MAJOR PROJECT

Design Document

'Emotion Recognition for mental health and providing them Geeta quotes support for improvement'

under the supervision of

Ms. Anjana Mishra

Submitted by-

Name	Reg No.	Branch
Gaurav Pradhan	2101020820	Data Science
P.Sriman Patro	2101020422	Data Science
Guruprasad Bhuyan	2101020773	CSE

Department of Computer Science and Engineering C.V. Raman Global University, Bhubaneswar Odisha, 752054, India

PROBLEM SPECIFICATION

Mental health issues are a growing concern in modern society, often leaving individuals struggling to manage their emotions without adequate support. While traditional methods of mental health care exist, they are not always accessible or personalized. This project aims to address these challenges by combining AI-driven emotion detection with the timeless wisdom of the Bhagavad Gita, which is known to provide answers to life's deepest problems. The Bhagavad Gita offers profound insights into human emotions, self-control, and inner peace, making it an ideal source for mental and emotional guidance.

Using Convolutional Neural Networks (CNN), the project detects six primary emotions from facial expressions and analyzes the sentiment of Bhagavad Gita quotes. By matching detected emotions with relevant quotes, users are offered personalized guidance aimed at emotional stability and personal growth. This innovative approach merges modern AI techniques with ancient spiritual wisdom, providing a holistic solution to improve mental well-being, and demonstrating that the Gita's teachings hold timeless answers to human challenges.

INTRODUCTION

In today's fast-paced world, mental health issues are increasingly prevalent, impacting millions globally. Emotional well-being is crucial to leading a balanced, fulfilling life, yet many struggle to manage their emotions effectively, leading to stress, anxiety, and depression. Addressing mental health challenges requires timely recognition of emotional states and personalized support mechanisms.

With advancements in Artificial Intelligence (AI), technology now has the capability to assist in mental health management. AI can recognize emotional cues, such as facial expressions, voice tones, and even text, providing real-time insights into an individual's emotional state. Through emotion recognition, AI opens new avenues for timely intervention and support.

This project leverages AI to not only detect emotions through facial expressions but also to provide personalized spiritual guidance. By analyzing the emotional state of a user and linking it to relevant quotes from the Bhagavad Gita, we aim to offer meaningful guidance that promotes inner peace and emotional balance. The Bhagavad Gita, a revered spiritual text, is rich with timeless wisdom that can help people manage emotions and cultivate a sense of purpose and calm. By integrating modern AI with ancient wisdom, this project bridges the gap between technology and spirituality in addressing mental well-being.

LITERATURE SURVEY

Facial emotion recognition has been extensively studied using various artificial intelligence techniques. Ismail Silahin, Ali Bou Nassif, and Shibani Hamsa (University of Sharjah) proposed a hybrid approach combining maximum entropy and Markov models to focus on clause-based emotion recognition. They introduced a genetic algorithm to improve the selection of emotional clauses within sentences, enhancing sentence-level emotion recognition. Similarly, Quan Changqini and Ren Fuji (Hefei University of Technology) developed a model using maximum entropy and Markov models for clause emotion recognition, targeting specific clauses to identify the emotional focus within sentences.

Mustafa Can Gursesli and his team at the University of Florence addressed the computational cost and complexity of emotion recognition using a lightweight CNN model based on MobileNetV2 architecture. Their custom CNN (CLCM) was tested on multiple public datasets and aimed to offer a more efficient solution for emotion detection. Mohd Nadhir Ab Wahab and colleagues (Universiti Sains Malaysia) explored a hybrid CNN-KNN model for facial expression recognition (FER) on the Raspberry Pi 4, integrating KNN with CNN to improve feature extraction and accuracy in FER tasks, particularly for healthcare and marketing applications.

Suci Dwijayanti and her team (Universitas Sriwijaya) compared emotion recognition architectures such as AlexNet and VGG16, applying them to real-time face and emotion recognition in humanoid robots. Their model used a combination of primary and secondary data for robust training and testing. Lastly, a sequential GMM-DNN classifier was proposed in the United Arab Emirates to improve text-independent, speaker-independent emotion recognition, offering a hybrid solution combining Gaussian Mixture Models and deep neural networks.

This literature highlights the diverse methods and innovations in the field of facial emotion recognition, from lightweight CNN models to hybrid approaches, each addressing specific challenges in real-time applications and computational efficiency.

