

# An Approach To Uncover The Roots Of Complex Emotions

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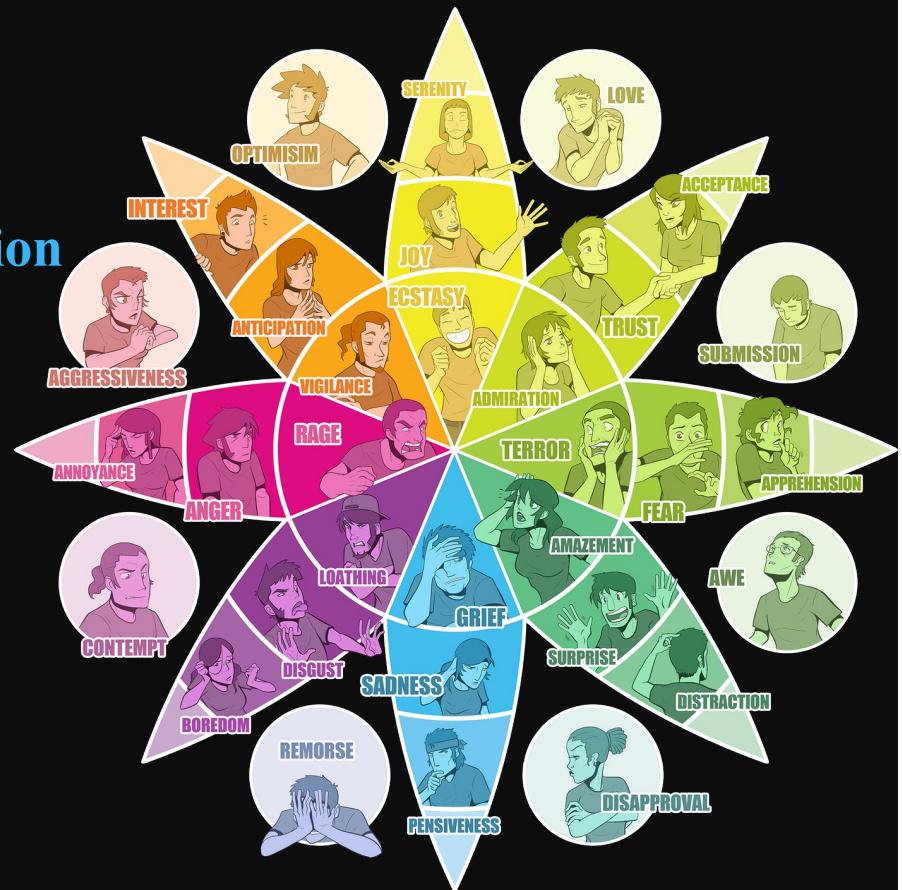
