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Bi-Channel Generative Recurrent Network-Based Identification of Marathi Poems

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Abstract: The term "Marathi poems" refers to writings in the Marathi language, which is largely used in the Indian state of Maharashtra and certain surrounding areas. With contributions from notable poets over the ages, Marathi poetry has a rich legacy and a lengthy history. It is used to display various perspectives. Every poet has a particular purpose and point of view when we classifies the poem. A recurrent network that recognizes Marathi poetry may be trained using a dataset of Marathi poems, where each poem is represented as a collection of words or characters. The poem was categorized in the suggested way utilizing terms from several categories by its thoughts. The poem's classification is determined using the machine learning method Bi-Channel Generative Recurrent Network (BI-CGRN) classifier. Additionally, this method allows users to search for poems depending on the name and category of author. The recommended technique surpasses earlier approaches for 336 poems, increasing the BI-CGRN classification's accuracy. To evaluate the performance of the suggested approach, the dataset is used. The noisy data are taken out of the samples of raw data using the Adaptive Median Filter (AMF). The properties are extracted using a Kernel Principal Component Analysis (KPCA). The results of the research demonstrate that accuracy, precision, f1-score, and recall measures to illustrate the performance of poetry for five categories, including "Friend," "Prem," "Bhakti," "Prerna," and "Desh," are important. The recommended method makes it easier to identify and categorize Marathi poetry, which may help to preserve and promote Marathi literary history.

Keywords: *Bi-Channel Generative Recurrent Network, Marathi Poems, , Adaptive Median Filter , Kernel Principal Component Analysis, Classification*

1. Introduction

In current society, the human face plays an important function in Marathi is a sophisticated language with a thriving poetic history. There are many ways to identify Marathi poems: There are several websites with collections of Marathi poetry that are devoted to Marathi literature. A variety of Marathi poetry written by various poets is available on websites like Marathi Kavita.co.in, marathikavitasangrah.com, and marathikavita.org. Look for book-sized collections and anthologies of Marathi poetry. Compilations of famous Marathi poets' works are widely available [1]. Marathi poetry written by new and experienced poets is often published in magazines like "Abhidhanantar," "Kavita," and "Navakshari." The study may get fresh Marathi poetry by subscribing to the publications or browsing their online archives. On social media sites like Facebook, Instagram, and Twitter, many Marathi poets post their work. The study may get a huge selection of Marathi poems by following Marathi poetry sites or looking for particular hashtags like MarathiKavita or MarathiPoems.

Attend poetry readings at literary events, book fairs, or poetry festivals in Marathi-speaking areas like Maharashtra [2]. The occasions provide a chance to interact with poets and fans while getting a personal taste of Marathi poetry. Keep in mind that Marathi poetry covers a diverse spectrum of subjects and tenets, from the conventional and classical to the experimental and modern. The study may find a wide variety of Marathi poems by looking through various sites and conversing with Marathi poetry fans. Like poetry in any other language, Marathi poems may address a variety of issues and genres [3]. They may have been penned by well-known Marathi poets or by aspiring authors. A few well-known Marathi poets who have published a range of poetry are listed below: Sant Tukaram was a well-known Marathi poet and philosopher of the 17th century. His abhangs (devotional poetry), which express his devotion to Lord Vitthal, are highly valued in Marathi literature. [4]. Popular Marathi poet Mangesh Padgaonkar covered a broad variety of subjects in his writing.

The poetry often addresses themes of love, nature, and interpersonal connections. A notable Marathi poet and author by the name of Vinda Karandikar. The handful of

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brilliant Marathi poets with distinctive styles and contributions to Marathi poetry; there are many more. The study may get a wide variety of Marathi poetry to appreciate by exploring their works. The study may check for certain traits and qualities that are often connected with Marathi poetry to recognize Marathi poems [5]. Here are some important things to think about Marathi poetry is composed in the language that is predominantly used in the Indian state of Maharashtra, Marathi. Look for poetry that has been translated or that has been written in the Marathi script. Many different topics are covered in Marathi poetry, including love, nature, spirituality, social concerns, patriotism, and human emotions. Look for poetry that addresses the issues and illuminates Maharashtra's cultural and socioeconomic background.

Marathi poetry uses a variety of conventional patterns and styles. A few of the most well-liked types include Abhanga, Ovi, Povada, Kavita, and Ghazal. The meter, rhyme, and structure of the forms are governed by a set of principles. Get to know well-known Marathi poets who have had a major impact on the genre [6]. Sant Tukaram, Bahinabai Chaudhari, Keshavsut, Vinda Karandikar, Mangesh Padgaonkar, and Arun Kolatkar are a few well-known Marathi poets. Investigate websites, books, and publications on Marathi literature that are devoted to Marathi poetry. The websites often provideS a selection of Marathi poetry by different authors and periods. Attend Marathi poetry readings, literary festivals, or other cultural activities. Such occasions provide the chance to listen to modern Marathi poets and learn about new works. Look through bookshops or online resources for published collections of Marathi poetry. The anthologies often include the works of several poets or concentrate on certain subjects [7].

Keep in mind that the style, subject matter, and emotion of Marathi poetry may all differ. The study may find a wide variety of Marathi poetry by looking through various sources and interacting with the Marathi literary scene [8]. Tokenizing the Marathi poetry into individual words or characters serves as a preprocessing step. Prepare the Marathi script for input into the bi-channel generative recurrent network by converting it. Create training and validation sets from the dataset.

Create a bi-channel generating architecture for recurrent networks that can analyze Marathi poetry. Two parallel channels should be present on the network one for the input text and another, if necessary, for extra data. The network's recurrent layers should be able to identify sequential dependencies and provide fresh sequences. Utilize the provided dataset to train the bi-channel generative recurrent network. Increase the probability of producing Marathi poetry that matches the training data by tuning the network's parameters. To do this, the weights of the network must be updated using methods like gradient descent and backpropagation. On the validation set, gauge the trained network's performance [9].

