AN APPROACH TO UNCOVER THE ROOTS OF COMPLEX EMOTIONS

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Abstract:

In Natural Language Processing (NLP), it's a challenge to fully capture the complexity and depth of human emotions. Most existing models oversimplify emotions into basic categories, missing out on their intricate details. This study presents a solution to this issue with AURA-Text (An Uncovering Roots Approach), a comprehensive framework that uses BERT family models to predict complex emotions. AURA-Text works with the Valence(V), Dominance(D), and Arousal(A), three independent dimensions, which goes beyond the simple "positive-negative" view of emotions, capturing a wider range of emotional states. By considering the details and changes in the VDA dimensions, AURA-Text offers a deeper look into complex emotions. By adapting VDA values, AURA-Text not only improves our understanding of emotions in text but also aids the development of smarter, more emotion-sensitive AI systems. We believe that our contribution paves the way for further study towards a better understanding of human emotions.

GitHub Repo: https://github.com/karthik0899/EmoSense

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1. Introduction

Emotions play a pivotal role in human existence, influencing our perception, cognition, and behavior. They are complex physiological responses resulting from the interplay between subjective experiences, cognitive processes, and biological reactions. Valence, Dominance, and Arousal (VDA) are three prominent dimensions that provide a comprehensive framework to represent and understand the broad spectrum of human emotions. Valence refers to the intrinsic attractiveness or averseness of an emotion, essentially gauging its positive or negative nature. Dominance reflects the level of control or influence one perceives they have in a situation, and Arousal indicates the intensity of an emotion, capturing the physiological and cognitive activation. An emotion, for instance, joy, may be expressed with high valence (positive), moderate arousal (somewhat intense), and high dominance (a feeling of control). These three dimensions are interrelated yet distinct, creating a multidimensional emotional space that allows a nuanced interpretation of emotional states. The VDA model transcends the binary positivity-negativity paradigm by incorporating the intensity and dominance aspects of emotions, thereby painting a more comprehensive emotional picture.

Addressing the research gap by considering the complexity and multidimensionality of human emotions, the analysis of VDA values in predicting emotional states holds significant promise over conventional classification models. Classification models tend to oversimplify the emotional landscape by assigning a single, discrete label, often neglecting the intricate emotional nuances inherent in human sentiment. On the contrary, the VDA-based approach captures the subtleties and variability of emotions. Given the dimensional nature of VDA values, it allows us to identify and analyze the intensity and control aspect of emotions, thus providing a richer, more detailed emotional context. In the domain of Natural Language Processing, predicting the VDA values of a sentence rather than classifying it into a single emotional category has the potential to revolutionize the way we understand and interpret sentiment in text. This approach opens the door to a more refined understanding of human sentiment, paving the way for more personalized and empathetic AI systems. With its capacity to detect the subtleties of human emotion, this method promises to advance our comprehension of emotions in text and enhance the development of emotionally intelligent AI systems.
We used EmoBank[2] dataset to train our DistillBERT[3] and RoBERTa[4] Model for VDA regression and we used the table proposed by[1] to convert VDA values to their corresponding emotions from the plethora of 151 emotions.

