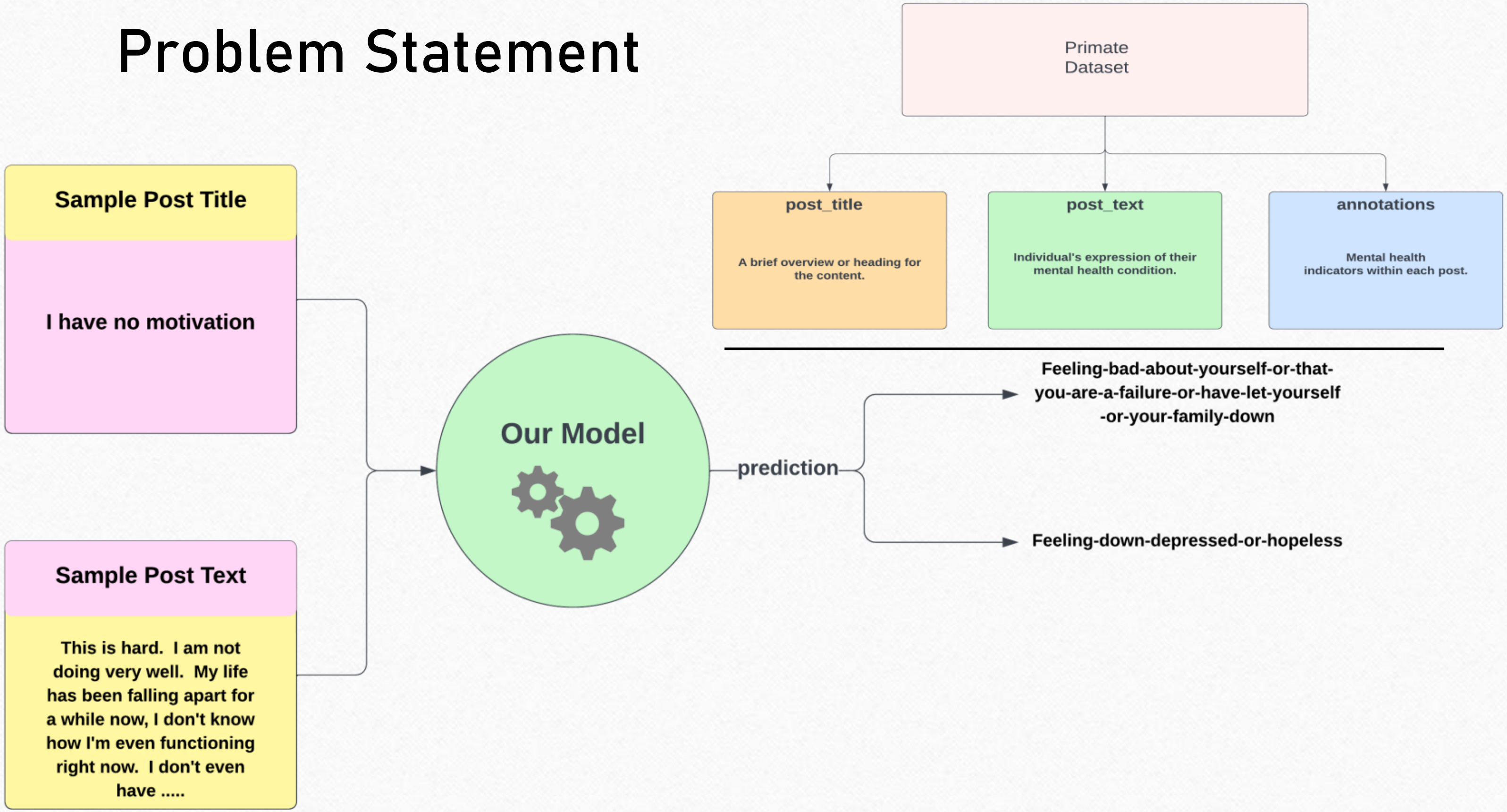
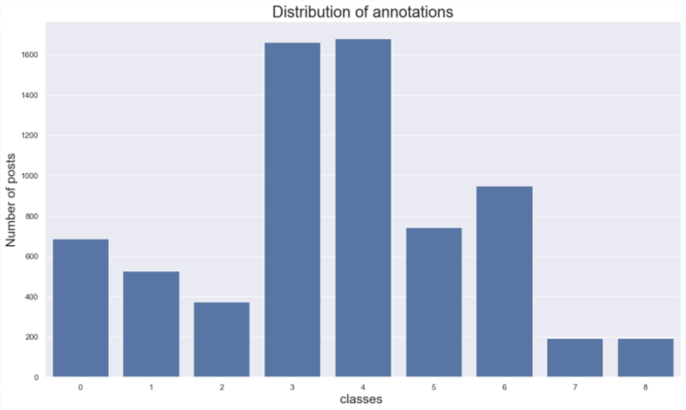
TEAM DETAILS AND PROBLEM STATEMENT