Measure measures for language-generating tasks, such as perplexity, accuracy, or other appropriate metrics. If necessary, modify the training settings or the network design. The study may utilize the network to produce fresh Marathi poetry once it has been taught and assessed. Give the network a seed input or a prompt, and let it produce a string of Marathi words or characters depending on the patterns it has learned. The study may play around with various inputs and discover the inventiveness of the network when it comes to producing Marathi poetry. It's crucial to remember that the training dataset's quality and representativeness, as well as the capabilities of the bi-channel generative recurrent network, have a significant impact on the produced Marathi poetry's quality and authenticity. To get the desired outcomes, testing, and fine-tuning may be needed [10]. The bi-channel generative recurrent network-based identification of Marathi poems advances research and aids in the automation of Marathi poetry analysis as well as the preservation of language and culture. It provides a useful resource for academics and poets to comprehend and create Marathi poetry, and it lays the path for future advancements in computational methods to analyze and produce poetic material.

The remainder of the document is structured as follows: Concerning the aims or objectives of the research, segment 2 describes the preceding study and identifies any deficiencies or discrepancies. In segment 3, the research methodology and techniques used to collect and evaluate the data are described along with recommendations for future research based on the findings. Before presenting the research results concisely and systematically, analyzing and explaining them in light of the study aims or objectives, we go through the Discussion and results in Segment 4 first. Segment 5 provides an overview of the Study's main elements, as well as its relevance and contributions, potential ramifications for practice or policy, and potential future study areas.

2. Related Work

Research [11] illustrated the qualities of the poetry, using Term Frequency Inverse Document Frequency (TFIDF). To choose the top-ranked features, the research divided the poetry into six groups. Machine learning methods such as Naive Bayes and Neural Networks are used for experimentation. With Chi2 feature selection, the maximum accuracy of any feature selection technique is 97%. The Study [12] presented a technique for identifying the authors of writings in Marathi. The statistical similarity model and the Sequential minimum optimization with a rule-based Decision Tree (SMORDT) approach are two

separate models that we developed after carefully examining the text using a variety of exact lexical and stylistic criteria. The feature extraction method was then tested to show that it consistently produced relevant features for each model used in this experiment. Research [13] investigated the devotion to the deity Vitthal of Pandharpur and the medieval saint-poets who adored him in poems and yearned for his companionship characterizes the Varkari tradition of the Marathi-speaking region of Western India. Janabai, a poetess who lived most likely in the thirteenth or fourteenth century, is portrayed in contemporary accounts as one of the Varkari saint poets.

The study [14] examined the amount of plagiarism that is rising daily. Despite being one of the most difficult requirements, plagiarism detection is necessary. The work uses an N-gram language model and a Marathi dataset to identify word-level plagiarism in Marathi literature. Even though it has the most straightforward form, this nonetheless emphasizes copy-paste and paraphrased plagiarism detection and offers significant depth for learning. It serves as the foundation for processing at the sentence and paragraph levels. The overview objective of the goal [15] suggested a method for identifying plagiarism in Marathi using semantic analysis. Plagiarism detection is a difficult problem in the academic and scientific sectors nowadays. There are now various methods available to identify plagiarism based on word similarity. However, there is no technique available to identify semantic plagiarism. To determine the frequency of terms, the writers of this paper preprocessed a database by tokenizing it and removing stop words and punctuation. Then use WordNet to search for synonyms of the same phrase or other words to identify semantic plagiarism. It is helpful for several researchers researching this field. Research [16] preferred the tokens that are derived from two corpora using two different approaches. To count and compare extracted tokens, a context-based term extraction approach, is employed. It has several activities, such as Term Frequency Inverse Document Frequency and Zipf's law. Additional token comparison between the two approaches is accomplished. Both Hindi and Marathi poems and prose may be found in the corpus. To demonstrate that Hindi and Marathi behave similarly for operations, common tokens from corpora of Marathi and Hindi poetry and prose are found. It is shown that BaSa outperforms Zipf's law. The Marathi corpus has 610 tales and 505 poetry, whereas the Hindi corpus has 820 stories and 710 poems.

The overview objective of the goal [17] evaluated certain regions of the globe, the development of loneliness as a contemporary phenomenon and a worldwide phenomenon that is both historically conditioned and culturally bound, may act as a signal for a particular kind of historical shift. In light of this, uncovering more lineages outside of the English-speaking West is essential for a thorough and non-Eurocentric history of widespread disease. This chapter makes an effort to solve this issue by examining two South Asian vernacular poetry traditions, Bengali and Marathi. While doing so, it discusses the ethical and methodological problems of trying to find pre-modern genealogy for (post)colonial issues like loneliness. It also explores how emotional history may be valuable for periodization in the historical study. Research [18] proved that the talented, independent Marathi youth may achieve popularity in today's globalized metropolis. They can now reach a worldwide audience on YouTube, which is well beyond the confines of the Indian city, thanks to technologies like mobile phones and the Internet. This was previously unattainable in the pre-digital era. Bombay's popular culture saw the birth of a hybrid language that combines American English with Marathi under the cultural impact of America's poor metropolitan neighborhoods, resurrecting the bilingual - Marathi poetry of the 1970s. Popular neighborhoods have essentially transformed into "cultural workshops" that develop their interpretations of the metropolis.

