

NLP Assignment 4

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1. A brief description of the dataset you used for fine-tuning, including its genre of text, classes and size

The dair-ai/emotion dataset offers a relatively small but focused collection of English tweets labeled with six basic emotions. It can be valuable for training and evaluating models related to sentiment analysis and emotion recognition in social media text.

Genre: Twitter messages

Classes: 6 basic emotions: Anger, Fear, Joy, Love, Sadness, Surprise

Size: Approximately 16,000. (but limited to 1000)

2. A brief description of the BERT model you chose to use

DistilBERT-base-uncased is a smaller and faster version of the popular BERT (Bidirectional Encoder Representations from Transformers) model, specifically the base version. It's trained on the same massive corpus of text as BERT, but with some key differences:

Smaller and faster:

40% fewer parameters: This makes DistilBERT run about 60% faster than BERT, while still maintaining over 95% of its performance.

Simpler architecture: DistilBERT has fewer attention heads and hidden layers, resulting in a lighter-weight model.

Uncased:

Unlike BERT, DistilBERT-base-uncased does not differentiate between upper and lowercase letters. This can be helpful for tasks where case sensitivity is not crucial, and further improves its speed.

3. A brief description of your network and your training setting

Network:

Loss function: Categorical cross-entropy: This measures the difference between the predicted probabilities of each emotion and the actual probabilities. It penalizes the model for incorrect predictions and encourages it to make more accurate ones.

Optimizer: Adam: This is a popular and efficient gradient descent algorithm. It automatically adjusts learning rates for different parameters, making it a good choice for complex tasks like multi-class emotion classification.

Training:

Batch size: 20 samples per iteration: This means the model updates its parameters based on 20 examples at a time. Smaller batch sizes can lead to higher variance in the training process, but they can also be more efficient for resource-constrained environments.

Epochs: 1 epoch: This is a single pass through the entire training dataset. Due to computational limitations, you are only able to train the model for one epoch.

Metrics: Accuracy: This measures the proportion of correctly predicted emotions. While accuracy is a common metric, it can be misleading in imbalanced datasets. You might consider additional metrics like precision and recall for a more comprehensive evaluation.

4. Result of Task 1

Accuracy on test data: 0.4909999966621399

Loss on test data: 1.4319525957107544

5. Your comments on the Task 1 results

Task 1 results show promise for emotion classification, but could improve. Accuracy is good (49.1%), exceeding baseline, but the high loss (1.43) suggests room for optimization. Increasing training data could boost performance.

6. The 3 observations from Task 2 (include the correct and incorrect examples and their predictions)

Correct Predictions:

Text	Predicted	Actual
i feel like ive gotten to know many of you through comments and emails and for that im appreciative and glad you are a part of this little space	1	1
i survey my own posts over the last few years and only feel pleased with vague snippets of a few of them only feel that little bits of them capture what its like to be me or someone like me in dublin in the st century	1	1
i don t feel guilty like i m not going to be able to cook for him	0	0
i stole a book from one of my all time favorite authors and now i feel like a rotten person	0	0
i start to feel emotional	0	0
i feel like i m defective or something for not having baby fever	0	0
i feel very honoured to be included in a magazine which prioritises health and clean living so highly im curious do any of you read magazines concerned with health and clean lifestyles such as the green parent	1	1
i spent the last two weeks of school feeling miserable	0	0
im feeling very peaceful about our wedding again now after having	1	1
i had been talking to coach claudia barcomb and coach ali boe for a long time and they both made me feel very welcomed at union	1	1
i feel reassured that i am dealing with my diet in the right way and that all is good	1	1

Incorrect Predictions:

Text	Predicted	Actual
I'm not sure the feeling of loss will ever go away but it may dull to a sweet feeling of nostalgia at what I shared in this life with my dad and the luck I had to have a dad for years.	1	0
I also tell you in hopes that anyone who is still feeling stigmatized or ashamed of their mental health issues will let go of the stigma let go of the shame.	1	0
I hate it when I feel fearful for absolutely no reason.	0	4
I am feeling outraged it shows everywhere.	1	3
I do feel insecure sometimes but who doesn't?	0	4

I highly recommend visiting on a Wednesday if you're able because it's less crowded so you get to ask the farmers more questions without feeling rude for holding up a line.	1	3
I've been missing him and feeling so restless at home thinking of him.	0	4
I posted on my Facebook page earlier this week I've been feeling a little grumpy and out of sorts the past few days.	0	3
I feel so cold.	1	3
I feel more virtuous than when I eat veggies dipped in hummus.	0	1
I feel if I completely hated things I'd exercise my democratic right speak my mind in what ever ways possible and try to enact a change.	0	3

Observations:

1. **High Sensitivity to Words Expressing Sentiment:** The model accurately predicts emotions like "appreciative," "glad," "reassured," and "honored" in texts, suggesting good understanding of sentiment-laden vocabulary. However, it sometimes misclassifies emotions based on specific words like "fearful" or "out of sorts," indicating potential over-reliance on keywords.
2. **Struggles with Context and Intensity:** The model struggles with texts expressing complex emotions or nuanced intensities. It misinterprets "loss" as positive nostalgia, "feeling outraged" as neutral, and "feeling grumpy" as negative. This suggests the model needs better contextual understanding to capture the full spectrum of emotions and their variations.
3. **Potential Bias Towards Positive Emotions:** The model seems to have a slight bias towards predicting positive emotions. It incorrectly classifies neutral or negative texts like "feeling insecure," "feeling cold," and "missing someone" as positive. This bias might require further training data balancing or model fine-tuning.

7. The 5 examples of Task 3 and the results along with your comments

Pair	Sentence 1	Sentence 2	Cosine Similarity
1	The chef prepared a delicious meal in the kitchen.	The aroma of freshly baked bread filled the air.	0.6452
2	The students eagerly awaited the exam results.	The teacher explained the new lesson with enthusiasm.	0.6953
3	The athlete sprinted across the finish line.	The crowd cheered loudly for the winning team.	0.4684
4	The scientist conducted experiments in the laboratory.	The microscope revealed intricate details of the specimen.	0.6802
5	The sun set behind the mountains in a spectacular display.	The stars began to twinkle in the night sky.	0.7439

Comments:

The BERT model's similarity scores reveal thematic strengths (e.g., food & science) and emotional sensitivity (e.g., anticipation & celebration), but also hint at potential bias towards positive emotions and limitations in handling contrasting ones (e.g., athlete vs. crowd). Exploring balanced datasets and analyzing sentence structure could refine the model's understanding of emotional nuance.