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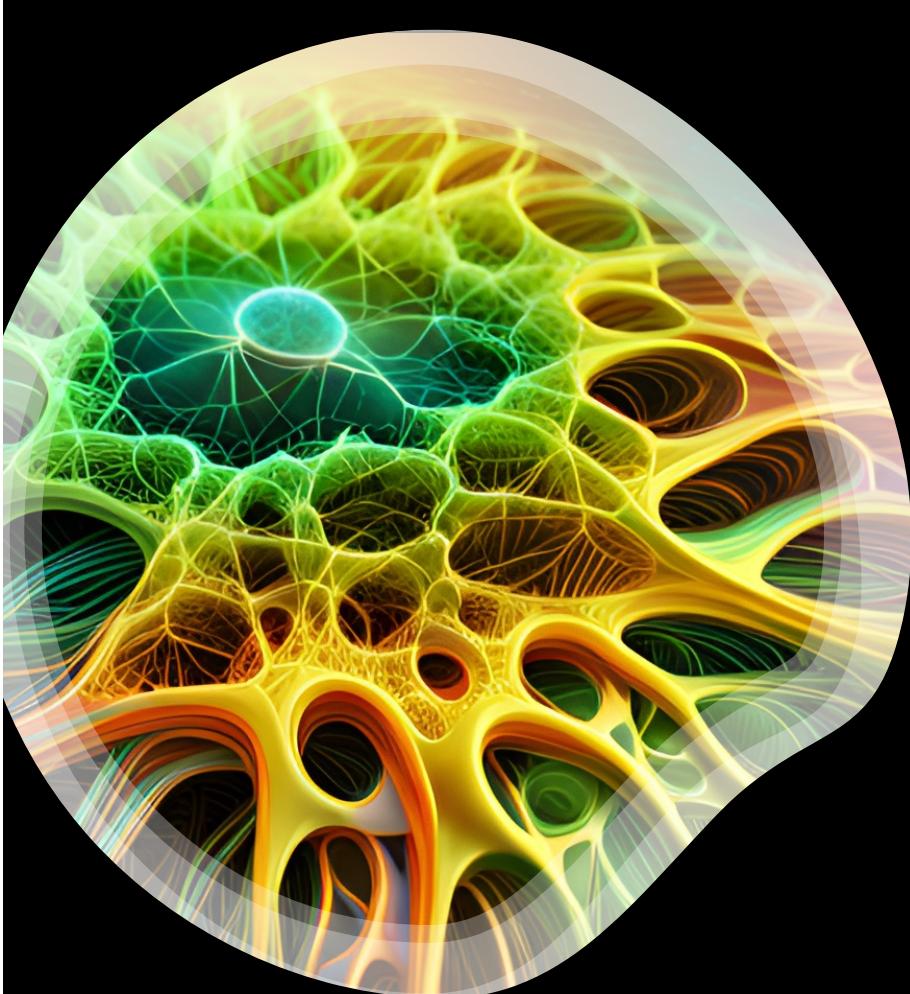
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## Outline