2. Experimental Results
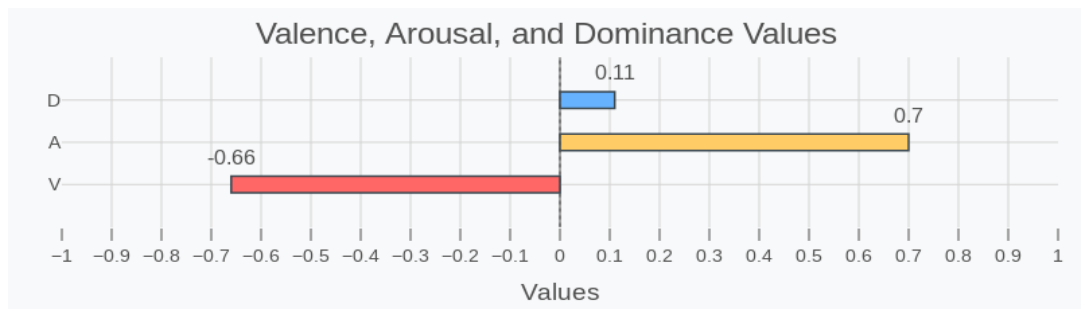
I.   Sentence: "I hate you"

        Prediction: [Valence= -0.71, Arousal= 0.51, Dominance= 0.11]
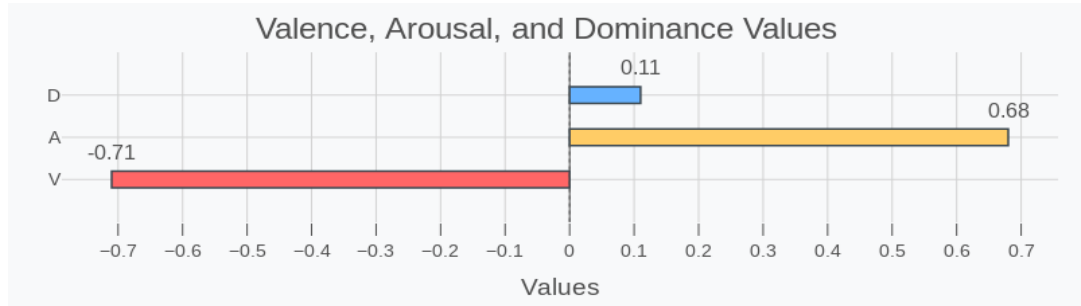
Top 5 predicted emotions with intensities:
1. Hate: 89.90 %
2. Disgusted: 88.54 %
3. Irritated: 88.35 %
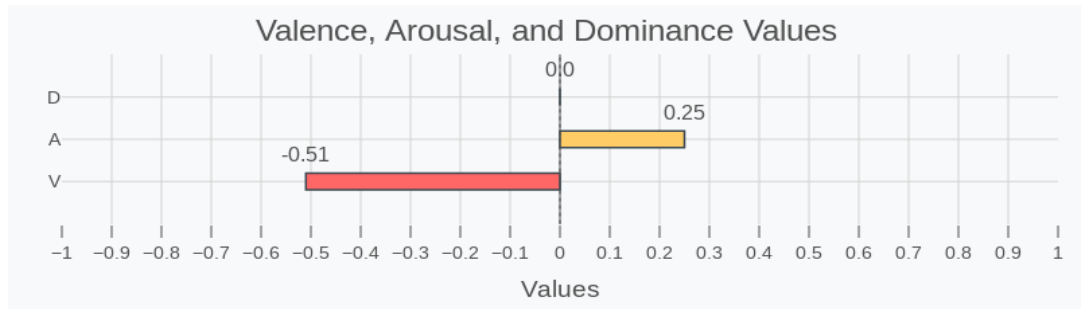4. Angry: 84.84%
5. Hostile: 79.52%

II.   Sentence: "I hate you and disgust you"

        Prediction: [Valence= -0.66, Arousal= 0.7, Dominance= 0.11]

Top 5 predicted emotions with intensities:
1. Hate: 91.54%
2. Angry: 86.87%
3. Enraged: 82.81%
4. Irritated: 81.60%
5. Cold anger: 81.58%
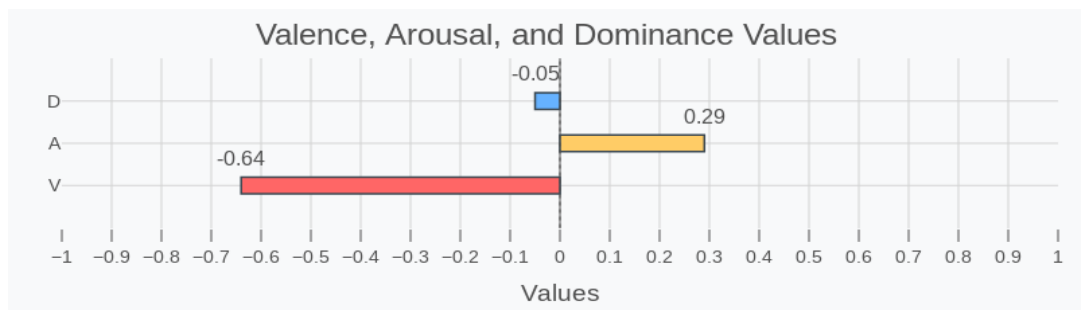
III.   Sentence: "It was the worst day of my life"
      Prediction: [Valence= -0.51, Arousal= 0.25, Dominance= 0.0]

