International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

AGRIBOT: A TAMIL CHATBOT FOR FAMER USING TRANSFORMER

Narmatha. R[1], Karthikraj.C[2], Rahul M[3], Ameenul Hasan.A[4], Jegadesan.M[5]

[1-5]Department of Computer Science and Engineering, Government College of Engineering (Anna University), Dharmapuri, Tamil Nadu, India

ABSTRACT:

AgriBot engages farmers in their native language, providing personalised assistance tailored to their needs and local contexts. With features such as real-time data integration, predictive analytics, and community-driven knowledge-sharing, AgriBot empowers farmers to make informed decisions, optimize resource utilization, and adapt to changing environmental conditions. The transformer model helps to achieve natural and contextually relevant conversations with users

Index terms: Deep Learning, Transformer, Attention, TensorFlow, Natural Processing Language

I. INTRODUCTION :

In today's agricultural landscape, Tamil Nadu farmers face various challenges, including limited access to information, resources, and expert guidance. To address these challenges, this paper focuses on the development of "AgriBot," a Tamil farmer chatbot powered by Transformer models. The chatbot serves as a virtual agricultural assistant, offering personalized advice, guidance, and support to Tamil-speaking farmers in Tamil Nadu. By harnessing the capabilities of Transformer models and natural language processing techniques, AgriBot facilitates seamless communication in Tamil, enabling farmers to access agricultural information, crop management techniques, and market insights. Traditional Chatbot models like Long Short-Term Memory and Recurrent Neural Networks are not better at context understanding and long sentences. However, the transformer and its attention mechanism are better at context understanding and long sentences. It gives better performance.

II. LITERATURE SURVEY

Several recent studies have explored the development of chatbot systems tailored to address the specific information needs of farmers in agricultural contexts. For instance, Jain et al. (2019) introduced the Agriculture-Specific Question Answer System, which aims to provide answers to a wide range of agricultural queries, including weather, plant protection, market prices, and government schemes. By utilizing the RASA NLU framework, the system effectively classifies user queries into intents and identifies relevant entities, ensuring accurate responses. Leveraging the dataset from the Kisan Call Centre (KCC), Jain et al. enhanced the system's effectiveness in addressing real-world agricultural challenges.

Similarly, Arora et al. (2020) presented Agribot, a natural language generative neural network engine designed specifically for agricultural applications. Agribot employs LSTM-based models trained on data from the Kisan Call Centre to address crop disease and weather-related queries. By utilizing historical queries and their corresponding answers, Agribot effectively caters to farmers' inquiries. Moreover, the integration of a Telegram bot interface enhances accessibility, allowing farmers to access information conveniently from various electronic devices.

Furthermore, Momaya et al. (2021) introduced Krushi, also known as "The Farmer Chatbot," designed specifically to meet the needs of farmers. Leveraging natural language processing techniques, Krushi enables farmers to access information on various agricultural aspects, including weather forecasts, crop management practices, and government schemes. The chatbot's user-friendly interface and integration with platforms enhance accessibility, allowing farmers to seek assistance conveniently using their preferred electronic devices.

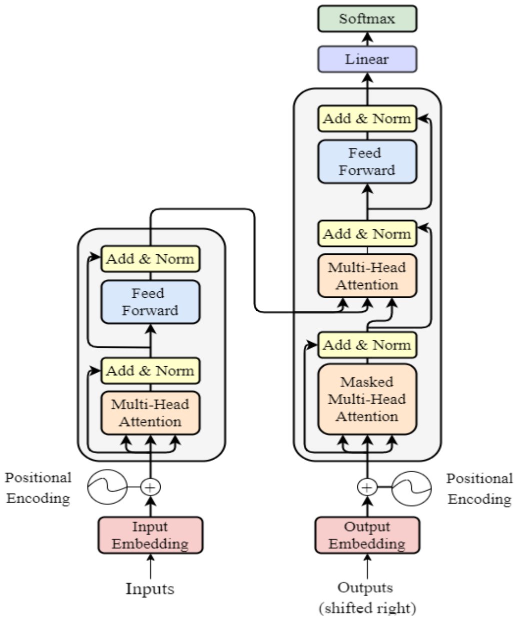
Moreover, recent research by Vaswani et al. (2017) introduced the Transformer architecture, which utilizes attention mechanisms to capture dependencies between tokens in a sequence. The Transformer model has revolutionized natural language processing tasks by allowing models to focus on relevant parts of the input sequence, enabling more efficient and effective processing of long sequences. The incorporation of attention mechanisms has been shown to improve the performance of chatbot systems by enabling them to better understand and respond to user queries in context

III. TRANSFORMER

The Transformer architecture, introduced by Vaswani et al. (2017), represents a breakthrough in natural language processing and has significantly advanced the field of machine learning. Unlike traditional sequence-to-sequence models such as recurrent neural networks and Long Short-Term Memory networks, the Transformer architecture relies solely on self-attention mechanisms to capture dependencies between input tokens.