Research [19] suggested an automatic classification of poetry written in Marathi, one of the widely spoken Indian languages, using convolutional neural networks (CNN). A non-Marathi speaker may learn what kind of feeling the provided poetry represents using this categorization. As far as we are aware, this is perhaps the first use of a deep learning method for the categorization of Marathi poetry. We experimented with several Deep Convolutional Neural Network (DCNN) models, taking into account various batch sizes, filter sizes, and regularization techniques including dropout and early stopping. The suggested technique excels in terms of efficacy and efficiency, according to experimental data. The outstanding accuracy of 73% produced by the study suggested DCNN architecture for classifying poetry is noteworthy. The study [20] examined the corpus to analyze Indian language sentiment. Additionally, sentiment categorization methods such as lexicon-based, hybrid, and machine-learning approaches are applied. Support vector machine (SVM), NB, Decision Tree, as well as other lexicons including SentiWordNet, WordNet, domain-specific corpora, and Stop words are utilized in machine learning techniques. Since so many Indian languages remain undiscovered, future work on sentiment analysis should consider the languages. And we believe that Marathi is one of the languages that lack resources for developing resources and doing sentiment analysis.

The study [21] considered the division of Marathi poetry, one of the widely used Indian languages, into nine categories. A person who is not familiar with Marathi may learn what sort of feeling the poem expresses by using this categorization. Here, we saw tf-idf as a representation of the characteristics of the poetry. To choose the top-ranked

features, we employed Univariate Feature Selection (Chi2), Tree-based models, L1-based feature selection, and Recursive Feature Elimination. The Naive Bayes classifier obtains a maximum accuracy of 85% using Chi2 feature selection for nine categories of poems: Fear, Joy, Love(Prem), Sadness, Vir(Courage), Wonder, Anger, Depression, and Peace. Next, we divided poetry into six groups for categorization. Machine learning methods such as Naive Bayes (NB) and Neural Networks are used for experimentation. With Chi2 feature selection, the maximum accuracy of any feature selection technique is 97%.

Key Contributions

The identification of Marathi poems using a bi-channel generative recurrent network makes several advances to the study of Marathi literature and computer poetry analysis. It has made several significant contributions, such as:

• Identification is automated via the use of bi-channel generative recurrent networks, eliminating the need for human classification and saving a substantial amount of time and effort. It makes it possible to analyze enormous volumes of Marathi texts effectively.

• The identification system can recognize the complicated patterns, stylistic components, and linguistic structures particular to Marathi poetry thanks to the usage of recurrent networks. This enhances the identification method's accuracy and dependability, which results in a more accurate classification of Marathi poetry.

3. Experimental Procedure

Depending on the tools and frameworks we choose to use, the particular implementation details may change. The procedures listed above provide a broad foundation for creating an experimental method for categorizing Marathi poems. The suggested approach for classifying Marathi poems is shown in Fig.1.

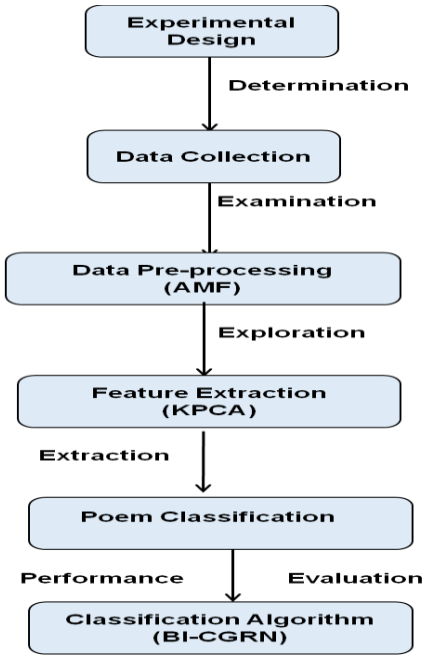

Fig.1. Experimental Design of Marathi Poem

3.1. Data Collection

- Each category, such as love, friendship, and nationality, has at least 200 words in the original dataset. The BI-CGRN is being trained using these phrases. With more poems being written, this word dataset may grow in the future.
- Using MySQL, we are storing this data in an organized fashion.
- We have a stopwords dataset, which contains words without any emotion.

3.2. Modules of a dataset based on a Marathi Poem

To efficiently organize and arrange the data while dealing with a dataset of Marathi poetry, we may take into account several modules. To manage a dataset of Marathi poems, the following modules are suggested:

i. Module 1: Increasing the dataset's word and stopping word count

In this module, we are adding stop words to the stop word dataset that could be removed after the poem has been extracted. After that, to further build the classifier model, we add sentiment-aware words to the word dataset.

ii. Module 2: Identification of Poems

- Input: Poem
- Poem elements are separated by distance and arranged in a series
- To eliminate stop words from the resulting series, we generally refer to the stop words database.
- Subsequently, to categorize the words in the series, we are referring to word data collection.
- The demonstration table now includes category-specific word data.

- The identification method BI-CGRN is utilized.
- Each category's tfidf (the frequency of a word is computed) is determined.
- To choose the best hyper-plane and split groups, we shall maximize the distances among each class's closest point of data.
- Now that we've included untrained poetry, a poem is categorized based on the feelings expressed in its words which are represented in algorithm 1.

Algorithm 1: Poem Classification

Input: Poem

Output: Category of poem

Initialize: an array array [] with words of poems

Step 1: $array\ [] = split[poem];$

Step 2: $for(ward: Array)$

Step 3: $if\big(Ispresenr(word, stopword)\big)$

Step 4: $Tfidf \ll category \gg remove(\ word, array)$

Step 5: $Array\ presentword[category] = 0;$

Step 6: $Map \ll string, int \gg tfidf;$

Step 7: $for(ward: array)$

Step 8: $If\big(category = Ispresent(word, prime)\big)$

Step 9: $Tfidf[category] + +;$

Step 10: $max = 0;$

Step 11: $for(i = 0; i < category.length; i + +)$

Step 12: $if(tfidf[category] > max$

Step 13: $return\ max;$

"A supervised machine learning technique called BI-CGRN may be used to classification and regression problems. However, categorization issues are where it's most often employed. The value of each feature is represented by the value of a specific coordinate in this technique, which plots each data point as a point in n-dimensional space (where n is the number of characteristics we have). Next, we classify by identifying the hyper-plane that effectively distinguishes the two classes.

iii. Module 3: Search Module

- Look up poets by name. In this module, we're running a query to look for poetry on a certain poet.
- Look up poetry emotion. In this module, we're running a query to look for poems in the specified poetry category.