Top 5 predicted emotions with intensities:
1. Angry but detached: 93.39%
2. Displeased: 92.66%
3. Irritated: 88.98%
4. Disgusted: 88.45%
5. Embattled: 86.29%
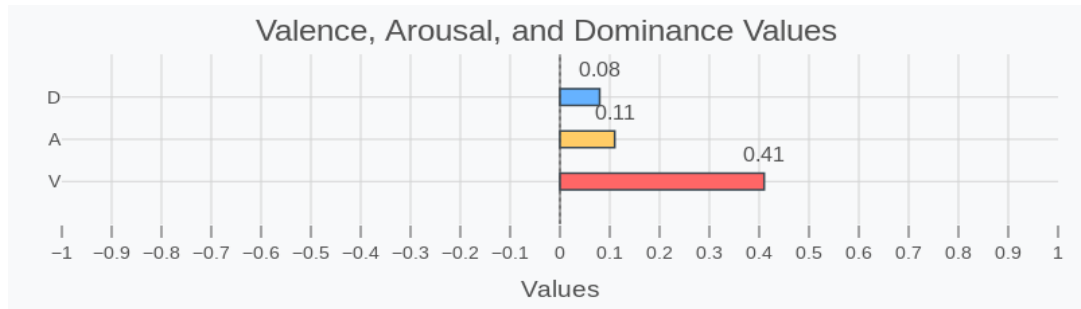
IV.   Sentence: "I am sad to be alive"
      Prediction: [Valence= -0.64, Arousal= 0.29, Dominance= -0.05]

Top 5 predicted emotions with intensities:
1. Irritated: 91.56 %
2. Displeased: 90.39 %
3. Disgusted: 89.33 %
4. Upset: 88.42 %
5. Angry but detached: 86.56 %
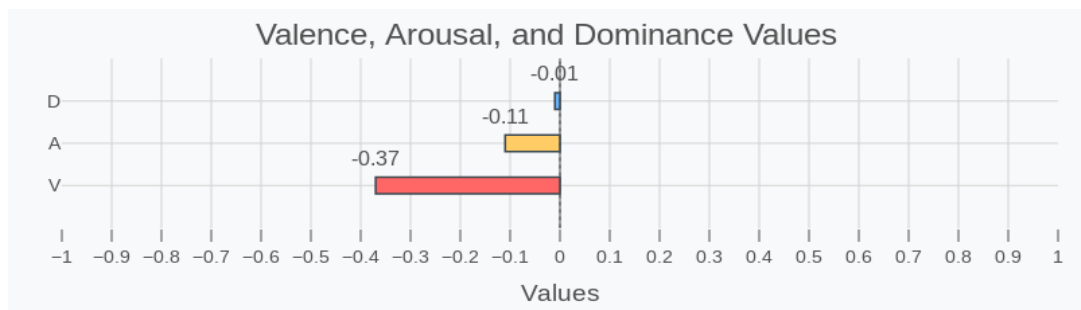
V.   Sentence: "Thank you for your help"
        Prediction: [Valence= 0.41, Arousal= 0.11, Dominance= 0.08]

