# Assignment 2: Subjective/Objective Sentence Classification Using MLP and CNN

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## Question 3.1.1:

Review the data to see how it is organized in the file. How many examples are in the file data.tsv?

## Answer:

There are 10000 examples in the file.

## Question 3.1.2:

Select two random examples each from the positive set (subjective) and two from the negative set. For all four examples, explain, in English, why it has the given label. [1 point]

## Answer:

```
Printing a couple of examples from objective class
0 as this sacrifice draws to its close , our story begins .
0 including finding the anti-christ , who is now a 11-year-old boy .


Printing a couple of examples from subjective class
1 uno de los policiales m�s interesantes de los �ltimos tiempos .
1 the trappings of i spy are so familiar you might as well be watching a rerun .
```

Example 1:

now a full time tattoo artist , he meets a young student named sienna (de rossi) who secretly works as a bar stripper . [Objective]

**Reasoning:**

This statement is labelled as objective as it is framed as a statement of fact. There are no emotions or opinions referenced to over here in the sentence.

Example 2:

she takes a fancy to chan kwok chan , whom she stalks . [Objective]

**Reasoning:**

The reasoning for this is similar to the above, verbs are being used without inferring any opinions to explain an activity that “she” does which makes it a objective sentence

Example 3:

miyazaki is one of world cinema's most wondrously gifted artists and storytellers . [Subjective]

**Reasoning:**

The sentence mentioned earlier is indeed subjective because it aligns with the definition of a "statement based on opinion." When Miyazaki is described as one of the most talented artists, it lacks factual basis and instead reflects a subjective viewpoint.

Example 4:

ya-yas everywhere will forgive the flaws and love the film . [Subjective]

**Reasoning:**

Saying “everyone will forgive” and “love the film” shows bias in the their judgement as there is not factual basis to this statement  and is stated merely as an opinion.

## Question 3.1.3:

Find one example from each of the positive and negative sets that you think has the incorrect label, and explain why each is wrong [2 points].

## Answer:

**Wrongly Subjective:**

based on a devilishly witty script by heather mcgowan and niels mueller , the film gets great laughs , but never at the expense of its characters.

**Reasoning:**

The above sentence although contains a tint of subjectivity, is in my opinion an objective statement as we have factual information saying “the film gets great laughs”, script writer names etc gives strong enough information to say that it is a factual statements.

**Wrongly Objective:**

joe hickley thinks he's got a great scheme : kidnap the child of rich parents , hold it for 24 hours , keeping the mother under his control while an accomplice gets the ransom from the father , who is on a trip .