3.3. Data pre-processing using Adaptive median filter (AMF)

The AMF approach is a more advanced variant of the traditional median filter. The elimination of impulse noise occurs via spatial processing. Each pixel in the skin picture is classified by the AMF together with its surrounding pixels to determine whether or not noise is present. It outperforms other filters because it protects the delicate details of the picture and lowers non-impulse noise. It is also quite likely that it can adapt to sudden loudness. The median channel has the same effect on an image's disorder that the mean channel does. For two descriptions, the median channel could be different, as in equation 1.

$$\mathrm{med}(\mathrm{n_k}) = \begin{cases} \mathrm{n_i} + 1^{\mathrm{a}} = 2\mathrm{i} + 1(\mathrm{ODD})) \\ \frac{[\mathrm{n_i}+\mathrm{n_{i+1}}]}{2}\mathrm{a} = 2\mathrm{i}(\mathrm{even}) \end{cases} \quad (1)$$

Here n_i is the i^{th} the biggest observed data and n_1; n_2; n_3... n_i are the observed data. Consider a case where the median filter produces an output of 2.5 and there are a total of 7 samples in the data collection, including 2, 3.5, 1, 3, 1.5, and 4. The signal will be preserved if the pulse is n + 1 or longer; else, it will be dropped from the series. The median filter stands out from other filters due to its capacity to reduce pulse noise while preserving local features. The signal produced by this approach is then sent to the feature extraction step.

3.4. Feature extraction by using Kernel Principal Component Analysis (KPCA)

An approximate covariance matrix of the data in equation 2 is diagonalized using a basis transformation known as Principal Component Analysis (PCA).

$$\mathrm{D} = \frac{1}{\mathrm{k}}\sum_{\mathrm{i}=1}^{\mathrm{k}} \mathrm{v_l}\mathrm{v_i^S} \quad (2)$$

The orthogonal projections onto the Eigenvectors or the new coordinates in the tile Eigenvector basis are principal components. In this work, this setting is further developed into a nonlinear setting of the following kind. If the data were initially nonlinearly mapped onto a feature space using equation 3,

$$\Phi: Q^M \to E, v \to V \quad (3)$$

We'll show that, for certain values, even if it has arbitrarily large dimensionality, we can still do KPCA in E.

For now, let's assume that equation 4 translates data into feature space. KPCA for the covariance matrix,

$$\overline{\mathrm{D}} = \frac{1}{\mathrm{k}}\sum_{\mathrm{i}=1}^{\mathrm{k}} \Phi(\mathrm{v_l})\Phi(\mathrm{v_l})^{\mathrm{S}} \quad (4)$$

A nonlinear variant known as principal component analysis (KPCA) is often utilized in denoising and wavelet

transform applications. The traditional PCA approach aims to reduce dimensionality when the manifold is linearly buried in the observation space. The kernel technique, one of the two components of KPCA, is used to linearize the manifold to satisfy the requirements of the PCA, the other component. Feature mapping is used by KPCA to automatically project data into a pairwise-specific pairwise formula between the mapped data in the feature set. The kernel calculates this pairwise formula. It is difficult to find an appropriate kernel that linearizes the surface in the feature space while taking into consideration the geometry of the input space. The nonlinear dimensionality reduction of KPCA would be ineffective for a suboptimal projection that does not satisfy these conditions.

3.5. Bi-Channel Generative Recurrent Network (BI-CGRRN)

A neural network design known as a bi-channel generative recurrent network works on two input channels and includes generative and recurrent components. Let's clarify these ideas: A generative model may produce fresh samples that mimic the training data and seeks to understand the underlying distribution of a dataset. To learn and produce new data, generative models often use methods like Variational Autoencoders (VAEs) or Generative Adversarial Networks (GANs) in the context of neural networks. To handle sequential input, recurrent neural networks (RNNs) have a hidden state that stores knowledge from earlier time steps. Natural language processing and voice recognition are two examples of jobs that RNNs are well-suited for. These tasks entail sequential or time-dependent patterns. The phrase "bi-channel" denotes that the network uses two input channels to function. An input channel in the context of neural networks denotes a unique source of data or a feature representation. Two separate views on the same data, such as audio and video, or two different forms of data, such as text and graphics, might be used. The network design of a bi-channel generative recurrent network comprises both generative and recurrent components, and the network receives inputs from two separate channels. The model may make use of this architecture's sequential modeling skills to identify relationships and patterns in the sequential data as well as its generative modeling capabilities to learn the underlying data distribution. Depending on the job at hand and the preferred model architecture, a bi-channel generative recurrent network may be implemented in a variety of ways. The two input channels may be handled independently before being combined at a later stage in the network, enabling the model to learn intricate representations and provide results based on both sources of data. A bi-channel generative recurrent network is a flexible architecture that may be utilized in a variety of applications that include sequential data and multiple input channels. This design enables the model to capture dependencies and produce data that is consistent with the learned distribution.

The words in the proposed system were collected from our dataset, divided into stop words, and trained using the BI-CGRN algorithm. Using these trained words, we then classified the poem and compared it to our dataset. The poems are categorized based on their feelings. We may search by poet and by poet emotion using the poem's embedded data. The user will be able to locate a poem using the proposed system's poet- and category-based classifications. With the use of words that divide the poem into several categories, such as nationalism, love, etc., the user will be able to comprehend the diverse nature of the poem and its distinctive features. Users will comprehend each category's unique characteristics. The user of the suggested system who has limited knowledge of Marathi would benefit from it. Examining the poet's work in the Marathi language, their writing style, and how to improve, it will also improve the poet's reputation. The operation of the system is shown in Fig.2.