- **Problem Statement :** categorizes paragraphs based on the dataset's presence or absence of specific mental health indicators.
- **Team Name :** bHUC
- **Team Leader Details (Name, Phone Number, Email) :** Drishtant Singh Sengar , 9044400879
  bt22cse012@iiitn.ac.in
- **Institution Name :** IIIT Nagpur
- **Course Enrolled :** Btech CSE

Problem Statement



Observations : Class imbalance



1.Imbalanced Classes: When the classes are imbalanced, meaning some classes have significantly more instances than others, the model may become **biased towards the majority class**. This can lead to **poor performance** on the minority classes and inaccurate predictions.

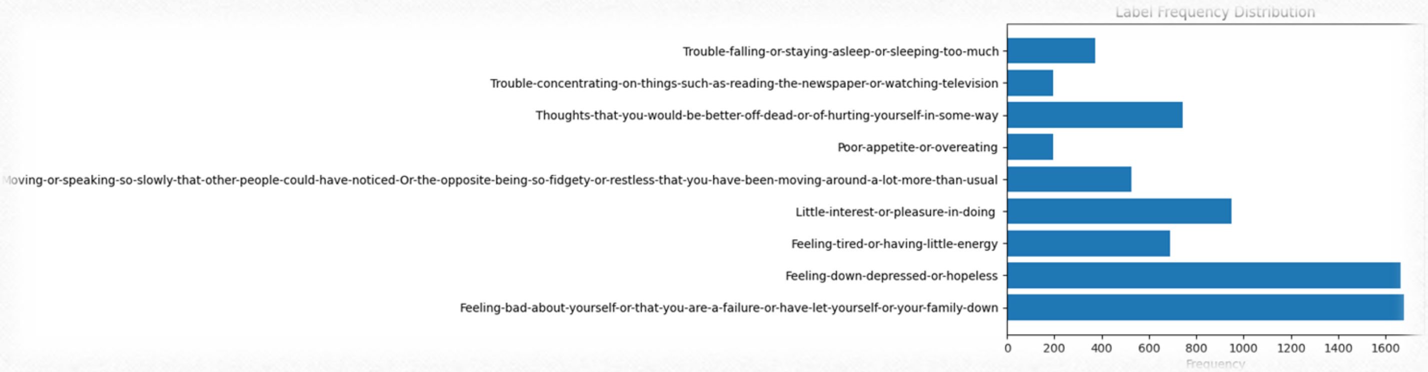
2.Limited Representation: Annotations with fewer instances may not have enough data to accurately learn their patterns and characteristics. As a result, the model may struggle to make accurate predictions for these annotations.

3.Evaluation Metrics: When evaluating the model's performance, metrics such as **accuracy may not provide an accurate representation of its effectiveness**. For imbalanced datasets, metrics like precision, recall, and F1-score are more informative in assessing the model's performance on individual classes.

Our Approach

To solve the problem of **label/class imbalance** we assigned different **weights** to each label to improve the precision and recall of our model.

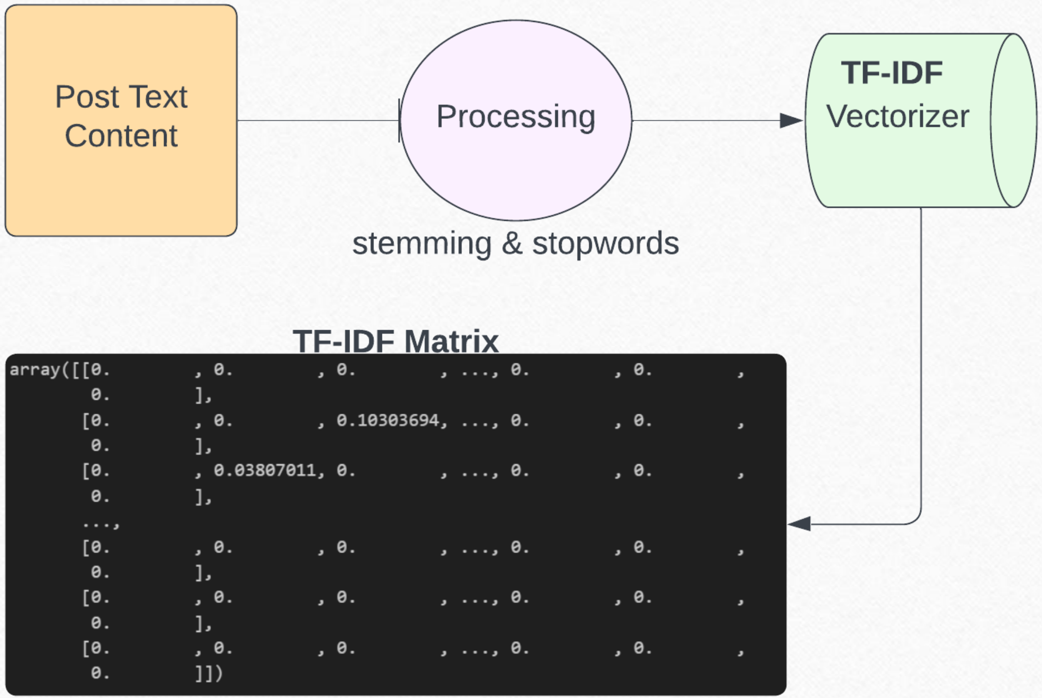
```
sample_weights = sample_weights[:-401]
sample_weights
✓ 0.0s
array([0.27509327, 0.07394186, 0.09504036, ..., 0.07394186, 0.26618515,
       0.32206228])
```