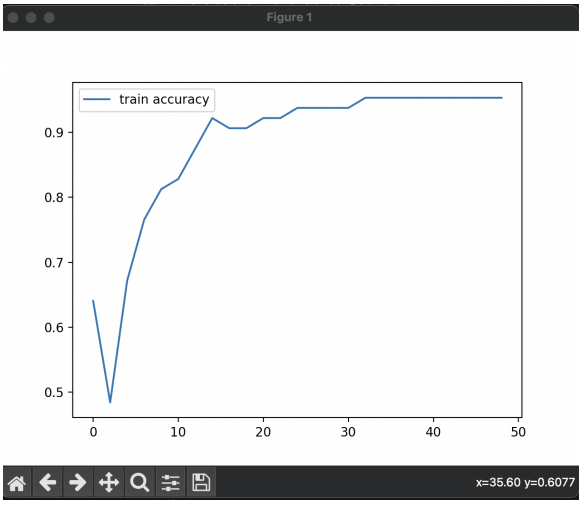
**Reasoning:**

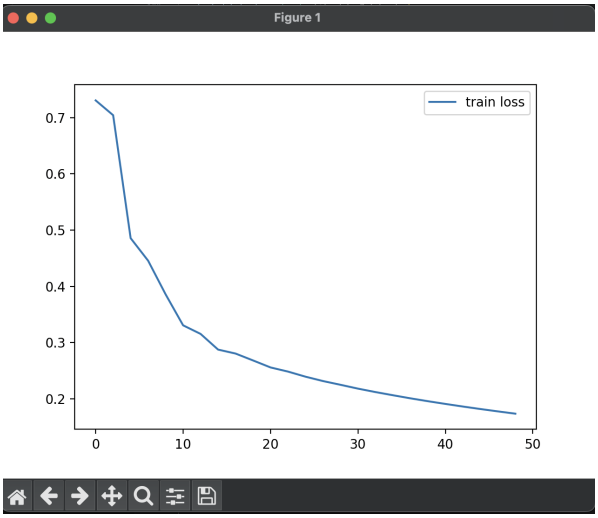
I believe that the following statement can be considered subjective as it conveys the opinions of hickley and not facts and saying “thinks he’s got a great scheme” makes it more subjective than objective.

## Question 4.4:

Provide the training loss and accuracy plot for the overfit data in your Report. [1 point]

## Answer:



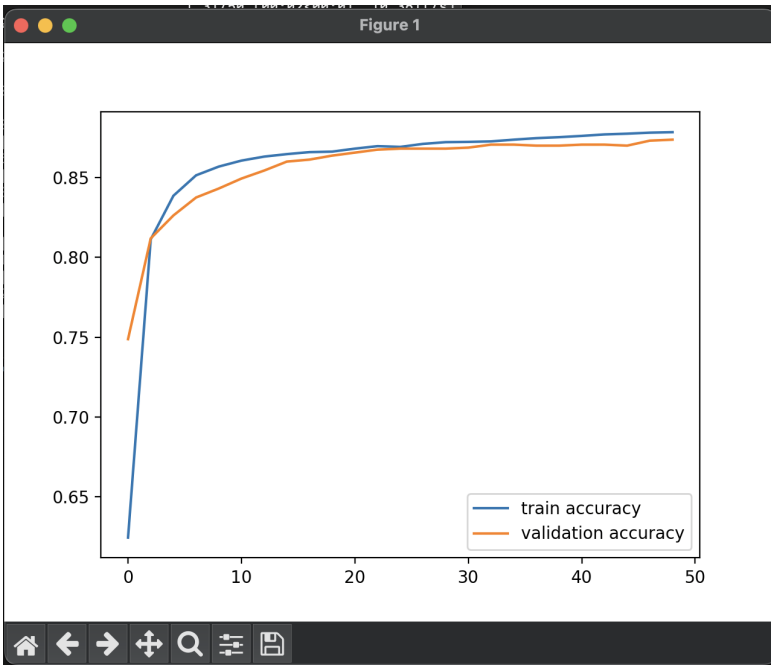

Final Loss: 0.17325676264590584

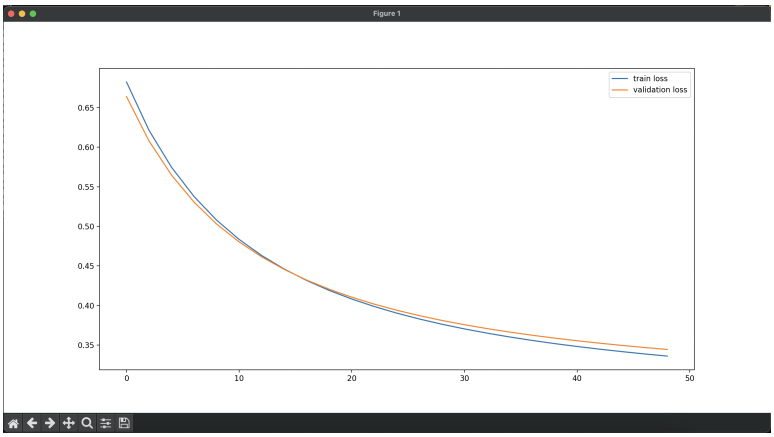
FInal Accuracy: 95.3125%

## Question 4.5:

Give the training and validation loss and accuracy curves vs. epoch in your report, and report the final test accuracy. Evaluate the test data and provide the accuracy result in your report.

