcastic

Conclusion & Future Work

- Multi-task helps in better classification of related tasks, these tasks have to carefully chosen
- Related tasks can sometimes have negative effect on classification as well
- Sarcasm detection from text can be improved using embeddings for emojis and hashtags, useful in a social media setting

Future Work:

- Creating a larger training corpus with better annotation of Emotion
- Explore multiple modalities using text, audio and video
- Training with the help of individual task specific dataset
- Using hashtag embeddings for twitter dataset.

References

[1] Dushyant Singh Chauhan, SR Dhanush, Asif Ekbal, and Pushpak Bhattacharyya.2020.*Sentiment and emotion help sarcasm? a multi-task learning frame work for multi-modal sarcasm, sentiment and emotion analysis*. In Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics , pages 4351–4360.

[2] https://github.com/jsubram/Sarcasm-Detection-Using-Emoji

[3]https://www.kaggle.com/rmisra/news-headlines-dataset-for-sarcasm-detection?select=Sarcasm_Headlines_Dataset.json