- Challenges in Text Emotion Prediction
- Approach
- Methodology
- Results
- Conclusion
- Future scope





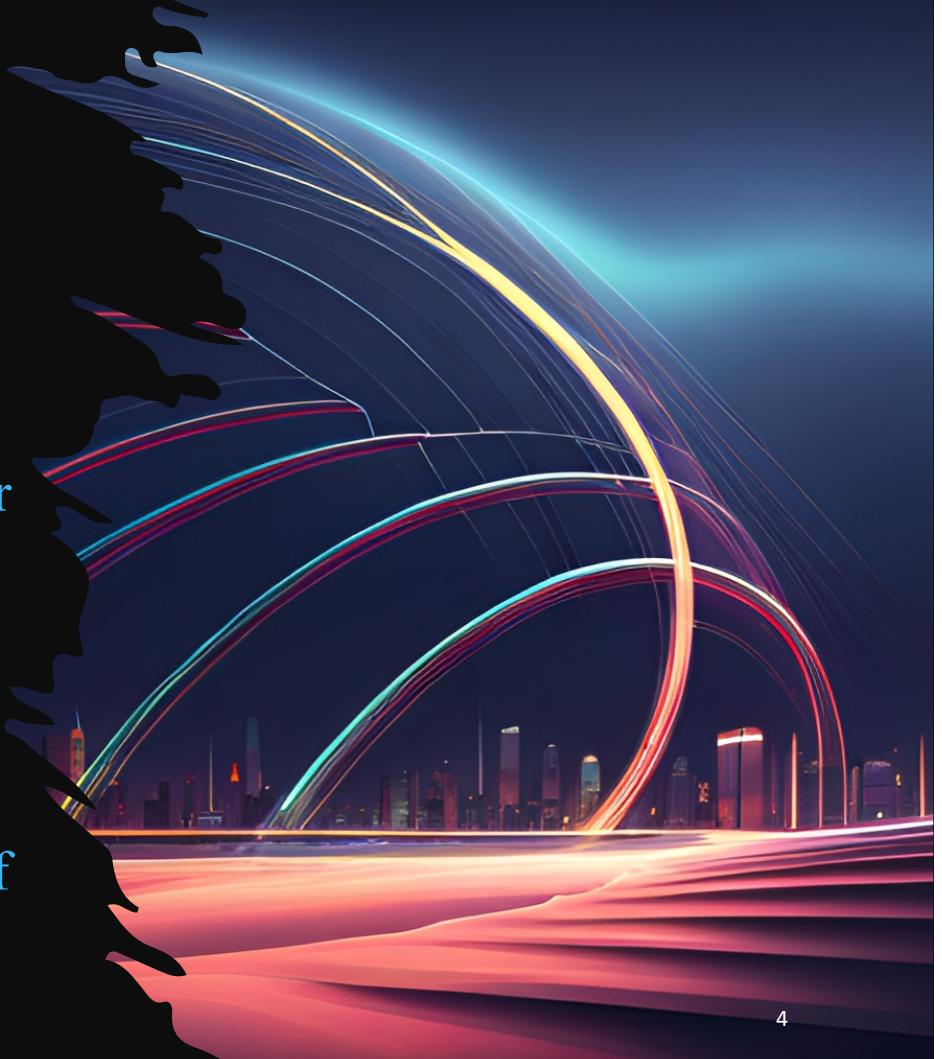
## Challenges in Text Emotion Prediction