### Answer:




It is to be noted that, there were different batch values tried from 16 to 128. I have stuck with 32 as the overfitting is relatively lesser acting as a good middle ground for the

results.

Final Test Accuracy: 87.85%

In the baseline model, what information contained in the original sentence is being ignored? [1 points]

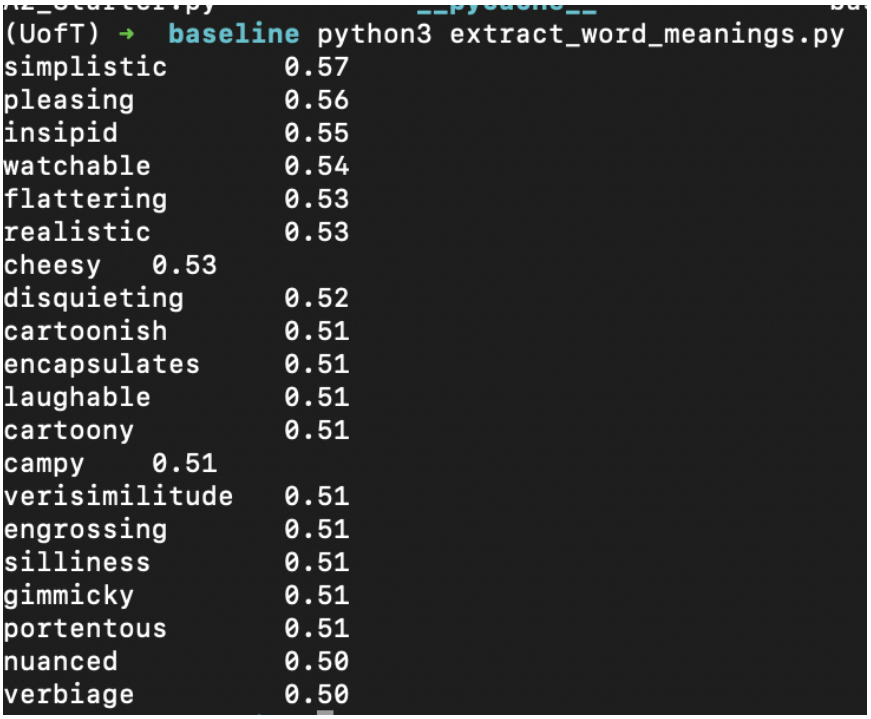
**Answer:**

When we compute the sentence's average meaning directly, we ignore various layers of information of the sentence. Firstly, we do not include contextual information, similar to how CNN kernels capture specific features to enhance predictions. However, in this approach, we directly average them leading to information loss. Secondly, the word order is ignored as well, as all words in the sentence are collectively seen together through averaging.

## Question 4.6:

Use that function to determine the 20 closest words to those trained parameters of the neuron. You should see some words that make it clear what the classifier is doing. Do some of the words that you generated make sense? Explain. [4 points]

## Answer:




We see that most of these words are adjectives that seem to refer to some type of sentiment (both positive and negative). As the database is related to movies reviews, we can possible say that these words are used to describe movies as a whole or scenes in particular.

Words like “pleasing”, “simplistic”, “engrossing” can be seen as positive sentiments while words like “cheesy”, “gimmicky” and “insipid” can refer to negative sentiments.