Our workflow(addressing class imbalance)

These are extremely black boxed explanations of the ML models to know how they were really implemented check out the Jupyter notebooks here!

Our workflow(vectorizing data)

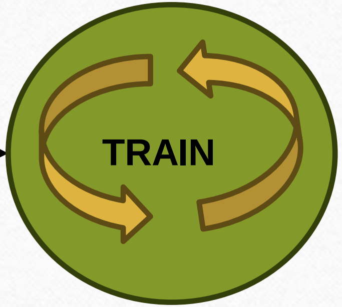


These are extremely black boxed explanations of the ML models to know how they were really implemented check out the Jupyter notebooks here!

Our workflow(neural network define and train)

```
model = Sequential([
    Dense(128, activation='relu', input_shape=(X_train.shape[1],)),
    Dropout(0.5),
    Dense(64, activation='relu'),
    Dropout(0.5),
    Dense(y_train.shape[1], activation='sigmoid')
])
```

Dense layer with 128 units
Dropout : to avoid overfitting
Final Dense layer → Num of target classes



10 EPOCHS

These are extremely black boxed explanations of the ML models to know how they were really implemented check out the Jupyter notebooks [here!]

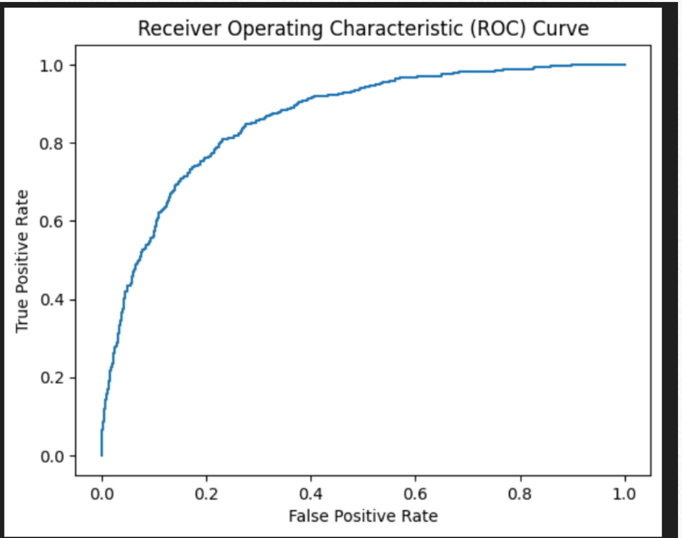
Evaluation metrics

	precision	recall	f1-score	support
0	0.81	1.00	0.89	162
1	0.83	1.00	0.90	166
2	0.61	0.19	0.29	72
3	0.56	0.47	0.51	93
4	0.83	0.18	0.29	56
5	1.00	0.05	0.10	19
6	0.88	0.53	0.66	81
7	1.00	0.05	0.09	21
8	0.50	0.05	0.09	39
micro avg	0.78	0.62	0.69	709
macro avg	0.78	0.39	0.43	709
weighted avg	0.76	0.62	0.62	709
samples avg	0.78	0.67	0.69	709

```
# Calculate the number of correct predictions
correct_predictions = sum(y_test == y_pred)

# Calculate the total number of predictions
total_predictions = len(y_pred)

# Calculate the accuracy
accuracy = correct_predictions / total_predictions

# Print the accuracy
print("Accuracy:", accuracy)
```