Human emotions come in wide varieties and intensities. It becomes hard to characterize them just by relating the context to a emotion, thus failing to grasp the writer's core idea. This issue become more prominent when a written text is the only way to comprehend the author's ideas or when words are the sole means of expressing one's emotions. A way must be devised to understand the complex emotions.

## Approach

An emotion is a combination of three dimensions which are independent of each other.

- Valence(V): The subjective positive or negative evaluation of an experience or stimulus.
- Arousal(A): The level of physiological and psychological activation or energy associated with an experience or stimulus.
- Dominance(D): The perceived sense of control or power in relation to an experience or stimulus.



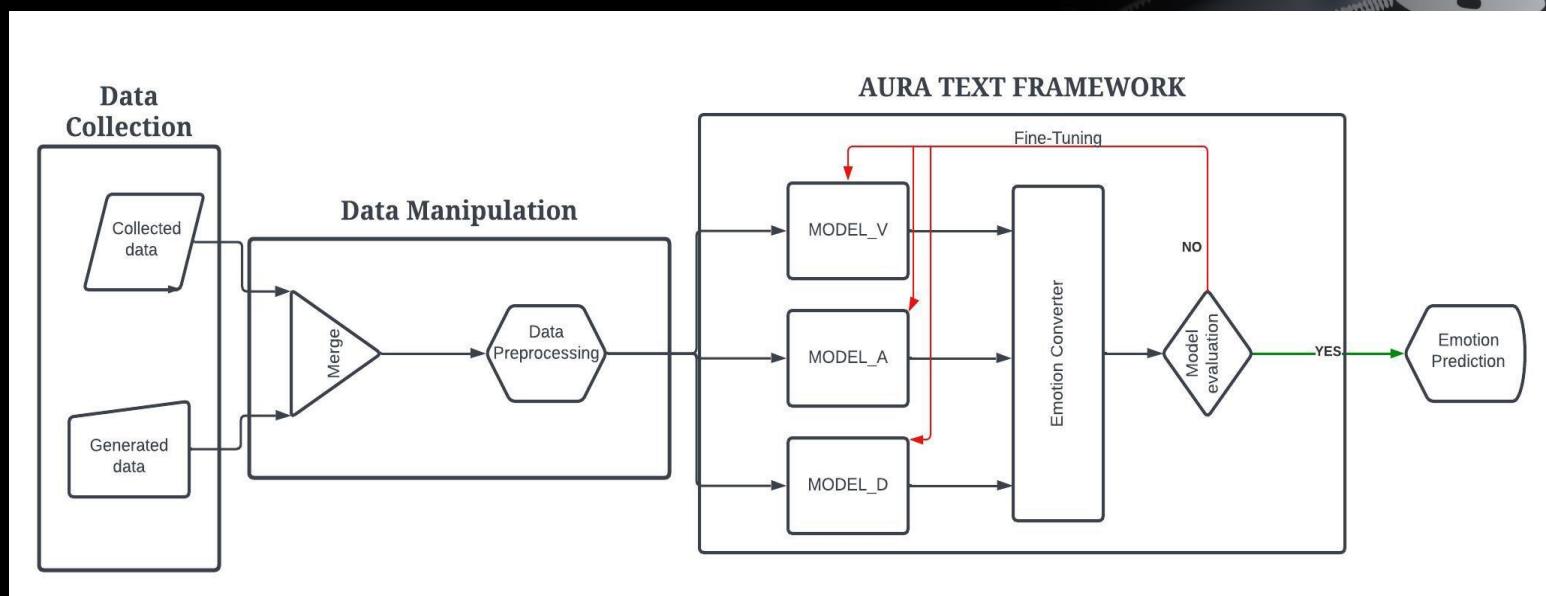
## Approach

We will leverage the multi-dimensionality nature of human emotions to create a precise predicting system

This approach will help use over come the restrictive nature of classic classification method which are limited to small set of emotions



# Methodology



The flow of data through the model

## Data Collection

- The main source of data was decided as *EmoBank<sup>1</sup>* Corpus due to its unique annotations of continuous VAD values.
- The second source of data was OpenAi ChatGPT4 using advanced prompting to generate certain amount of textual data to fill gaps in the distribution of *EmoBank<sup>1</sup>* corpus
- A data set was created from the research paper *Evidence of Three Factor Theory of Emotions<sup>2</sup>* to get emotions and their VAD values

### References :

1. <https://doi.org/10.48550/arXiv.2205.01996>
2. [https://doi.org/10.1016/0092-6566\(77\)90037-X](https://doi.org/10.1016/0092-6566(77)90037-X)



## Data Wrangling

- We have merged two datasets i.e., EmoBank and data generated using ChatGPT4.
- Then data is pre-processed to remove all the clutter that may exist, like website links, unwanted punctuations etc..
- We tried to preserve any special characters that can contribute to emotion prediction.



## AURA-TEXT FRAMEWORK

- Our devised system incorporates three different BERT architectures, each trained independently on individual variables.
- The unique training approach acknowledges the independence of the three variables(V,A,D).
- Once these models have been effectively trained, their predicted outputs are fed into an emotion-converter, which derives the emotional tone of the predicted sentence.