Top 5 predicted emotions with intensities:
1. Cooperative: 95.75%
2. Devoted: 92.45%
3. Respectful: 87.86%
4. Hopeful: 87.61%
5. Modest: 83.43%
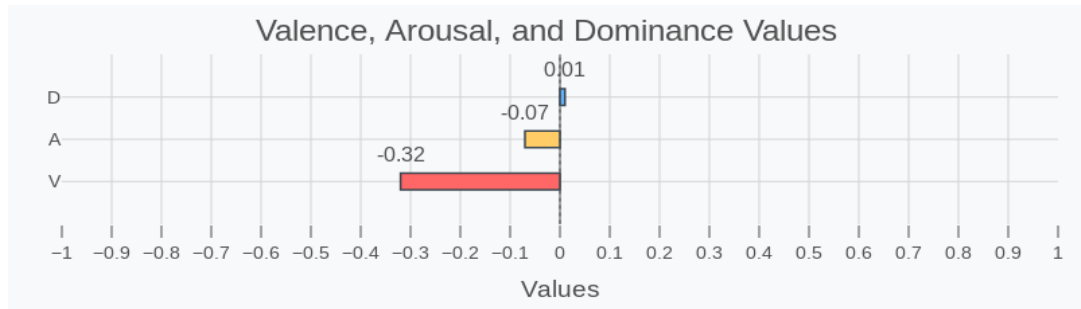
VI.   Sentence: "It was a boring day"
        Prediction: [Valence= -0.37, Arousal= -0.22, Dominance= -0.01]

Top 5 predicted emotions with intensities:
1. Disdainful: 94.48 %
2. Weary with responsibility: 88.41 %
3. Detached: 85.99 %
4. Haughty and lonely: 85.65 %
5. Quietly indignant: 83.72 %
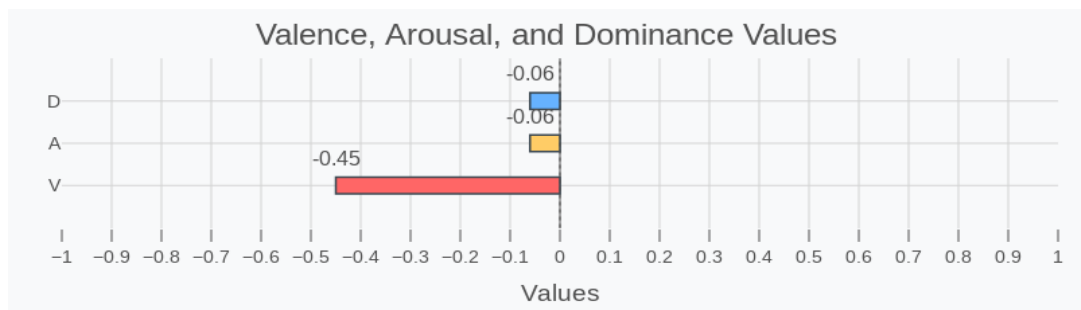
VII.   Sentence: "That was a bad situation"

         Prediction: [Valence= -0.32, Arousal= -0.07, Dominance= 0.01]

Top 5 predicted emotions with intensities:

1. Disdainful: 95.83%
2. Weary with responsibility: 92.26%
3. Quietly indignant: 84.77%
4. Mildly annoyed: 81.91%
5. Detached: 81.76%

VIII.   Sentence: "The window shattered in pieces when the ball hit it"

         Prediction: [Valence= -0.45, Arousal= -0.06, Dominance= -0.06]

Top 5 predicted emotions with intensities:

1. Disdainful: 88.16%
2. Regretful: 87.73%
3. Haughty and lonely: 87.04%
4. Weary with responsibility: 86.44%
5. Anguished: 86.37%
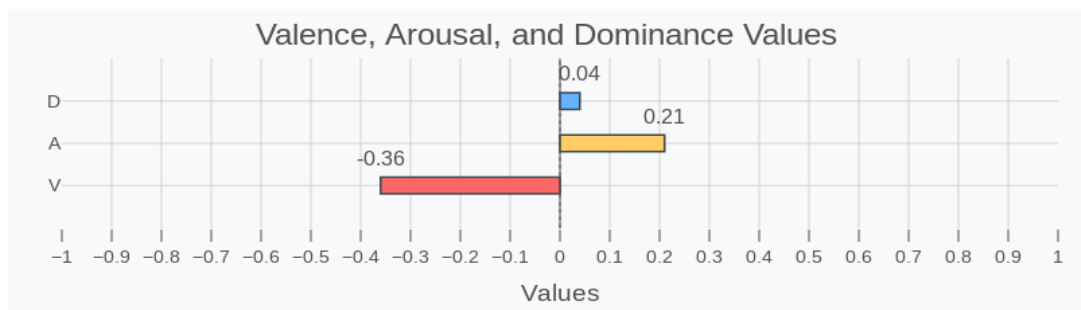
IX.   Sentence: "The old woman was very weak to walk"
       Prediction: [Valence= -0.26, Arousal= -0.05, Dominance= -0.1]
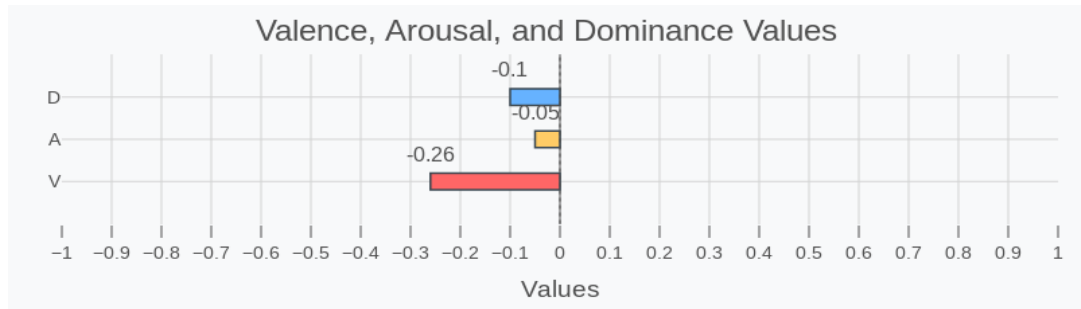
Top 5 predicted emotions with intensities:
1. Quietly indignant: 91.88%
2. Weary with responsibility: 91.55%
3. Disdainful: 87.28%
4. Repentant: 83.09%
5. Detached: 82.25%
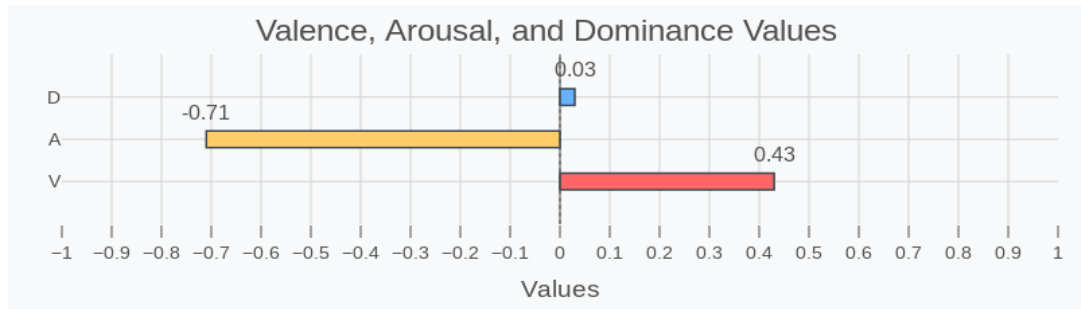
X.   Sentence: "Judge said that evidence tampering is a crime"
       Prediction: [Valence= -0.36, Arousal= 0.21, Dominance= 0.04]