This novel approach has several key components:

- **Self-Attention Mechanism**: The core of the Transformer architecture lies in its self-attention mechanism, which enables the model to weigh the importance of each token's contribution to the representation of other tokens in the input sequence. By attending to all tokens simultaneously, the Transformer captures long-range dependencies more effectively than sequential models like RNNs and LSTMs.
- **Multi-Head Attention**: The Transformer model utilizes multi-head attention mechanisms, allowing it to focus on different parts of the input sequence simultaneously. By combining multiple attention heads, the model can capture diverse patterns and relationships within the data, leading to richer and more robust representations.
- **Positional Encoding**: In addition to token embeddings, the Transformer architecture incorporates positional encoding to provide information about the position of tokens in the input sequence. This positional encoding enables the model to maintain spatial relationships between tokens, which is crucial for tasks like language translation and text generation.
- **Encoder-Decoder Architecture**: The Transformer architecture consists of an encoder and a decoder, each comprising multiple layers of self-attention and feedforward neural networks. The encoder processes the input sequence to generate a representation, while the decoder uses this representation to generate an output sequence. This encoder-decoder architecture is highly flexible and can be adapted to various sequence-to-sequence tasks.



TRANSFORMER ARCHITECTURE

IV. EXPERIMENT AND RESULT:

this paper, we used the KCC dataset from Kissan call centre data that contains query, answer, state, district, date and time. It has 10 crore entries. And Wiki corpus data sets and NEWS article data corpus from the Ezhil Foundation.

I trained the model in collab with T4 GPU with 58GB of RAM. Six Hours of Training hours are taken to train this model and its loss and accuracy.

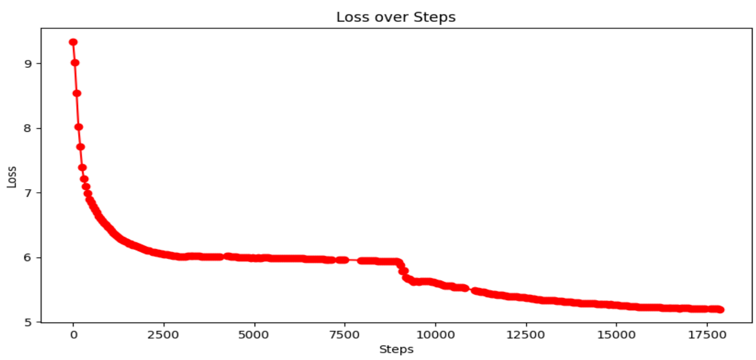


Fig 2: Training and Validation

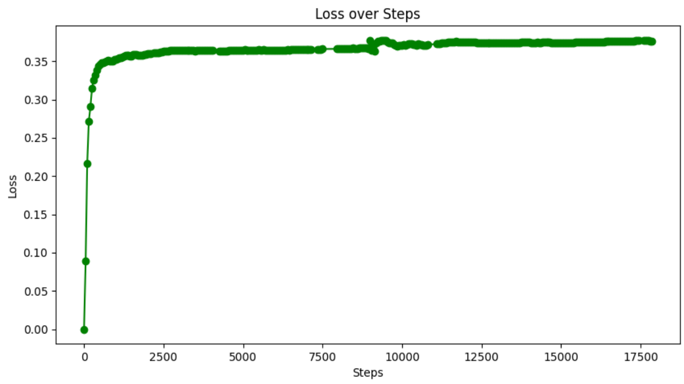


Fig 3: Model Accuracy

We created an application for this chatbot that takes input from the user and produces results shown to the user. The below image shows the application result.

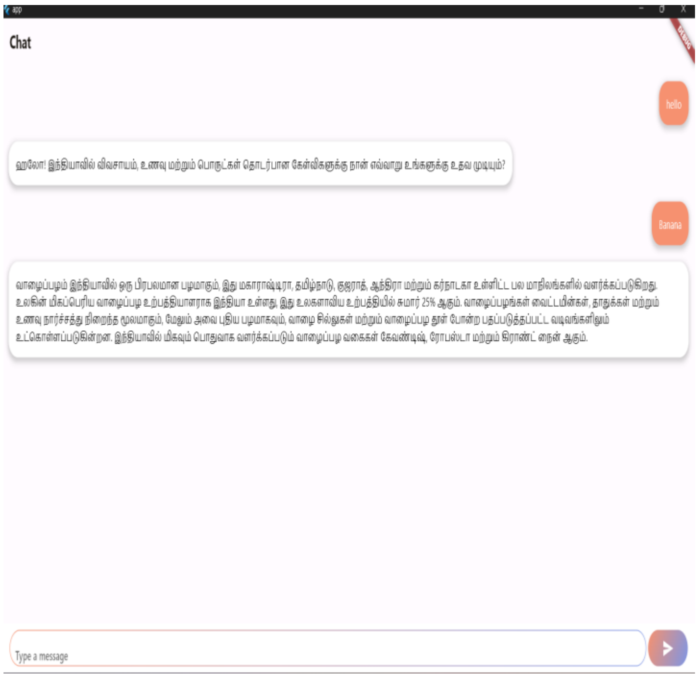


Fig 4: Application Result

V. CONCLUSION:

The implementation of the Transformer for Tamil chatbot specialized for farming is a significant advancement in agricultural technology. Its context-understanding ability and long sequence handling, easy-to-use approach enable better knowledge sharing. Continued refinement and expansion of training hold immense potential for sustainable agricultural practices.

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