Comparative Study of Transformer Models in Understanding Emotions

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Introduction

Motivation for the Study

- The rise of platforms like Reddit has led to a vast amount of text data rich in emotional content. Understanding and categorizing these emotions is crucial for analyzing online interactions and fostering healthier online environments.

Dataset - *GoEmotions*

- Dataset comprised of approximately 43,000 instances for training, 5,000 instances for Dev and Test set, sourced from Reddit.
- Contains 28 distinct labels for emotions.

Dataset Examples

EMOTIONS: admiration, amusement, anger, annoyance, approval, caring, confusion, curiosity, desire, disappointment, disapproval, disgust, embarrassment, excitement, fear, gratitude, grief, joy, love, nervousness, optimism, pride, realization, relief, remorse, sadness, surprise, neutral.

Example Posts	Associated Labels
We need more boards and to create a bit more space for [NAME]. Then we'll be good	desire, optimism
maybe that is what happened to the great white at houston zoo	confusion, realization
hello everyone. i am from toronto as well. can call and visit in personal if needed	neutral
demographics? i do not know anybody under 35 who has cable tv.	confusion
aww... she will probably come around eventually, i am sure she was just jealous of [name]... i mean, what woman would not be! lol	amusement, approval

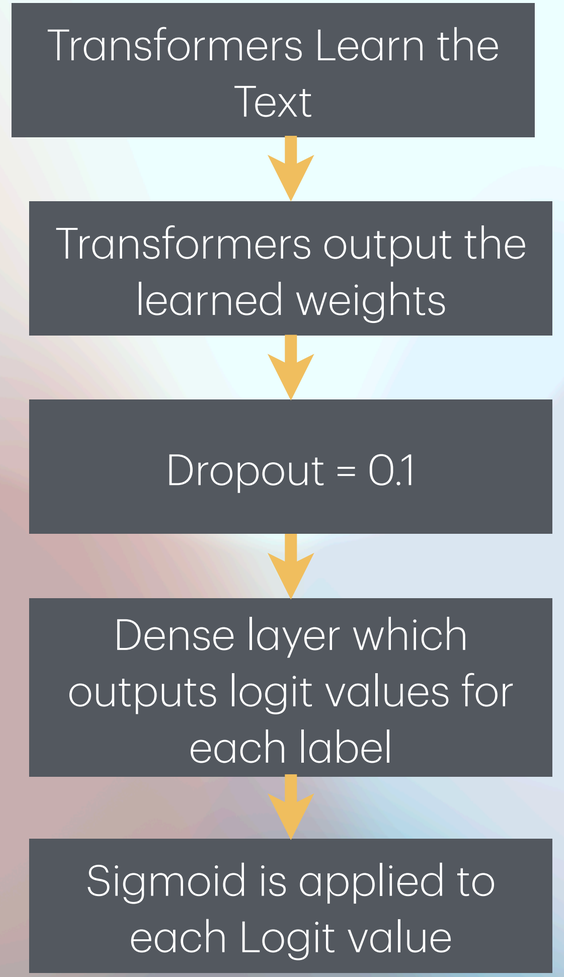
Models Overview

Common Parameters in the different Models:

- Length of input word embeddings were 128.
- Learning Rate was set at 0.0005.
- Dropout Rate was set at 0.1.
- Labels were picked based on the sigmoid probability of more than 0.3.

Model	Precision	Recall	F1-Score
Naive Bayes Classifier	0.25	0.04	0.06
BERT-base Cased	0.54	0.41	0.45
DistilBERT	0.62	0.39	0.45
Roberta BERT	0.65	0.35	0.42
XLNET	0.62	0.35	0.41