Top 5 predicted emotions with intensities:
1. Sinful: 94.17%
2. Mildly annoyed: 93.38%
3. Angry but detached: 91.43%
4. Skeptical: 89.61%
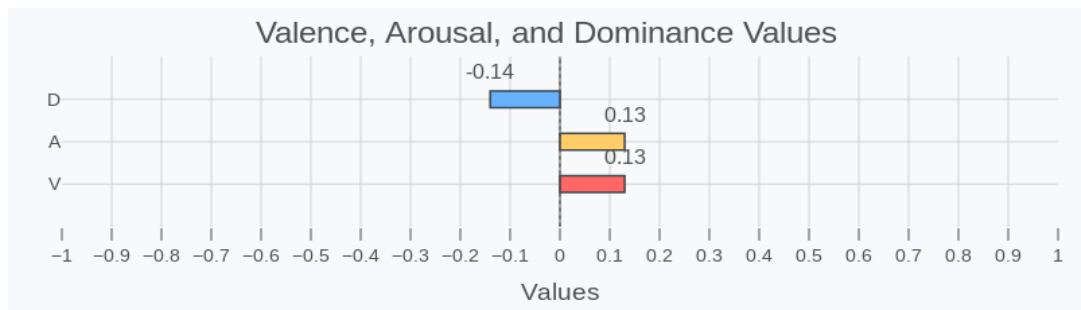5. Insolent: 86.03%

XI. Sentence: "The ocean is so peaceful"
    Prediction: [Valence= 0.43, Arousal= -0.71, Dominance= 0.03]

Top 5 predicted emotions with intensities:
1. Relaxed: 81.44%
2. Quiet: 79.17%
3. Leisurely: 77.75%
4. Humble: 70.65%
5. Solemn: 69.87%

XII. Sentence: "I hope for a better future"
    Prediction: [Valence= 0.13, Arousal= 0.13, Dominance= -0.14]
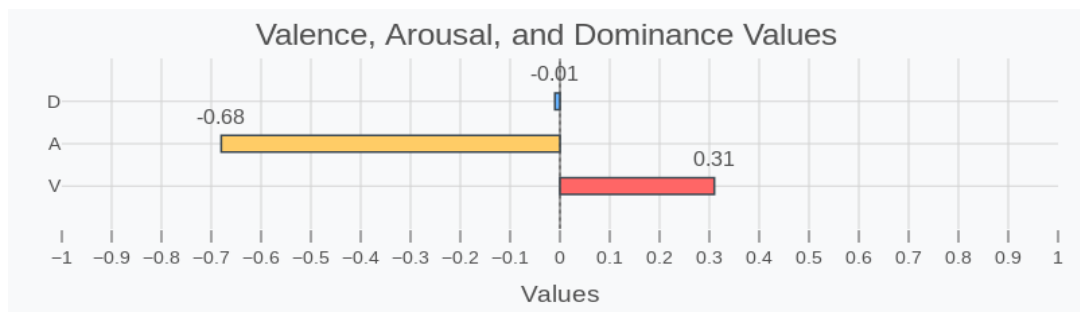

Top 5 predicted emotions with intensities:
1. Wonder: 83.57%
2. Repentant: 81.48%
3. Respectful: 76.60%
4. Reprehensible: 72.88%
5. Cooperative: 71.73%

XIII.   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."
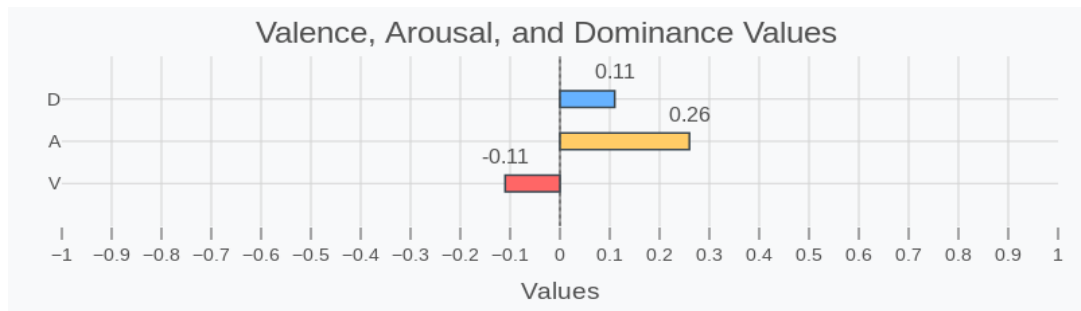
Prediction: [Valence= 0.31, Arousal= -0.68, Dominance= -0.01]