## Question 5.1:

Report the training accuracy that you were able to achieve with the overfit dataset. [1 point]

## Answer:

Following was the accuracy obtained:

**Train Acc:** 1.0

**Val Acc:** 0.77125

**Test Acc:** 0.7725

**Train Loss:** 0.518636167049408,

**Val Loss:** 0.6280039358139038,

## Question 5.2.1:

Report the accuracy and the full hyper-parameter settings. Give the training and validation curves for that best model, and describe your overall hyper-parameter tuning approach. [4 points]

## Answer:

Train Loss: 0.5291170297563076,

Val Loss: 0.5534900751709938,

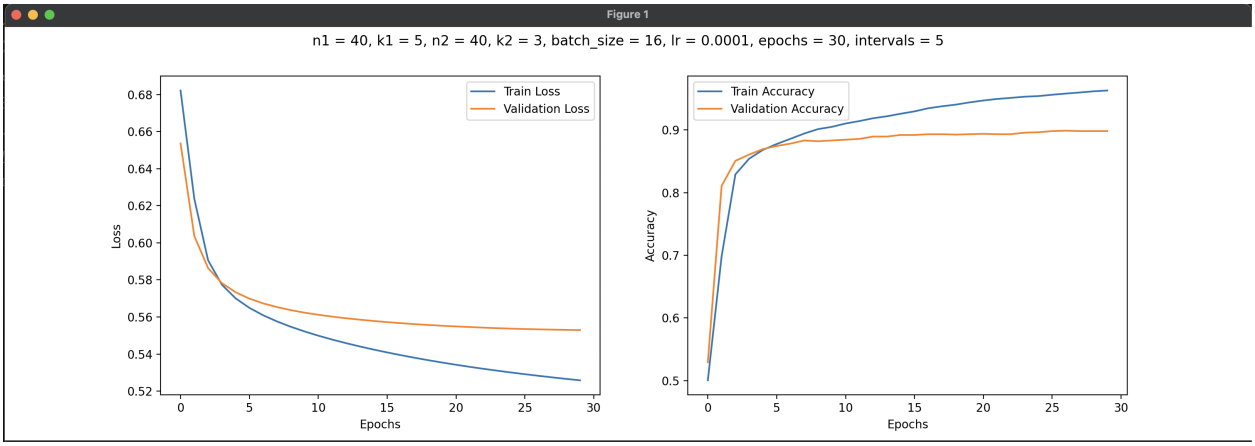
Train Acc: 0.95609375,

Val Acc: 0.898125

Test Acc: 0.9085

**Hyperparameters:**

- Input Parameters: n1 = 40, k1 = 5, n2 = 40, k2 = 3, batch_size = 16, lr = 0.0001, epochs = 30, intervals = 5




Used a grid search approach by selecting 3-4 values for each of n1, n2, k1, k2. This way we are able to select the best performing results. The upper and lower edge cases for each of the values were tested separately then the grid search was performed. All the results were stored in a text file with test accuracy.

## Question 5.2.2:

Report the accuracy of the result, and comment on the result. Save this model in a .pt file as you did in Section 4.7, for use below in Section 6. [2 points