PROPOSED MODEL

Datasets used are the following-
A. 28709 images collection from Cohn-Kanade Dataset.

CNN Model for Facial Emotion Detection

The facial emotion detection model uses a dataset of 2082 images, each classified into six distinct emotions: happy, sad, angry, surprised, disgusted, and neutral. These emotions were chosen for their universal recognition and significance in human emotional experiences. The images were sourced from publicly available datasets and manually labeled. Preprocessing involved standardizing image sizes and reducing noise to improve model performance.

The model architecture is based on a Convolutional Neural Network (CNN), which is ideal for image recognition tasks. CNNs automatically learn hierarchical feature representations such as edges, textures, and complex patterns in facial images. The model includes several convolutional layers to extract features, followed by pooling layers to reduce dimensionality. Fully connected layers are used for the final classification of emotions. Tools such as OpenCV were employed for image processing and manipulation, while the Seros libraries facilitated the building and training of the CNN model using Python. The model achieved an accuracy of 86%. Performance metrics such as the confusion matrix show how well the model distinguishes between emotions, revealing true and false positives for each category. Precision and recall further measure the model's accuracy and ability to capture emotions effectively.
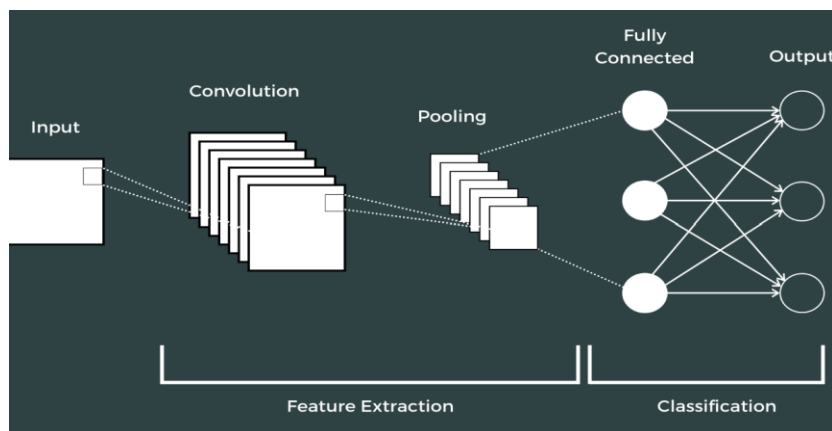
Sentiment Analysis of Geeta Quotes

The aim of sentiment analysis is to classify a dataset of Bhagavad Gita quotes into various sentiment categories such as positive, negative, and neutral. Each quote carries a distinct emotional tone, and by organizing them based on sentiment, they can better match specific emotional needs. Preprocessing the dataset involves tokenizing the quotes into individual words, removing stop words (common words like "the" and "and"), and using stemming and lemmatization to reduce words to their root forms for better sentiment detection. Sentiment classification is performed using traditional machine learning techniques like Naive Bayes or deep learning approaches such as Long Short-Term Memory (LSTM) networks. The sentiment categories include peaceful (promoting calm and self-reflection), encouraging (inspiring hope and motivation), and reflective (helping individuals think about life and purpose).

Emotion-Quote Matching

The final step in the process involves matching the detected emotions from facial recognition with relevant Bhagavad Gita quotes based on the sentiment analysis. This ensures that users receive personalized guidance aligned with their emotional state. For example, if the user is sad, the system might suggest uplifting or encouraging quotes to provide comfort and hope. In the case of anger, calming or reflective quotes are recommended to promote self-control and inner peace. The flow of data involves emotion detection through CNN, sentiment analysis of the Geeta quotes, and the final matching of quotes to detected emotions to provide a personalized experience.

- **Data Collection**:

  Emotion dataset: Facial images representing six distinct emotions.

  Quotes dataset: A collection of Bhagavad Gita quotes with varying emotional tones.

- **Emotion Detection**:

  Using a CNN model, the system detects the user's current emotional state based on facial expressions.

- **Sentiment Analysis**:

  The Geeta quotes dataset undergoes sentiment analysis to classify each quote into categories like peaceful, encouraging, and reflective.