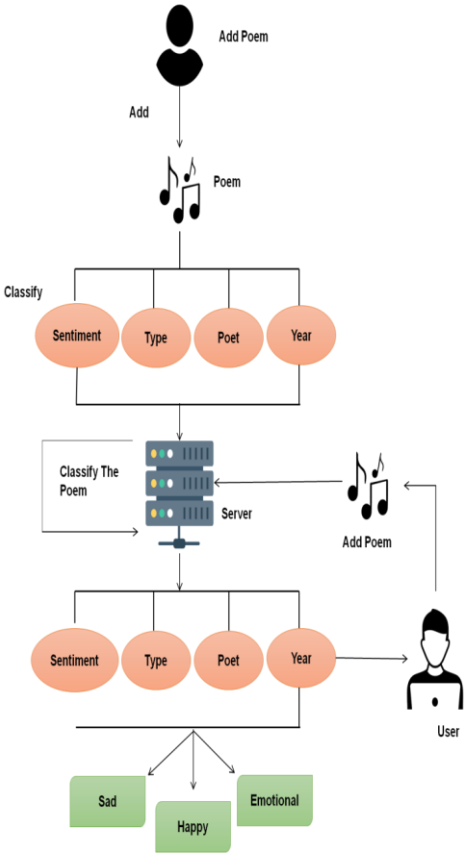

Fig.2. Structure of the System

3.6. Examination of bi-channel generative recurrent network based on Marathi poems

A thorough step-by-step procedure, including data collection, preprocessing, model architecture design, training, and generation, would be needed to implement a

particular bi-channel generative recurrent network based on Marathi poetry. However, research can provide a broad overview of the implementation process. Here is a general summary: assemble a collection of Marathi poetry. This can include collecting publicly accessible collections of Marathi poetry or scraping websites that host Marathi poetry. Make sure the dataset is varied and reflects various aesthetics and topics. The Marathi poetry dataset has to be prepared so that it may be used to train a generative recurrent network. Tokenization, eliminating superfluous punctuation, dealing with special characters, and segmenting the text into sequences are common duties involved in this. Create a sufficient numerical representation of the preprocessed text that the model can interpret. One-hot encoding, word embeddings using Word2Vec or GloVe, or character embeddings using LSTM or GRU are common ways. Create architecture for a bi-channel generative recurrent network. Combining the generative and recurring elements will be required. A combination of LSTM or GRU layers for the recurrent component and VAE or GAN for the generative component might be used as a method. The Marathi poetry's many textual and structural elements, as well as their rhyme schemes, may serve as the input channels. Utilize the preprocessed Marathi poetry dataset to train the bi-channel generative recurrent network. Decide on the proper loss functions for the generating and recurrent components after dividing the data into training and validation sets. Implementing a bi-channel generative recurrent network for Marathi poetry may be a challenging endeavor that requires knowledge of natural language processing, deep learning, and especially Marathi language processing. Additionally, substantial investment in computer power and training time may be necessary.

3.7. Mathematical Model of Marathi Poem

Let's assume that S is a system in the sense that $T = \{ Bc, V, Q, AM, O\}$where

V=User

O=Prediction Result

Q=Recommendations

T=System

- $V = \{V1, V2, V3. Vn\ i\ V\ is\ a\ Set\ of\ all\ users\}$ The system may be used by a large number of people. Therefore, this is the Infinite Set.
- $Q = \{Q1, Q2, Q3 \ldots . Qn\ |S\ is\ a\ set\ of\ Poems\}$ It is a method that has been used with the specified arguments. Thus, this is a finite collection.

- **EVENT 1**

The user will register on the System and Storage Server. Let $e(v)$ be a function of the User

Thus, $e(v) \rightarrow \{Tt\}$

- **EVENT 2**

The user will be verified.

Let $e(B)$be a function of the System

Thus, $e(B) \rightarrow \{ V1, V2, V3 \ldots . . Vn\}\ f\ Tt$

3.8. Determination of word and poem count categories of

Marathi poem

The initial dataset includes at least 50 words in each category, such as nationality, love, and friendship. The BI-CGRN technique is then used to train these words. Additionally, we have included stop words in our data. Poems are accepted as input and separated into an array before being appended. There are no longer any special characters. Poems that are assigned to a certain category are added to the dataset, which is then used to determine accuracy.

Table 1: Category-wise word count

Category	Number of words
Friend	220
Prem	240
Bhakti	190
Prerna	240
Desh	230
Total	**1120**

Table 1 lists the categories and the number of words utilized for categorization. Table 2 displays the most helpful terms from that list.

Table 2: Category wise most useful words

Category	Most Useful Words
Friend	Friendship, for Mamtra, Due to friendship, friendship, friendship, Companions, friends, etc.
Prem	For love, for love, for love, for love, In love, lover, lover, love, love, love, lover, beloved for mind, In mind, heart, lover, lover,

	heart, heart, faith, companionship, etc.
Bhakti	Ganpati, Mangalamuti, Kakti, Vitthala, Panduang, Abhang, Tithi, Tukai, Sweets, Mauli, etc
Prerna	Patriotism, independence, nation, certification, anti-corruption, Freedom Fighter, Sacrifice, Historian, Justice, Right, Hindustan, Victory, Revolution, Peace, Unity, Life, History, Sahyadri, Independence, Freedom, Fraternity, Nationalism, India Seem violation etc.
Desh	Patriotism, independence, nation, certification, anti-corruption, Freedom Fighter, Sacrifice, Historian, Justice, Right, Hindustan, Victory, Revolution, Peace, Unity, Life, History, Sahyadri, Independence, Freedom, Fraternity, Nationalism, India Seem violation etc.