Top 5 predicted emotions with intensities:
1. Quiet: 83.13%
2. Relaxed: 75.96%
3. Leisurely: 74.33%
4. Solemn: 74.26%
5. Humble: 73.34%

XIV.   Sentence: "You should obey my order"
        Prediction: [Valence= -0.11, Arousal= 0.26, Dominance= 0.11]

Top 5 predicted emotions with intensities:
1. Burdened with responsibility: 92.18%
2. Skeptical: 87.09%
3. Contempt: 86.84%
4. Reprehensible: 85.80%
5. Contemptuous: 84.72%

Appendix

Definitions of Emotions

Angry: Feeling a strong, negative emotion often associated with frustration or injustice.

Anguished: Feeling extreme emotional or physical pain, often associated with grief or loss.

Burdened with responsibility: Feeling overwhelmed or burdened by responsibilities or obligations.

Contempt: Feeling disdain or scorn towards something or someone.

Contemptuous: Feeling contempt or disdain towards something or someone.

Cooperative: Feeling collaborative and willing to work with others towards a common goal.

Detached: Feeling emotionally or socially detached from others, often associated with a lack of empathy or concern.

Devoted: Feeling dedicated and committed to someone or something.

Disdainful: Feeling contemptuous or dismissive towards something or someone.

Disgusted: Feeling revulsion or disgust towards something or someone.

Displeased: Feeling unhappy or dissatisfied with a situation or outcome.

Dissatisfied: Feeling unhappy or unfulfilled with a situation or outcome.

Embattled: Feeling engaged in a difficult or challenging situation or conflict.

Hate: Feeling intense dislike or animosity towards something or someone.

Haughty and lonely: Feeling arrogant or superior to others, but also feeling isolated or disconnected from them.

Hopeful: Feeling optimistic about the future or a particular outcome.

Hostile: Feeling aggressive or unfriendly towards something or someone.

Humble: Feeling modest and unassuming, often associated with a lack of pride or arrogance.

Insolent: Feeling disrespectful or contemptuous towards someone in authority or with a perceived lower status.

Irritated: Feeling annoyed or bothered by something or someone.

Leisurely: Feeling relaxed and unhurried, often associated with a lack of urgency or stress.

Mildly annoyed:	Feeling slightly bothered or irritated by something.
Modest:	Feeling humble and unassuming, often associated with a lack of pride or arrogance.
Quiet:	Feeling peaceful and calm, often associated with a lack of noise or disturbance.
Quietly indignant:	Feeling anger or resentment towards a situation or outcome, often expressed in a subdued or restrained manner.
Regretful:	Feeling remorseful or sad about a past action or decision.
Relaxed:	Feeling calm and at ease, often associated with a lack of stress or tension.
Repentant:	Feeling remorseful or regretful for one's actions or behavior.
Reprehensible:	Feeling disapproval or condemnation towards something or someone, often associated with a moral judgment.
Respectful:	Feeling admiration and reverence towards someone or something.
Sinful:	Feeling guilty or ashamed for violating a moral or religious code.
Skeptical:	Feeling doubtful or questioning towards something or someone.
Solemn:	Feeling serious or solemn, often associated with a sense of reverence or gravity.
Subdued:	Feeling subdued or restrained in expressing oneself, often associated with a lack of energy or enthusiasm.
Upset:	Feeling emotionally disturbed or agitated.
Weary with responsibility:	Feeling tired or exhausted from a heavy burden of responsibility or obligation.
Wonder:	Feeling amazement or awe at something or someone.

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