## Answer:

Train Loss: 0.5100458048284053,

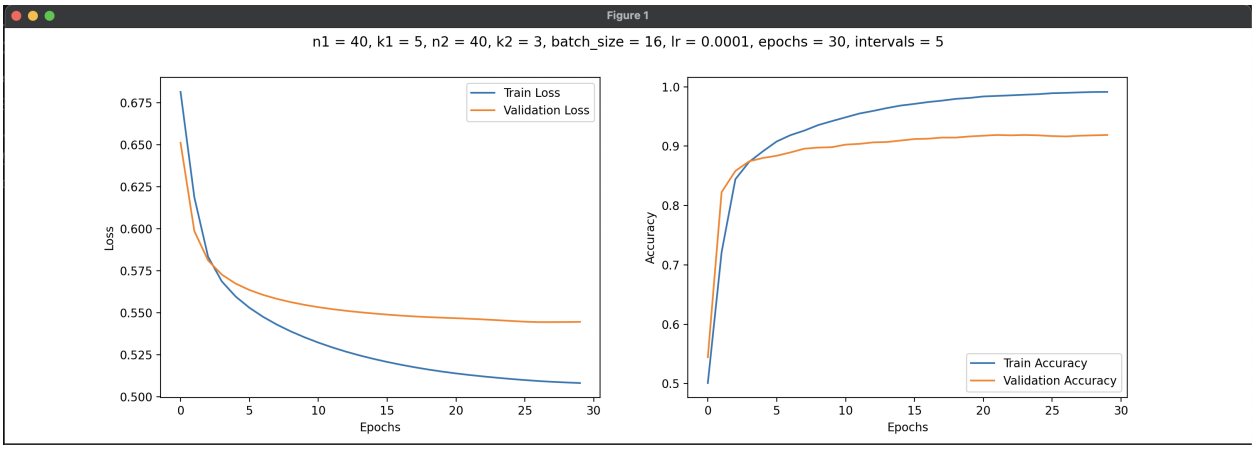
Val Loss: 0.5447830504179001,

Train Acc: 0.9890625,

Val Acc: 0.916875

Test Acc = 0.908

We see that the the accracy in training is higher for the unfrozen model which is possibly due to more learning of the specific parameters but interestingly the Test accuracy for both is roughly the same




## Question 5.3:

Use that function to determine the five closest words to each of the words in the the kernels trained in your best classifier. Do those words make sense? Do the set of words in each given kernel give a broader insight into what the model is looking for? Explain. [4 points]

## Answer:

Yes, the words do form certain patterns, indicating that the kernels predominantly cluster words that share common meanings or origins. In specific kernel instances,

there is a noticeable aggregation of terms related to body parts, countries, or synonymous adjectives, providing evidence for this.

In a more broader context, one could draw an analogy between the way kernels in convolutional neural networks (CNNs) excel at capturing diverse visual features in image-based tasks and the manner in which these textual kernels adeptly extract various textual characteristics.

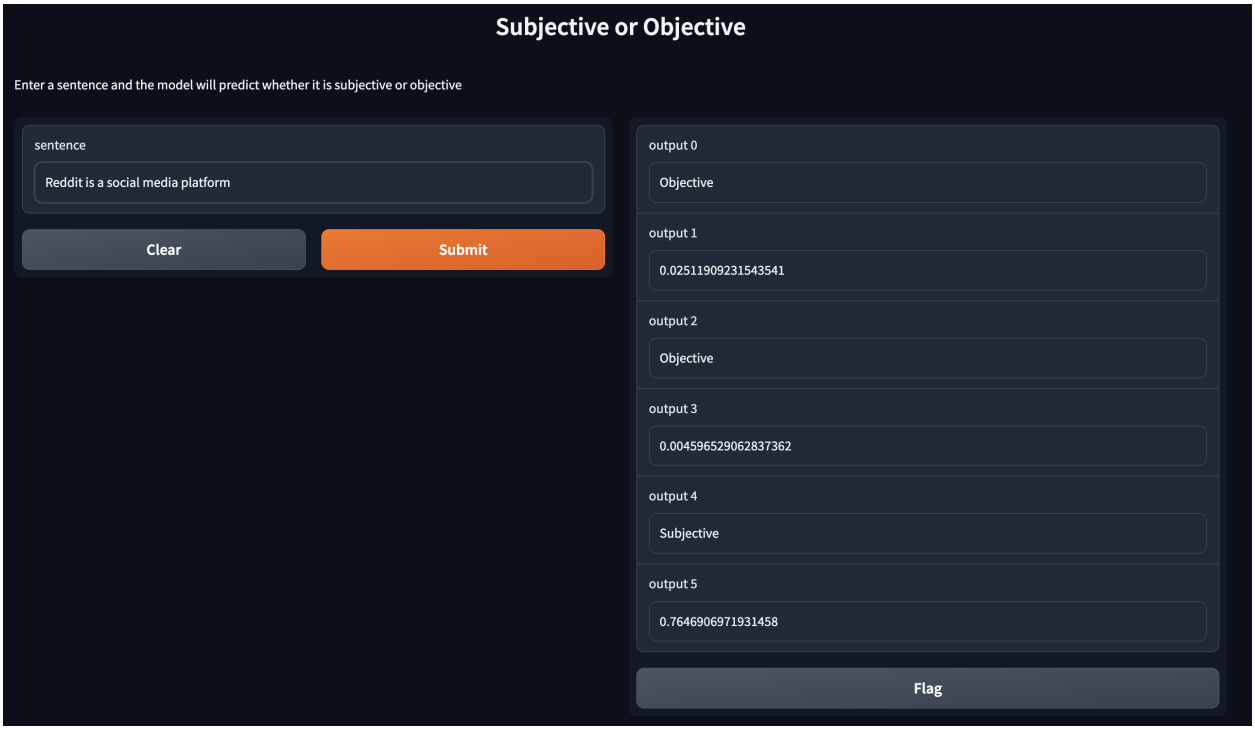
## Question 6.1:

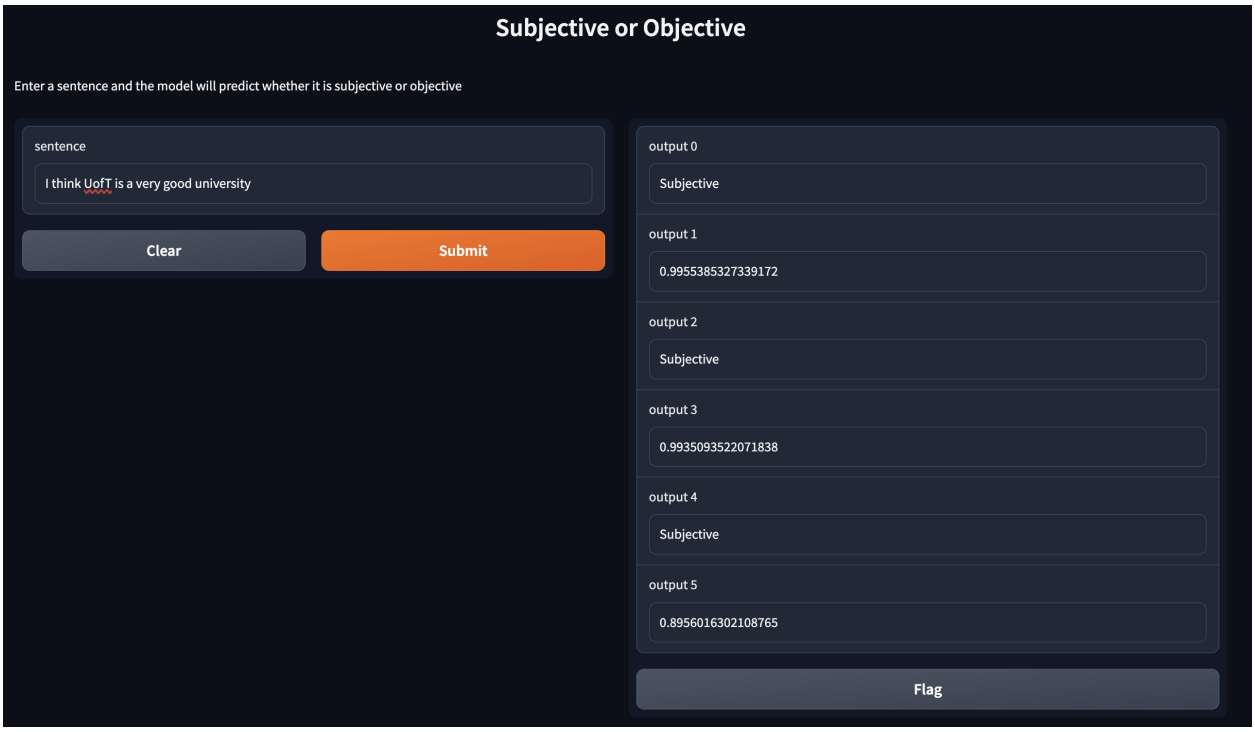
Include the input and output in your write up. Comment on how the two models performed and whether they are behaving as you expected. Do they agree with each other? Which model seems to be performing the best? [1 point]