We employed the supervised learning technique of machine learning known as the BI-CGRN classification algorithm for the implementation phase. It aids in the user's comprehension of the poem by classifying it according to the feelings expressed in it.

a. The overall fundamental stages are outlined below:

- Loading of various feature terms
- Category of Poems
- Lookup by poetry
- Lookup using poetry emotions

Result and data sharing Table 3 display category-wise poetry utilized in our investigation.

Table 3: Category-wise Poem count

Category	Number of Poems
Friend	77
Prem	80
Bhakti	65
Prerna	65
Desh	49
Total	**336**

4. Results and Discussion

4.1. Results

The classification of a poem is done by its feelings. The ability to contribute a poem, search by poet, and search by poem feelings is available to both users and administrators. Additionally, the administrator can approve or reject the poetry that the user has contributed. The poem is categorized using the term from the dataset that was trained. The words in the poem are identified according to their various features, and the poem is categorized in the feature with the highest frequency count. 336 poems have now been added to the dataset. Results or accuracy rely on the dataset's high word count being trained.

The confusion matrix for classifying poems is shown in Table 4, where the column denotes the anticipated class and the row is the actual class. The diagonal figures reflect the number of successfully categorized poems.

Table 4: Matrix of Marathi poem categories

Category	Desh	Prem	Friend	Prerna	Bhakti	Total
Desh	44	3	0	2	0	49
Prem	0	74	3	3	0	80
Friend	0	2	72	0	3	77
Prerna	0	0	2	63	0	65
Bhakti	0	1	1	2	61	65
Total	**44**	**80**	**78**	**70**	**64**	**336**

4.1.1. Accuracy

Accuracy is a metric used to assess how effectively the network can recognize Marathi poetry. It shows how well

the network performs in correctly identifying if a particular input text is Marathi poetry or not. By dividing the number of properly detected Marathi poems by the total number of poems in the dataset or assessment set, accuracy is commonly expressed as a percentage which was shown in equation 5. The network performs better at properly detecting Marathi poetry when the accuracy percentage is greater.

$$\text{Accuracy} = \frac{\text{TP+TN}}{\text{TP+TN+FP+FN}} \quad (5)$$

Table 5: Numerical outcomes of existing and proposed method

Methods	Accuracy (%)
DCNN [19]	44
SVM [20]	54
NB[21]	68
BI-CGRN [Proposed]	85

Fig.3 displays the accuracy of the proposed and current methodologies. The degree of accuracy is often expressed as a percentage of the total. Both the current process and the recommended one might result in incorrect estimations. The proposed method, BI-CGRN, has an accuracy rate of 85%, while DCNN, SVM, and NB have rates of accuracy of 44%, 54%, and 68%, respectively. Therefore, the suggested method has the highest accuracy rate. The accuracy of the suggested strategy is shown in Table 5.

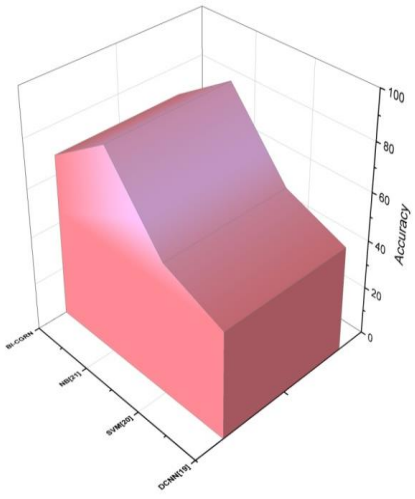

Fig.3. Comparison of the existing and proposed method

4.1.2. Precision

The precision of the "Bi-channel generative recurrent network based identification of Marathi Poems" in properly recognizing Marathi poetry is measured by precision, a performance parameter. Out of all the poetry that the network categorized as Marathi, precision is the percentage of properly recognized Marathi poems. The classifications made by the network are separated into true positives (Marathi poetry successfully recognized), false positives (non-Marathi texts mistakenly identified as Marathi), and perhaps false negatives (Marathi poems mistakenly detected as non-Marathi texts) to measure accuracy which was shown in equation 6. The number of true positives divided by the total number of true positives and false positives is then used to calculate the precision.

$$\text{precision} = \frac{\text{TP}}{\text{TP+FP}} \quad (6)$$

Table 6: Numerical Outcomes of Category-wise Precision

Category	Precision (%)
Desh	24
Prem	32
Friend	38
Prerna	46
Bhakti	58

Fig.4 displays a comparison of the Category-wise Precision's accuracy. The Precision level is sometimes expressed as a fraction of the total. Bhakti has a 58% Precision rate, whereas Desh, Prem, Friend, and Prerna have Precision rates of 24%, 32%, 38%, and 46%, respectively. The highest Precision rate belongs to the recommended Category Bhakti. The numerical results of category-wise precision are shown in Table 6.