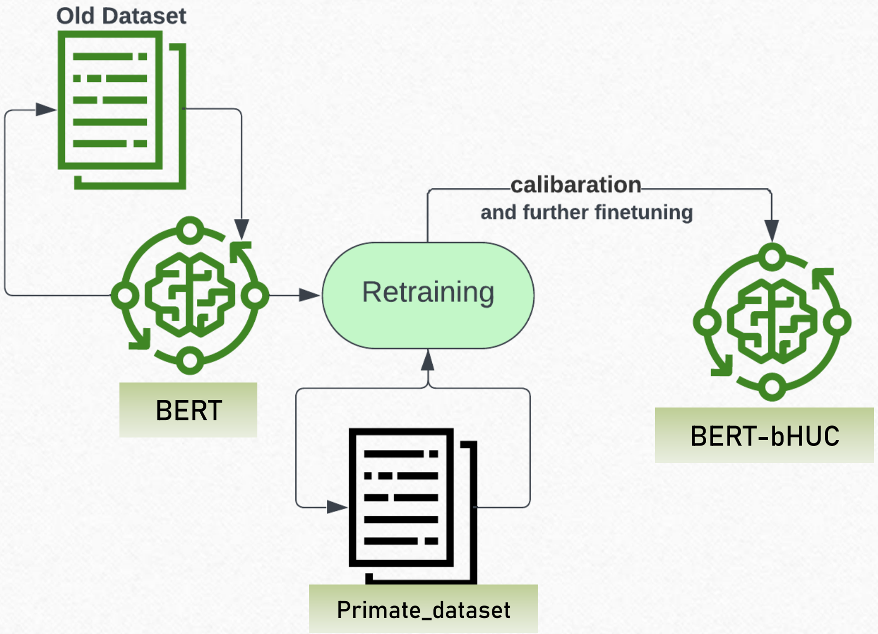
```
Accuracy: [0.80597015 0.82587065 0.66666667 0.58706468 0.76119403 0.91044776
 0.78109453 0.90049751 0.80597015]
```

Accuracy of each label



AUC Score: 0.8604103090139761

Our Second Approach(Transfer learning)



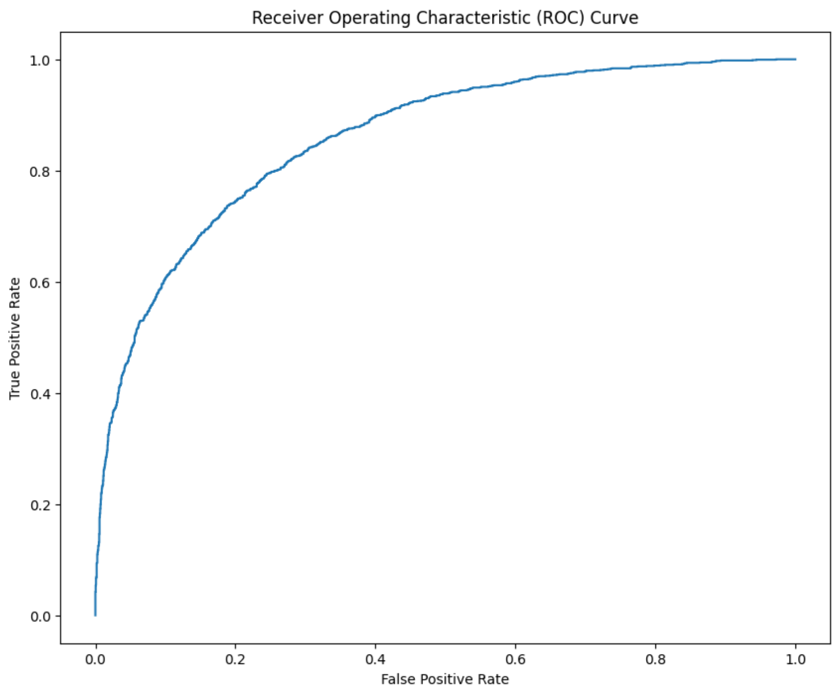
These are extremely black boxed explanations of the ML models to
know how they were really implemented check out the Jupyter notebooks here!

Evaluation metrics

Classification Report:

	precision	recall	f1-score	support
0	0.84	1.00	0.91	338
1	0.82	1.00	0.90	329
2	0.53	0.62	0.57	148
3	0.51	0.86	0.64	190
4	0.43	0.48	0.45	88
5	0.71	0.24	0.36	42
6	0.58	0.72	0.64	154
7	0.57	0.09	0.15	47
8	0.60	0.42	0.50	78
micro avg	0.68	0.79	0.73	1414
macro avg	0.62	0.60	0.57	1414
weighted avg	0.68	0.79	0.72	1414
samples avg	0.68	0.81	0.71	1414

Overall Accuracy: 10.47



As accuracy is not a great metric in multi-label classification with class imbalance we decided to choose this model as it performs better on other metrics