- **Emotion-Quote Matching**:

  The detected emotion is matched with an appropriate quote based on the sentiment analysis, providing a personalized recommendation to the user.
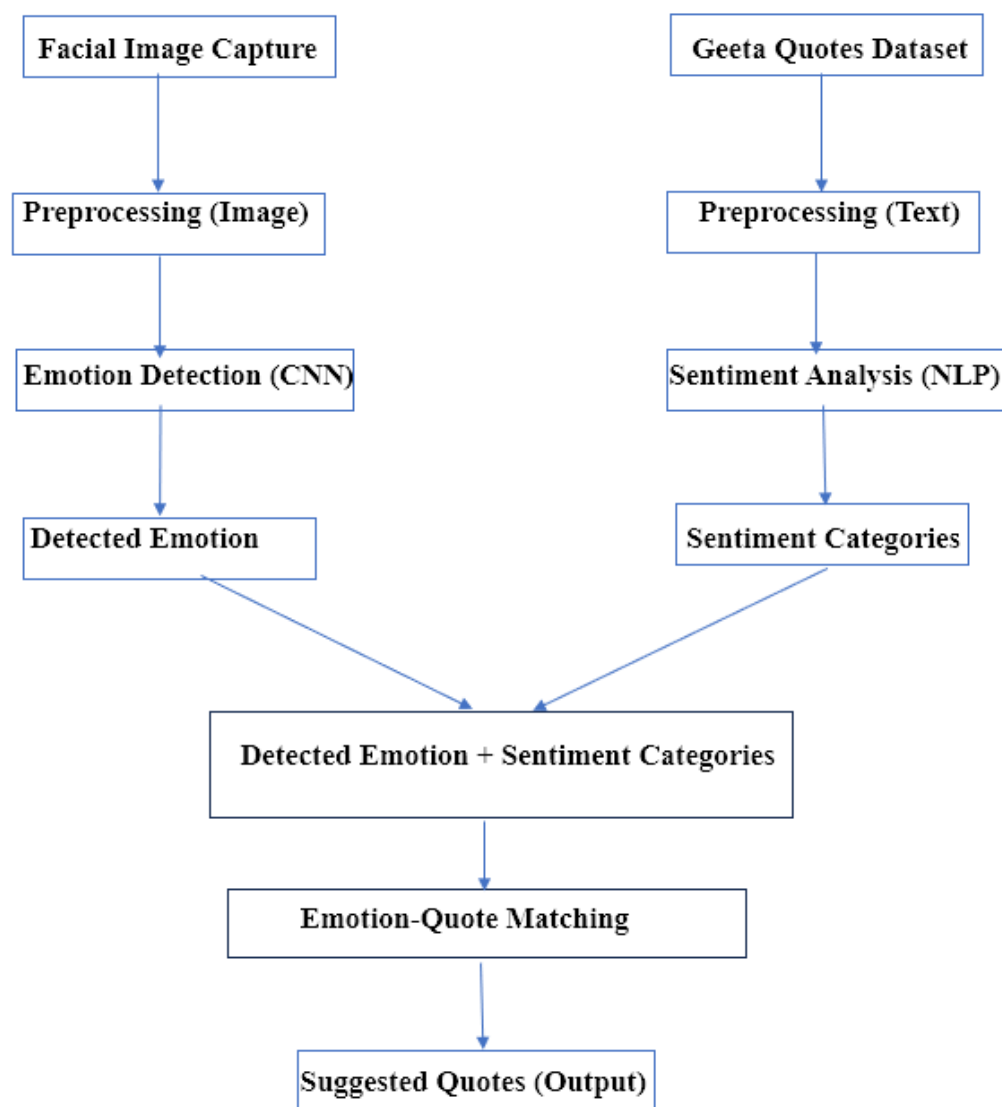
<u>**Block Diagram**</u> -

```
┌──────────────────────┐              ┌──────────────────────┐
│ Facial Image Capture │              │ Geeta Quotes Dataset │
└──────────────────────┘              └──────────────────────┘
            │                                     │
            ▼                                     ▼
┌──────────────────────┐              ┌──────────────────────┐
│ Preprocessing (Image)│              │ Preprocessing (Text) │
└──────────────────────┘              └──────────────────────┘
            │                                     │
            ▼                                     ▼
┌──────────────────────┐              ┌──────────────────────┐
│Emotion Detection (CNN)│             │Sentiment Analysis (NLP)│
└──────────────────────┘              └──────────────────────┘
            │                                     │
            ▼                                     ▼
┌──────────────────────┐              ┌──────────────────────┐
│   Detected Emotion   │              │  Sentiment Categories │
└──────────────────────┘              └──────────────────────┘
                  ╲                         ╱
                   ╲                       ╱
                    ▼                     ▼
        ┌──────────────────────────────────────────┐
        │ Detected Emotion + Sentiment Categories   │
        └──────────────────────────────────────────┘
                            │
                            ▼
        ┌──────────────────────────────────────────┐
        │         Emotion-Quote Matching            │
        └──────────────────────────────────────────┘
                            │
                            ▼
              ┌──────────────────────────┐
              │ Suggested Quotes (Output)│
              └──────────────────────────┘
```