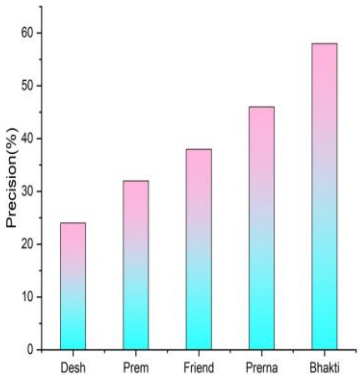

Fig.4. Comparison of Category wise Precision

4.1.3. Recall

The recall is a performance statistic that measures how well the "Bi-channel generative recurrent network based

identification of Marathi Poems" did at accurately recognizing every single Marathi poem that was shown to it. Out of all the real Marathi poetry in the dataset, it calculates the percentage of authentic Marathi poems that the network properly recognizes. The network's classifications are broken down into true positives (Marathi poetry successfully recognized), false negatives (Marathi poems mistakenly identified as non-Marathi texts), and potentially false positives (non-Marathi texts mistakenly identified as Marathi poems) to calculate recall which was shown in equation 7. The number of true positives divided by the total number of true positives and false negatives is then used to calculate recall.

$$\text{Recall} = \frac{\text{FN}}{\text{FN+TP}} \tag{7}$$

Table 7: Numerical Outcomes of Category-wise Recall

Category	Recall (%)
Desh	28
Prem	36
Friend	66
Prerna	52
Bhakti	42

Fig.5 displays a comparison of the recall accuracy by category. The Recall level is often expressed as a percentage of the total. In comparison to Desh, Prem, Prerna, and Bhakti, which have relative Recall rates of 28%, 52%, and 42%, the Category Friend has a 66% Recall rate. The highest Recall rate belongs to the selected Category Bhakti. The numerical results of a category-wise recall are shown in Table 7.

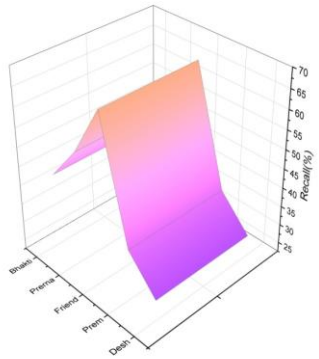

Fig.5. Comparison of Category wise Recall

4.1.4. F1-score

A performance parameter called the F1 measure, sometimes referred to as the F1 score or F-score is used to evaluate how well the "Bi-channel generative recurrent network based identification of Marathi Poems" recognizes Marathi poems by taking into consideration both recall and accuracy. The F1 measure offers a single score that strikes a balance between recall and accuracy trade-offs which was shown in equation 8. When the dataset's positive and negative sample distributions are unequal, it is very helpful.

$$\text{F1} - \text{score} = \frac{(\text{precision}) \times (\text{recall}) \times 2}{\text{precision+recall}} \tag{8}$$

Table 8: Numerical outcomes of Category wise F1-score

Category	F1-score (%)
Desh	78
Prem	40
Friend	48
Prerna	56
Bhakti	32

The Comparison of Category wise F1-score is shown in Fig.6. A percentage of the total is often used to represent the F1-score level. The Category Desh has a 78% F1-score rate, compared to 40%, 48%, and 32% for Prem, Friend, Prerna, and Bhakti, respectively. The preferred Category Bhakti has the greatest accuracy rate. Table 8 displays the Numerical outcomes of Category wise F1-score.

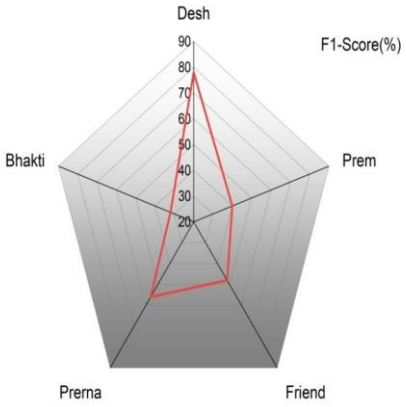

Fig.6. Comparison of Category wise F1-score

4.2. Discussion

The identification of Marathi poems using a bi-channel generative recurrent network is an intriguing issue that blends poetry analysis with natural language processing. This approach uses a bi-channel generative recurrent network, a kind of neural network, to detect and classify Marathi poetry. One of the main advantages of using a bi-

channel generative recurrent network is its ability to represent the sequential nature of poetry. Marathi poetry differs from other genres of literature in that it often uses certain organizational patterns, rhyme systems, and rhythmic elements. The network can accurately infer the genre or style of a given piece thanks to its capacity to represent and assess the temporal links revealed in the poetry. The recurring structure of the network enables this. Another advantage of the network's generative nature is its capacity to generate fresh works of Marathi poetry in the preferred style. This makes it a helpful tool for both researchers and poets, since it may assist in the analysis of different Marathi literary styles. This strategy does, however, have certain potential drawbacks and difficulties. The availability and amount of the training dataset provide a problem. It might take a lot of time and resources to create a high-quality Marathi poetry dataset with enough variety and representation. The caliber and variety of the training data have a critical role in the performance of the bi-channel generative recurrent network.

5. Conclusion

In this study, Marathi poetry authored by a variety of poets was used to test a novel job for classifying poems and identifying poets. For Marathi poetry, a number of sentimental characteristics have been noticed and examined. The BI-CGRN classifier, which bases its testing on 500 trained words and 500 poems, is used for classification purposes. The following observable points are the outcome of experiments with poem categorization and poet identification on poems by various poets, which were done independently for each attribute and sentiment: One of the few works on the Marathi language that shows genuine enthusiasm and effort is this work on poem classification. The system's accuracy is 85% when evaluated on 336 poems and compared to the current and suggested methods. A larger dataset will be used in the future to increase accuracy in light of globalization. Future applications of our concept can take advantage of deep learning. A potential method that combines the strength of recurrent neural networks with generative modeling strategies is the use of a bi-channel generative recurrent network for the identification of Marathi poetry. Preparing a varied dataset of Marathi poems, encoding the data for input into the network, creating a bi-channel architecture to capture various aspects of the poems, training the network on the dataset, and assessing the generated poems for similarity to real Marathi poetry are the key steps in this approach. Through repeated repetitions of fine-tuning the network, modifying its architecture and hyperparameters, and improving the training procedure, the procedure may be improved. The network's generative properties allow for the generation of fresh Marathi poetry based on previously discovered patterns, adding a creative and experimental element to the identification process. It is crucial to keep in mind that the effectiveness of this method depends on the availability of a high-quality dataset of Marathi poems and the network's capacity to fully understand Marathi poetry. To make sure the output is legitimate and of high quality, it is essential to fine-tune the network, improve the design, and evaluate the poetry that is produced. The identification of Marathi poems using a bi-channel generative recurrent network has a lot of promise for automating the procedure, facilitating the study of Marathi literature, and inspiring writers and Marathi poetry aficionados.