## Answer:

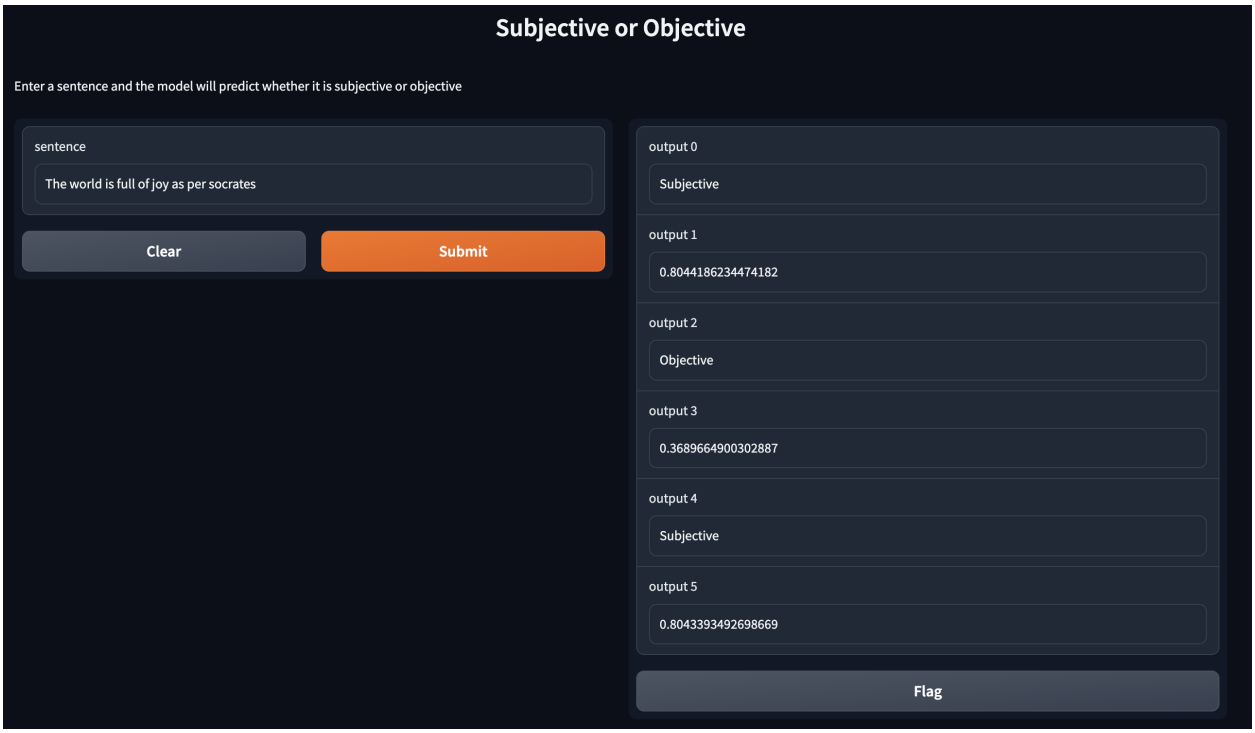
The first output is of CNN, second of unfrozen CNN, third is of the baseline model. They are indeed working as expected. Both the Definitely subjective and objective ones are perfect. But we see that even in the model's performance of borderline subjective or objective there are some differences.