Fig: Block diagram of proposed solution.

Block Diagram(review-2)

```
                    ┌─────────┐
                    │  Start  │
                    └─────────┘
                         │
                         ▼
              ┌──────────────────────┐
              │   Detect Emotion     │
              │   (using Model)      │
              └──────────────────────┘
                         │
                         ▼
              ┌──────────────────────┐
              │  Detected Emotion?   │
              │    (e.g., Sad)       │
              └──────────────────────┘
                         │
                         ▼
              ┌──────────────────────┐
              │   System Prompts     │
              │ User for Sub-Emotion │
              └──────────────────────┘
                         │
                         ▼
              ┌──────────────────────┐
              │    User Input        │
              │   (Sub-Emotion)      │
              └──────────────────────┘
                         │
                         ▼
              ┌──────────────────────┐
              │    Fetch Quote       │
              │   from Dataset       │
              └──────────────────────┘
                         │
                         ▼
              ┌──────────────────────┐
              │    Display Quote     │
              │      To User         │
              └──────────────────────┘
                         │
                         ▼
                    ┌─────────┐
                    │   End   │
                    └─────────┘
```
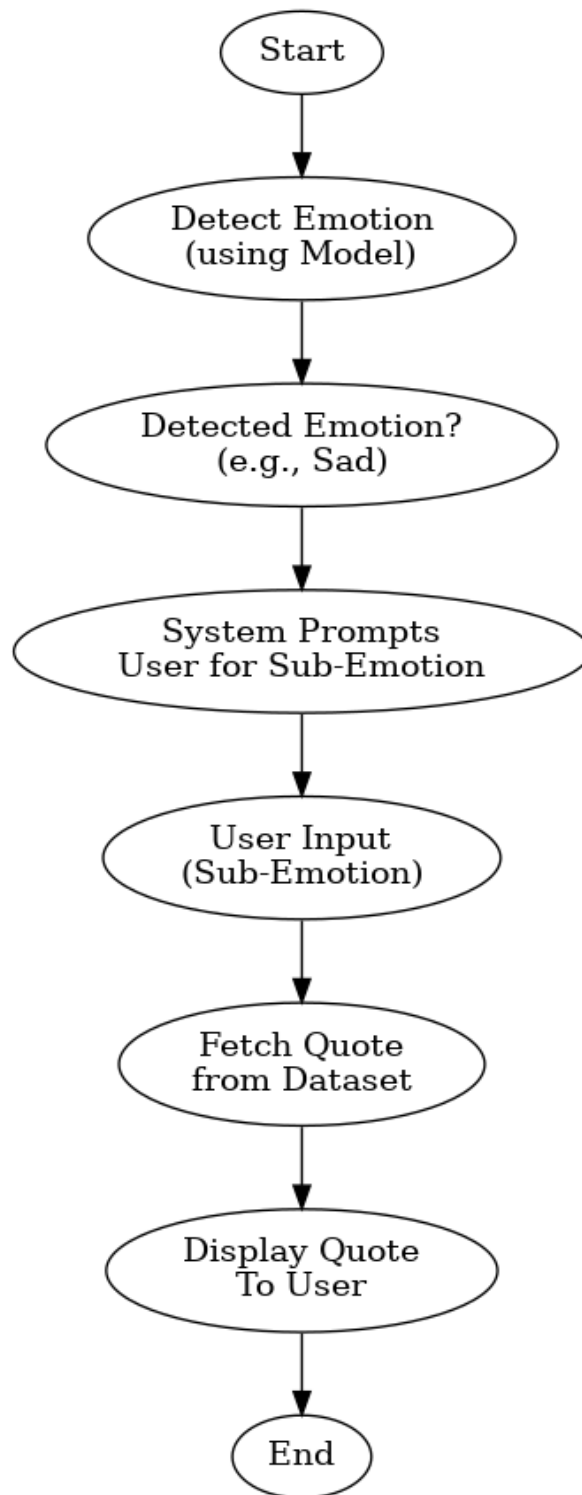
Fig: Block Diagram of training the classified Gita quotes using and taking user input