References

[1] Patil, R. S., & Kolhe, S. R. (2022). Supervised classifiers with TF-IDF features for sentiment analysis of Marathi tweets. Social Network Analysis and Mining, 12(1), 51.

[2] Saini, J. R., & Bafna, P. B. (2022, January). MaTop: An Evaluative Topic Model for Marathi. In Proceedings of Third International Conference on Sustainable Computing: SUSCOM 2021 (pp. 135-144). Singapore: Springer Nature Singapore.

[3] Ruma, J. F., Akter, S., Laboni, J. J., & Rahman, R. M. (2022). A deep learning classification model for Persian Hafez poetry based on the poet's era. Decision Analytics Journal, 4, 100111.

[4] Shelke, M., Sawant, D. D., Kadam, C. B., Ambhure, K., & Deshmukh, S. N. (2023). Marathi SentiWordNet: A lexical resource for sentiment analysis of Marathi. Concurrency and Computation: Practice and Experience, e7497.

[5] Deák, D. (2020). RESEARCHING MUSLIM SAINTS OF THE MARATHI DECCAN: SOME PROBLEMS AND CHALLENGES. Asian & African Studies (13351257), 29(2).

[6] Bafna, P. B., & Saini, J. R. (2020). An Application of Zipf's Law for Prose and Verse Corpora Neutrality for Hindi and Marathi Languages. International Journal of Advanced Computer Science and Applications, 11(3).

[7] Bafna, P. B., & Saini, J. R. (2020). Marathi document: similarity measurement using semantics-based dimension reduction technique. International Journal of Advanced Computer Science and Applications, 11(4).

[8] Venkatkrishnan, A. (2020). Leaving Kashi: Sanskrit knowledge and cultures of consumption in eighteenth-century South India. The Indian Economic & Social History Review, 57(4), 567-581.

[9] Nerlekar, A. (2020). The LCD (Lowest Common Denominator) of Language: The Materialist Poetry of Arun Kolatkar and RK Joshi. South Asia: Journal of South Asian Studies, 43(5), 943-969.

[10] Deshmukh, M. (2020). The Mothers and Daughters of Bhakti: Janābāī in Marathi Literature. International Journal of Hindu Studies, 24, 33-59.

[11] Saini, J. R., & Bafna, P. B. (2022, January). MaTop: An Evaluative Topic Model for Marathi. In Proceedings of Third International Conference on Sustainable Computing: SUSCOM 2021 (pp. 135-144). Singapore: Springer Nature Singapore.

[12] Digamberrao, K. S., & Prasad, R. S. (2018). Author identification using sequential minimal optimization with rule-based decision tree on Indian literature in Marathi. Procedia computer science, 132, 1086-1101..

[13] Glushkova, I. (2021). Janabai and Gangakhed of Das Ganu: Towards ethnic unity and religious cohesion in a time of transition. The Indian Economic & Social History Review, 58(4), 505-532.

[14] Naik, R. R., Landge, M. B., & Mahender, C. N. (2019). Word level plagiarism detection of marathi text using N-Gram approach. In Recent Trends in Image Processing and Pattern Recognition: Second International Conference, RTIP2R 2018, Solapur, India, December 21–22, 2018, Revised Selected Papers, Part III 2 (pp. 14-23). Springer Singapore.

[15] Naik, R. R., & Landge, M. B. (2019). Plagiarism detection in marathi language using semantic analysis. In Scholarly Ethics and Publishing: Breakthroughs in Research and Practice (pp. 473-482). IGI Global.

[16] Bafna, P. B., & Saini, J. R. (2020). An Application of Zipf's Law for Prose and Verse Corpora Neutrality for Hindi and Marathi Languages. International Journal of Advanced Computer Science and Applications, 11(3).

[17] Chakravarti, A. (2023). Time, Space and Loneliness in Bengali and Marathi Poetry. In The Routledge History of Loneliness (pp. 131-148). Routledge.

[18] Boukhroufa-Trijaud, M. (2022). How the Internet is Transforming the Bombay Poetry Scene. Sillages critiques, (33).

[19] Deshmukh, R., & Kiwelekar, A. W. (2022, March). Deep Convolutional Neural Network Approach for Classification of Poems. In Intelligent Human Computer Interaction: 13th International Conference, IHCI 2021, Kent, OH, USA, December 20–22, 2021, Revised Selected Papers (pp. 74-88). Cham: Springer International Publishing.

[20] Shelke, M. B., & Deshmukh, S. N. (2020). Recent advances in sentiment analysis of Indian languages. International Journal of Future Generation Communication and Networking, 13(4), 1656-1675.

[21] Deshmukh, R. A. (2022). Naive Bayes and Neural Network Techniques for Marathi Poem Classification into Nine Rasa using Feature Selection. International Journal of Performability Engineering, 18(9).

[22] Ravi, C., Yasmeen, Y., Masthan, K. ., Tulasi, R. ., Sriveni, D. ., & Shajahan, P. . (2023). A Novel Machine Learning Framework for Tracing Covid Contact Details by Using Time Series Locational data & Prediction Techniques. International Journal on Recent and Innovation Trends in Computing and Communication, 11(2s), 204–211. https://doi.org/10.17762/ijritcc.v11i2s.6046

[23] Tanaka, A., Min-ji, K., Silva, C., Cohen, D., & Mwangi, J. Predictive Analytics for Healthcare Resource Allocation. Kuwait Journal of Machine Learning, 1(4). Retrieved from http://kuwaitjournals.com/index.php/kjml/article/view/150