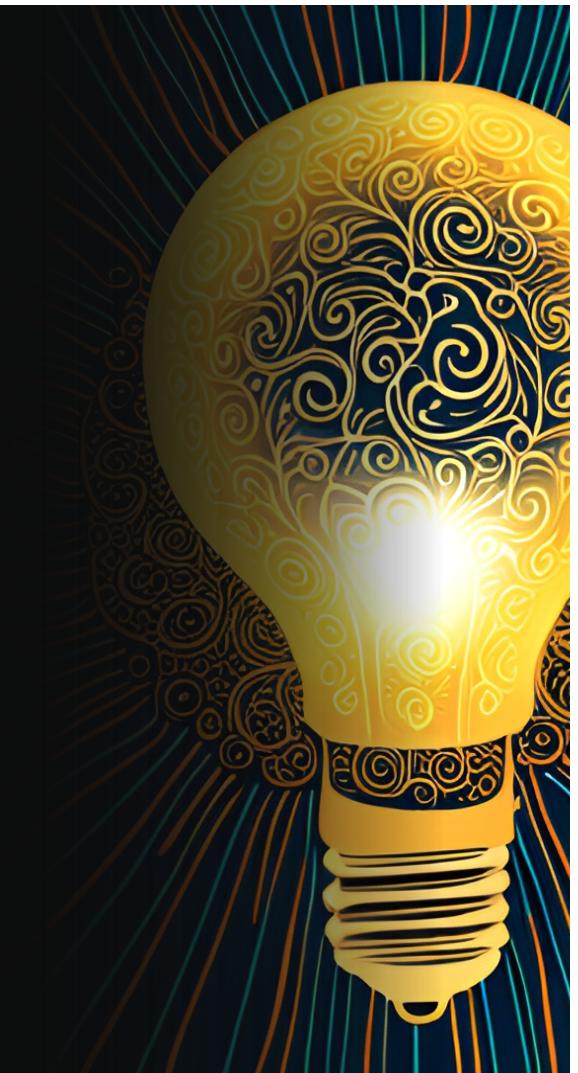


## AURA-TEXT FRAMEWORK

- The Emotion convertor works on the principle of *Mahalanobis distance*<sup>1</sup>, which is a measure between a sample point and a distribution.
- The emotion convertor will give top five emotions which are closest to the predicted VAD value in a 3D space with their intensities in percentage.

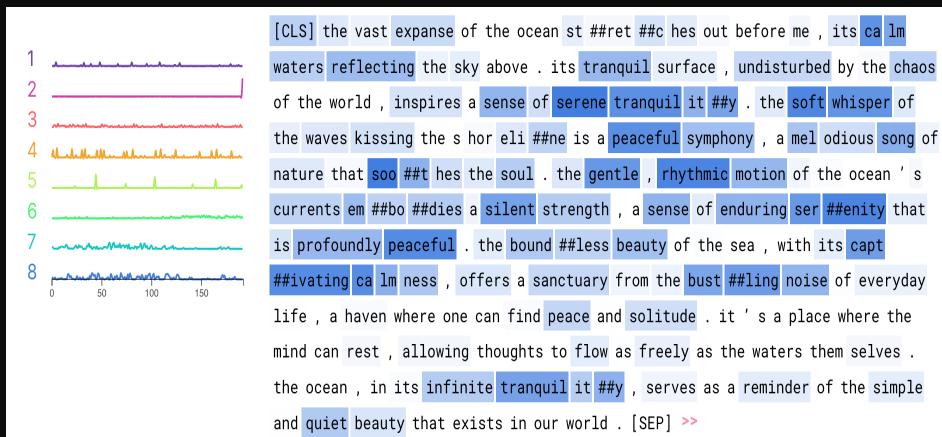
### References:

1. [https://www.researchgate.net/publication/225427767\\_Mahalanobis\\_Distance](https://www.researchgate.net/publication/225427767_Mahalanobis_Distance)