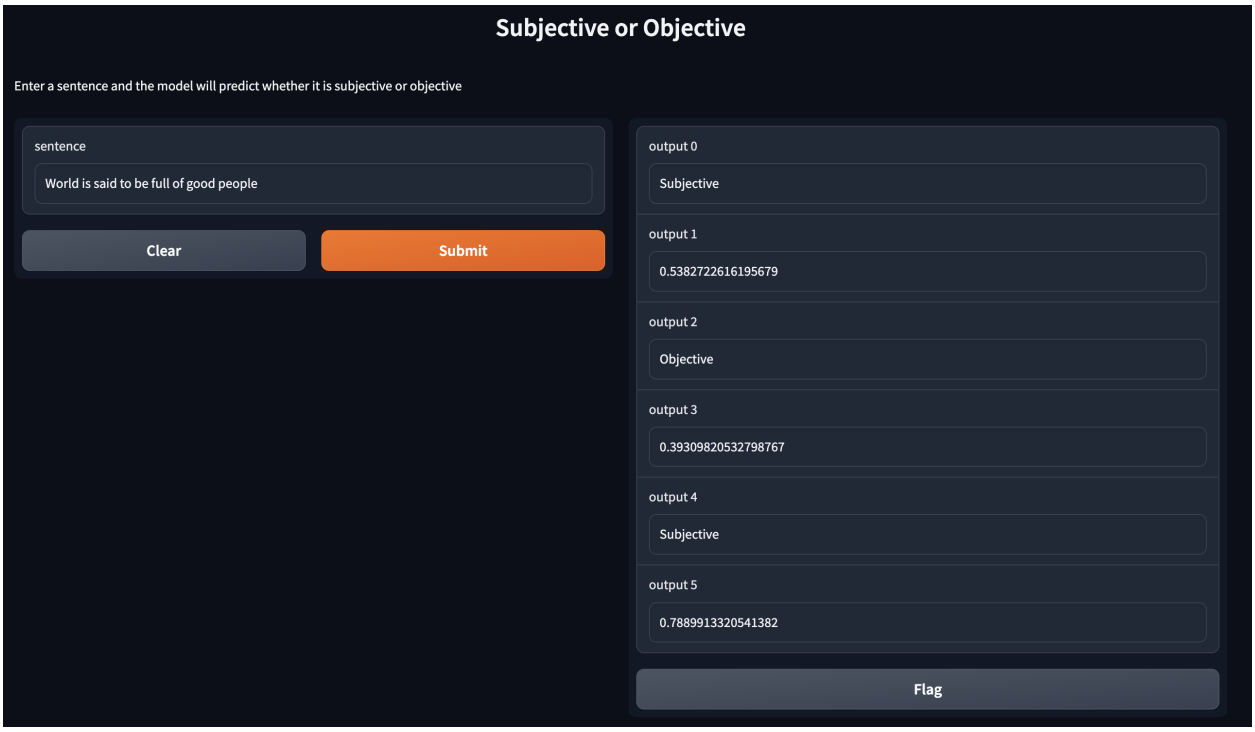
Unfrozen seems to run the best.




Subjective or Objective
Enter a sentence and the model will predict whether it is subjective or objective
sentence
I think UofT is a very good university
Clear
Submit
output 0
Subjective
output 1
0.9955385327339172
output 2
Subjective
output 3
0.9935093522071838
output 4
Subjective
output 5
0.8956016302108765
Flag

Debateable:


Subjective or Objective
Enter a sentence and the model will predict whether it is subjective or objective
sentence
The world is full of joy as per socrates
Clear
Submit
output 0
Subjective
output 1
0.8044186234474182
output 2
Objective
output 3
0.3689664900302887
output 4
Subjective
output 5
0.8043393492698669
Flag


Subjective or Objective
Enter a sentence and the model will predict whether it is subjective or objective
sentence
World is said to be full of good people
Clear
Submit
output 0
Subjective
output 1
0.5382722616195679
output 2
Objective
output 3
0.39309820532798767
output 4
Subjective
output 5
0.7889913320541382
Flag