RESULT AND DISCUSSION

Emotion Detection (CNN Model)

The CNN model for facial emotion detection was trained on a dataset of 28709 images classified into six distinct emotions: happy, sad, angry, surprised, disgusted, and neutral. The model achieved an **accuracy of 53%** (replace with actual value), demonstrating effective performance in recognizing human emotions through facial expressions. Performance metrics such as precision, recall, and the confusion matrix further highlighted the model's ability to accurately classify emotions.

Precision: The model exhibited high precision of **100%** for emotions like happiness and sadness, with lower precision for more subtle emotions like neutral or disgusted, possibly due to overlap in facial expressions.

Recall: The recall scores were generally around **43% to 60**%, indicating that the model captured most of the correct emotions, although there were minor misclassifications in cases of emotions such as surprise and disgust.
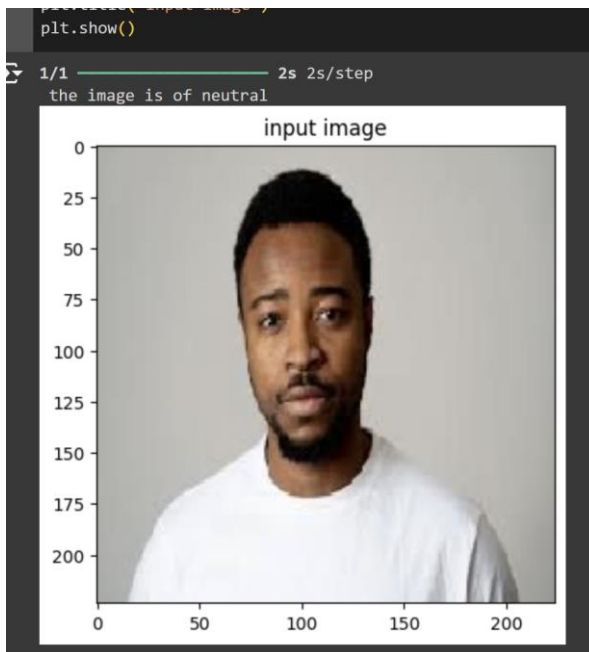
Fig: Screenshot of the model predicting emotion of the image.

Overall, the CNN model proved to be a robust tool for emotion recognition, particularly excelling in detecting distinct emotions like happiness and anger. Minor improvements can be made by increasing the dataset size or fine-tuning the model to handle subtle emotions better.

The results demonstrate the feasibility of using AI for emotion detection and pairing it with sentiment-analyzed spiritual texts to offer personalized mental health guidance. The CNN model performed well in classifying emotions, and the sentiment analysis of Bhagavad Gita quotes effectively categorized quotes for various emotional needs. This innovative approach bridges modern technology and ancient wisdom, providing a unique solution to mental health challenges.

Future work could involve enhancing the accuracy of both the emotion detection model and sentiment analysis, potentially by expanding datasets and employing more sophisticated models. Additionally, real-world testing with a diverse user base could further validate the system's efficacy in offering emotional guidance tailored to individual needs.

Taking input from the user about the sub-emotion to provide the most suitable Gita quote as per the emotion:

```
IR_CRASH_REPRODUCER_DIRECTORY` to enable.
I0000 00:00:1729303557.041192   19996 device_compiler.h:188] Compiled cluster using XLA!  This line is logged at most once for the lifetime
the process.
1/1 ━━━━━━━━━ 3s 3s/step
You seem surprise. Can you tell us why you're feeling that way? Because i am shocked to see my semester results!
1/1 ━━━━━━━━━ 0s 493ms/step
You seem sad. Can you tell us why you're feeling that way? because i was not able to get success in my job
```

```
You seem sad. Can you tell us why you're feeling that way?
```

```
You seem sad. Can you tell us why you're feeling that way? because i was not able to get success in my job
```

1. When You are Angry

1. **Shloka:**
   सञ्जय उवाच
   धृतराष्ट्रमुवाच
   धर्मक्षेत्रे कुरुक्षेत्रे समवेता युयुत्सवः।
   मामकाः पाण्डवाश्चैव किमकुर्वत सञ्जय॥ (Chapter 1, Verse 1)

Translation:
"Sanjaya said: O King, after gathering on the sacred field of Kurukshetra, and desiring to fight, what did my sons and the sons of Pandu do?"