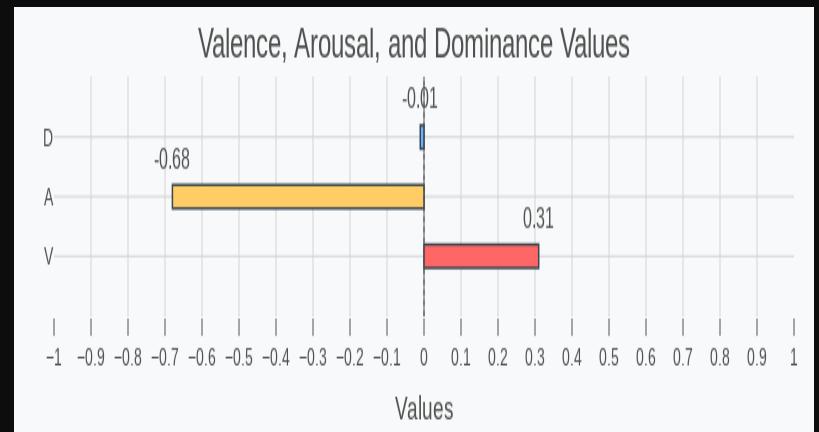
# Framework Result

**Test Sentence:** The vast expanse of the ocean stretches out before me, its calm waters reflecting the sky above. Its tranquil surface, undisturbed by the chaos of the world, inspires a sense of serene tranquility. The soft whisper of the waves kissing the shoreline is a peaceful symphony, a melodious song of nature that soothes the soul. The gentle, rhythmic motion of the ocean's currents embodies a silent strength, a sense of enduring serenity that is profoundly peaceful. The boundless beauty of the sea, with its captivating calmness, offers a sanctuary from the bustling noise of everyday life, a haven where one can find peace and solitude. It's a place where the mind can rest, allowing thoughts to flow as freely as the waters themselves. The ocean, in its infinite tranquility, serves as a reminder of the simple and quiet beauty that exists in our world.



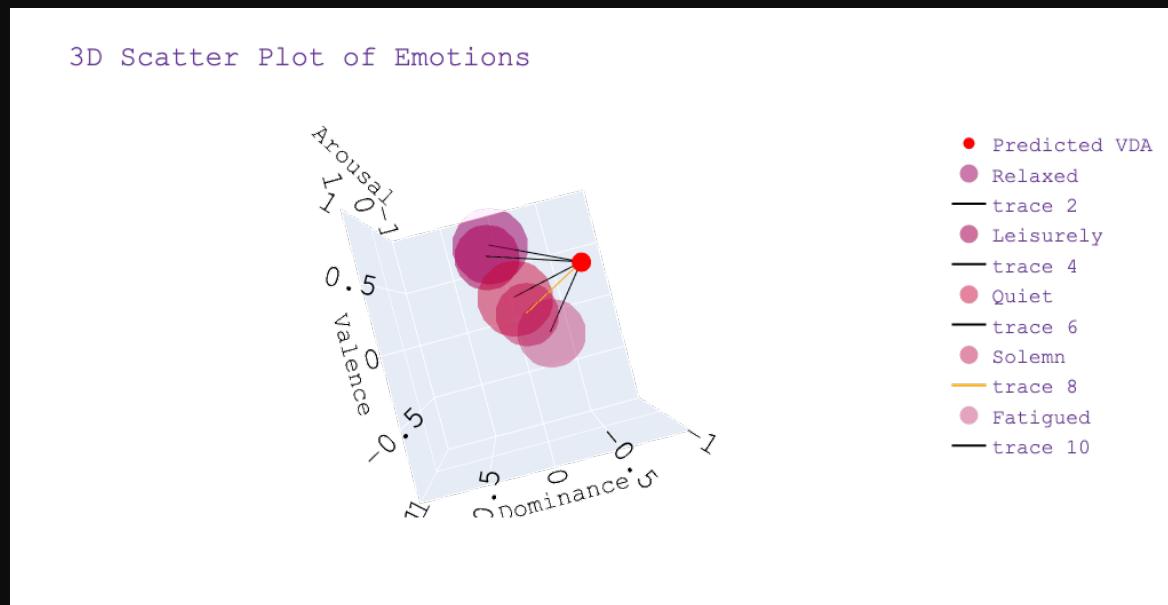
## Activations of All Layers

- We can observe that the model concentrates on such words that are related to emotions, though this is human intuition as the model never sees the actual emotions. words like "tranquil", "peaceful", "solitude", "symphony"