Table 1: Performance Metrics of Different Models

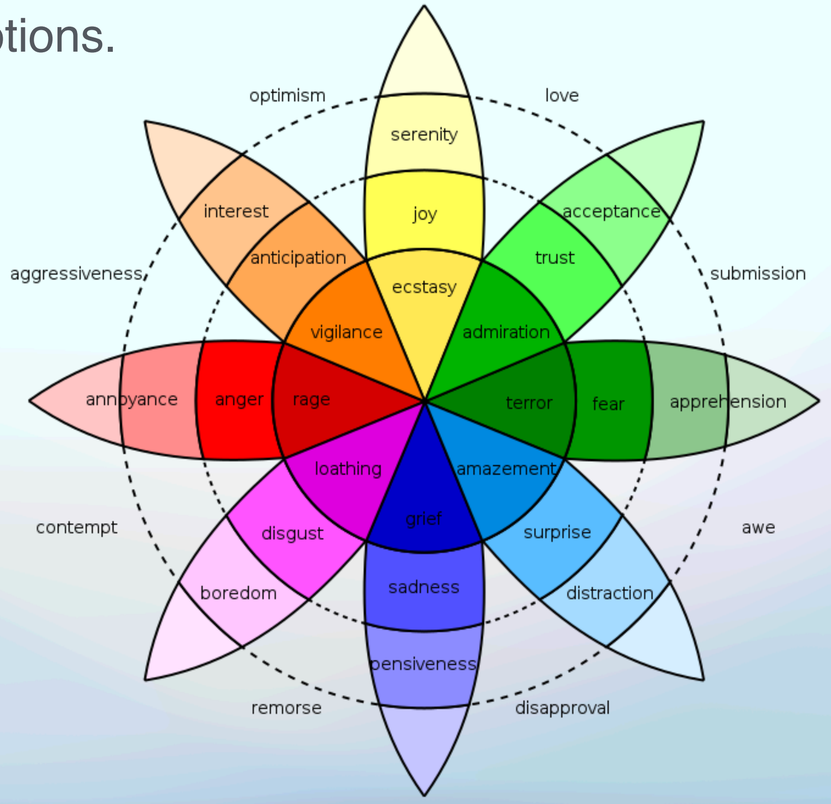


Some KeyPoints from the Models

- "*Grief*" received precision, recall, and F1-score of 0: It only has 6 examples.
- "*Realization*" received precision of 0.48, recall of 0.16, and F1-score of 0.24.
- Several other emotions received scores which are turned out to be low.

Question: How can the scores be improved?

- Group emotions using Ekman Wheel of Emotions.
- 28 emotions were cut down to 7 emotions.

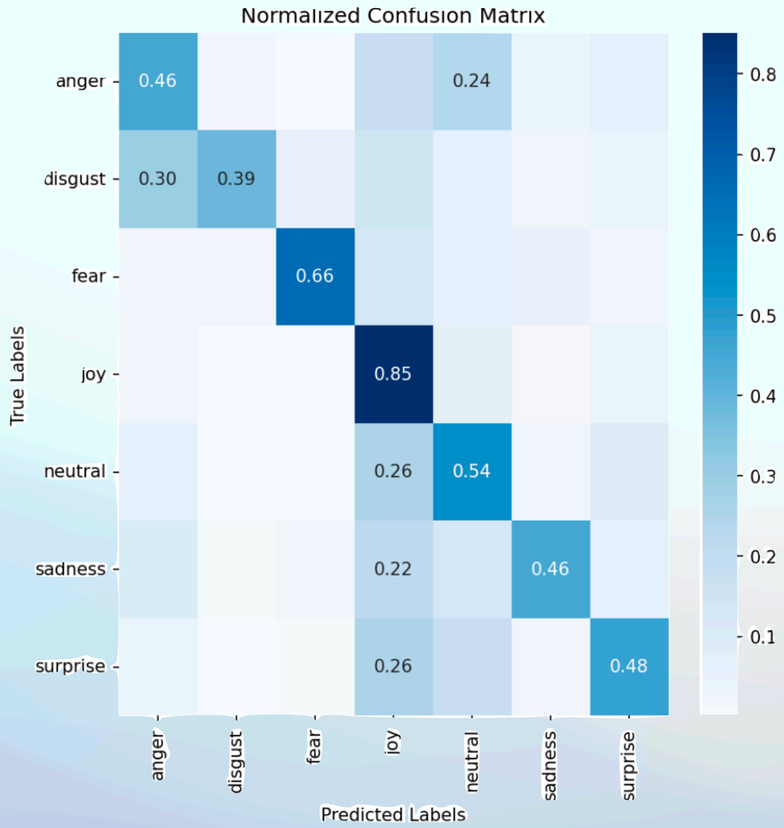


DistilBERT Results

	precision	recall	f1-score	support
admiration	0.73	0.60	0.66	504
amusement	0.76	0.82	0.79	264
anger	0.58	0.42	0.49	198
annoyance	0.45	0.20	0.28	320
approval	0.51	0.28	0.36	351
caring	0.48	0.23	0.31	135
confusion	0.40	0.33	0.36	153
curiosity	0.50	0.34	0.40	284
desire	0.61	0.36	0.45	83
disappointment	0.35	0.21	0.26	151
disapproval	0.38	0.31	0.34	267
disgust	0.68	0.36	0.47	123
embarrassment	0.60	0.24	0.35	37
excitement	0.51	0.35	0.42	103
fear	0.72	0.64	0.68	78
gratitude	0.95	0.89	0.92	352
grief	0.00	0.00	0.00	6
joy	0.67	0.50	0.57	161
love	0.75	0.85	0.79	238
nervousness	0.41	0.30	0.35	23
optimism	0.72	0.45	0.55	186
pride	0.80	0.25	0.38	16
realization	0.48	0.16	0.24	145
relief	0.38	0.27	0.32	11
remorse	0.58	0.66	0.62	56
sadness	0.72	0.42	0.53	156
surprise	0.58	0.45	0.51	141
neutral	0.67	0.57	0.61	1787
micro avg	0.65	0.49	0.56	6329
macro avg	0.57	0.41	0.46	6329
weighted avg	0.63	0.49	0.54	6329
samples avg	0.54	0.52	0.52	6329

Results

- After grouping the emotions, the new F1-score improved from 0.45 to 0.57.
- Individual scores of 7 grouped emotions improved as well.



DistilBERT Results

	precision	recall	f1-score	support
anger	0.57	0.47	0.51	726
disgust	0.63	0.40	0.49	123
fear	0.67	0.51	0.58	98
joy	0.80	0.82	0.81	2104
neutral	0.67	0.54	0.60	1787
sadness	0.75	0.39	0.51	379
surprise	0.55	0.48	0.51	677
micro avg	0.70	0.61	0.65	5894
macro avg	0.66	0.51	0.57	5894
weighted avg	0.70	0.61	0.64	5894
samples avg	0.65	0.63	0.63	5894

Thank you!!

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