Meaning: This verse reminds us that even though situations might lead to anger (like the battle of Kurukshetra), understanding your duties and being in the right mindset before acting is crucial.

2. **Shloka:**
   काम एष क्रोध एष रजोगुणसमुद्भवः।
   महाशनो महापाप्मा विद्ध्येनमिह वैरिणम्॥ (Chapter 3, Verse 37)

Translation:
"It is desire, it is anger born of the mode of passion, all-devouring and most sinful. Know this to be the greatest enemy in this world."

Meaning: Anger stems from unfulfilled desires. If you can control your desires, anger will subside.

3. **Shloka:**
   क्रोधाद्भवति संमोहः संमोहात्स्मृतिविभ्रमः।
   स्मृतिभ्रंशाद्बुद्धिनाशो बुद्धिनाशात्प्रणश्यति॥ (Chapter 2, Verse 63)

Translation:

CURRENT PROGRESS AND CHALLENGES

Current Status:

The final model is complete which uses CNN and NLP to detect the emotion. Right now we are working on finding ways to improve the accuracy of our project, one way is to refining of dataset, we are sorting slokas, categorizing them into motivational and general talk classes and giving each sloka an emotional tag, which can be linked to the users input so now we finding ways to connect emotions with slokas in a better way using this better dataset.

Challenges Encountered:

Refining the model for better accuracy in recognizing subtle emotions. Solved the delay where the camera lags to detects emotion. Faced difficulties adding more new quotes of different chapters into the text dataset.