## Model Predictions

## Framework Result

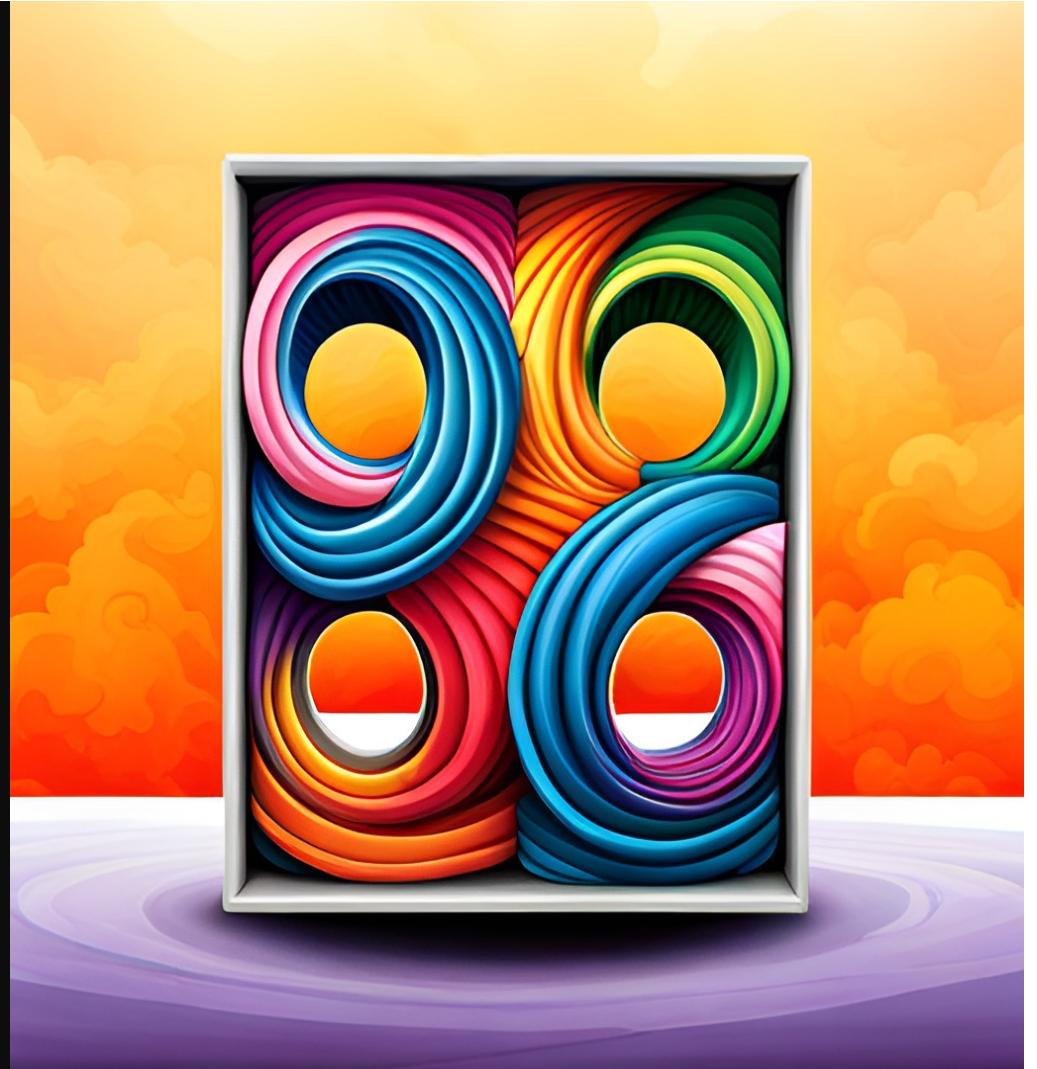


The point closely resembles the following emotions with the following intensities:  
Quiet : 83.60 %  
Relaxed : 83.39 %  
Leisurely : 83.21 %  
Fatigued : 82.35 %  
Solemn : 80.73%

The Orange color trace represents the line connecting the VAD values to the nearest emotion

## Conclusion

1. A framework was successfully devised to predict the emotion behind a sentence using VAD values .
2. The predicted values were plotted in a 3D-space for better understanding complex emotions.
3. Furthermore, we visualised how model is understanding the sentences while predicting without knowing the actual emotion.



## Future Scope

- We will fine-tune more on our models with different training strategies
- We will explore architecture which includes encoder-decoder like T5 family.
- We will explore our framework's performance on IEMOCAP and Go\_emotions dataset for evaluation



Thank you