Chapter No.	SLOK NO.	SLOK	TAG	Emotion Tag
1	1	The King Dhritarashtra asked: O Sanjaya! What happened on the sacred battlefield of Kurukshetra, when my people gathered against the Pandavas?	General Talk	
1	2	Sanjaya replied: The Prince Duryodhana, when he saw the army of the Pandavas paraded, approached his preceptor Guru Drona and spoke as follows:	General Talk	
1	3	Revered Father! Behold this mighty host of the Pandavas, paraded by the son of King Drupada, your wise disciple.	General Talk	
1	4	In it are heroes and great bowmen; the equals in battle of Arjuna and Bheema, Yuyudhana, Virata and Drupada, great soldiers all;	General Talk	
1	5	Dhrishtaketu, Chekitan, the valiant King of Benares, Purujit, Kuntibhoja, Shaibya a master over many;	General Talk	
1	6	Yudhamanyu, Uttamouja, Soubhadra and the sons of Droupadi, famous men.	General Talk	
1	7	Further, take note of all those captains who have ranged themselves on our side, O best of Spiritual Guides! The leaders of my army. I will name them for you.	General Talk	
1	8	You come first; then Bheeshma, Karna, Kripa, great soldiers; Ashwatthama, Vikarna and the son of Somadhatta;	General Talk	
1	9	And many others, all ready to die for my sake; all armed, all skilled in war.	General Talk	
1	10	Yet our army seems the weaker, though commanded by Bheeshma; their army seems the stronger, though commanded by Bheema.	General Talk	
1	11	Therefore in the rank and file, let stand firm in their posts, according to battalions; and all you generals about Bheeshma.	General Talk	
1	12	Then to enliven his spirits, the brave Grandfather Bheeshma, eldest of the Kuru-clan, blew his conch, till it sounded like a lions roar.	General Talk	
1	13	And immediately all the conches and drums, the trumpets and horns, blared forth in tumultuous uproar.	General Talk	
1	14	Then seated in their spacious war chariot, yoked with white horses, Lord Shri Krishna and Arjuna sounded their divine shells.	General Talk	
1	15	Lord Shri Krishna blew his Panchajanya and Arjuna his Devadatta, brave Bheema his renowned shell, Poundra.	General Talk	
1	16	The King Dharmaraja, the son of Kunti, blew the Anantavijaya, Nakalu and Sahadeo, the Sugosh and Manipushpaka, respectively.	General Talk	
1	17	And the Maharaja of Benares, the great archer, Shikhandi, the great soldier, Dhrishtayumna, Virata and Satyaki, the invincible,	General Talk	
1	18	And O King! Drupada, the sons of Droupadi and Soubhadra, the great soldier, blew their conches.	General Talk	
1	19	The tumult rent the hearts of the sons of Dhritarashtra, and violently shook heaven and earth with its echo.	General Talk	
1	20	Then beholding the sons of Dhritarashtra, drawn up on the battle- field, ready to fight, Arjuna, whose flag bore the Hanuman,	Motivational	Anger
1	21	Raising his bow, spoke this to the Lord Shri Krishna: O Infallible! Lord of the earth! Please draw up my chariot between the two armies,	General Talk	
1	22	So that I may observe those who must fight on my side, those who must fight against me;	General Talk	
1	23	And gaze over this array of soldiers, eager to please the sinful sons of Dhritarashtra.	General Talk	
1	24	Sanjaya said: Having listened to the request of Arjuna, Lord Shri Krishna drew up His bright chariot exactly in the midst between the two armies,	General Talk	
1	25	Where Bheeshma and Drona had led all the rulers of the earth, and spoke thus: O Arjuna! Behold these members of the family of Kuru assembled.	General Talk	
1	26	There Arjuna noticed fathers, grandfathers, uncles, cousins, sons, grandsons, teachers, friends;	General Talk	
1	27	Fathers-in-law and benefactors, arrayed on both sides. Arjuna then gazed at all those kinsmen before him.	General Talk	
1	28	And his heart melted with pity and sadly he spoke: O my Lord! When I see all these, my own people, thirsting for battle,	General Talk	
1	29	My limbs fail me and my throat is parched, my body trembles and my hair stands on end.	General Talk	
1	30	The bow Gandeeva slips from my hand, and my skin burns. I cannot keep quiet, for my mind is in tumult.	General Talk	
1	31	The omens are adverse; what good can come from the slaughter of my people on this battlefield?	General Talk	
1	32	Ah my Lord! I crave not for victory, nor for the kingdom, nor for any pleasure. What were a kingdom or happiness or life to me,	General Talk	
1	33	When those for whose sake I desire these things stand here about to sacrifice their property and their lives:	General Talk	
1	34	Teachers, fathers and grandfathers, sons and grandsons, uncles, father-in-law, brothers-inlaw and other relatives.	General Talk	
1	35	I would not kill them, even for three worlds; why then for this poor earth? It matters not if I myself am killed.	General Talk	
1	36	My Lord! What happiness can come from the death of these sons of Dhritarashtra? We shall sin if we kill these desperate men.	General Talk	
1	37	We are worthy of a nobler feat than to slaughter our relatives " the sons of Dhritarashtra; for, my Lord, how can we be happy of we kill our kinsmen?	General Talk	
1	38	Although these men, blinded by greed, see no guilt in destroying their kin, or fighting against their friends	General Talk	
1	39	Should not we, whose eyes are open, who consider it to be wrong to annihilate our house, turn away from so great a crime?	General Talk	
1	40	The destruction of our kindred means the destruction of the traditions of our ancient lineage, and when these are lost, irreligion will overrun our homes.	General Talk	
1	41	When irreligion spreads, the women of the house begin to stray; when they lose their purity, adulteration of the stock follows.	General Talk	
1	42	Promiscuity ruins both the family and those who defile it; while the souls of our ancestors droop, through lack of the funeral cakes and ablutions.	General Talk	
1	43	By the destruction of our lineage and the pollution of blood, ancient class traditions and family purity alike perish.	General Talk	
1	44	The wise say, my Lord, that they are forever lost, whose ancient traditions are lost.	General Talk	
1	45	Alas, it is strange that we should be willing to kill our own countrymen and commit a great sin, in order to enjoy the pleasures of a kingdom.	General Talk	
1	46	If, on the contrary, the sons of Dhritarashtra, with weapons in their hand, should slay me, unarmed and unresisting, surely that would be better for my welfare!	General Talk	
1	47	Sanjaya said:Having spoken thus, in the midst of the armies, Arjuna sank on the seat of the chariot, casting away his bow and arrow; heartbroken with grief.	General Talk	

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