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FemNet- Leveraging RAG for Women Empowerment

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Abstract - *FemNet is an AI-powered chatbot designed to empower women by providing reliable information on key domains such as education, health, legal rights, and career development. It utilizes Retrieval-Augmented Generation (RAG), which combines information retrieval and generative models to ensure accurate and contextually relevant responses. The chatbot features a simple text-based interface for seamless interaction, integrating a search algorithm that retrieves information from a curated dataset consisting of articles, FAQs, and guides focused on women's issues. The retrieved data is then processed by a pre-trained language model to generate clear and comprehensive responses. The project highlights FemNet's ability to address queries related to women's health, security, and legal rights, demonstrating AI-driven social empowerment. The backend efficiently manages user inputs and data retrieval, ensuring timely response generation, while the application interface facilitates smooth user interaction. Key performance metrics, including response accuracy and relevance, are used to evaluate the chatbot's effectiveness. FemNet exemplifies AI's role in tackling real-world challenges by enhancing access to crucial information for women. This initiative lays an explorable groundwork for future AI-driven tools aimed at promoting gender equality and supporting women's empowerment*

Key Words: ***Women Empowerment, AI Chatbot, Retrieval-Augmented Generation, Legal Rights, Healthcare Assistance, Career Development, Information Retrieval, Social Impact***

1.INTRODUCTION

Women worldwide continue to face significant challenges in accessing reliable and well-structured information on crucial topics such as healthcare, safety, legal rights, and professional growth. While vast amounts of data are available online, the lack of centralized, contextually relevant, and easily understandable resources poses a significant barrier. Traditional search engines often return scattered, unverified, or complex information, making it difficult for users to extract actionable insights. Additionally, marginalized communities and individuals with limited digital literacy struggle to navigate these platforms, further exacerbating the information gap. FemNet seeks to bridge this divide by offering an AI-powered knowledge assistant that delivers structured, accurate, and accessible responses tailored specifically to women's needs.

With rapid advancements in Artificial Intelligence (AI), Natural Language Processing (NLP), and Retrieval-Augmented Generation (RAG), intelligent systems can now process complex queries and provide real-time, personalized, and data-driven insights. FemNet leverages vector-based semantic search and Large Language Models (LLMs) to deliver contextually relevant, fact-based responses. Unlike traditional methods, which rely solely on keyword-based search algorithms, FemNet ensures that user queries are understood in-depth, retrieving the most pertinent information from its extensive knowledge base of curated articles, FAQs, and essential topic based PDFs. This approach enhances the precision, clarity, and usability of the information provided, empowering women to make informed decisions confidently.

Beyond being an AI-driven chatbot, FemNet serves as a community-driven platform that integrates expert-backed insights. By incorporating knowledge from healthcare, law, psychology, and career development, FemNet ensures that its responses reflect both academic expertise and day to day life experiences. This hybrid approach makes the system more dynamic, adaptable, and user-centric.

Another critical aspect of FemNet is its commitment to ethical AI. Given the sensitivity of topics such as women's health, personal safety, and legal matters, measures have been taken to mitigate algorithmic bias, ensuring that the responses generated are objective, inclusive, and factually accurate. The impact of FemNet extends beyond individual empowerment, contributing to broader societal goals of gender equality and digital inclusivity. By democratizing access to trusted, AI-enhanced knowledge, the platform supports women's rights advocacy, social awareness, and informed decision-making. Future developments aim to integrate real-time expert consultations, voice-based AI assistants, and expanded multilingual support, further strengthening FemNet's role as a comprehensive digital companion for women.

Through its unique blend of cutting-edge AI, expert insights, and community-driven knowledge-sharing, FemNet aspires to redefine how women access,

understand, and engage with essential information. As technology continues to evolve, AI-driven solutions like FemNet hold the potential to transform information accessibility, bridge knowledge gaps, and empower women.

2. LITERATURE SURVEY

[1] Buvana et al. (2024) proposed the "EMPOWER HER: WOMEN SAFETY HUB", an application leveraging machine learning techniques to enhance real-time navigation and provide educational content on women's safety. The system integrates AI-driven threat detection with personalized safety recommendations, ensuring users receive context-aware guidance on both personal and online security. By utilizing intelligent data analysis, the platform offers proactive safety measures while disseminating critical awareness content. The study demonstrated the application's effectiveness in improving security literacy and empowering women through technology-driven interventions. Experimental validation confirmed its reliability in delivering timely and relevant safety insights.

[2] Vani Bhat et al. (2024) proposed a Retrieval-Augmented Generation (RAG)-based restaurant chatbot with AI testability to enhance customer interactions in the restaurant industry. The study introduced RestoBot, a chatbot that integrates a Neo4j knowledge graph with a fine-tuned T5 language model to improve context-aware responses. The chatbot employs TF-IDF embeddings to retrieve relevant answer tokens, ensuring precise and coherent responses. AI testability was incorporated to evaluate chatbot performance at word, sentence, and information levels, ensuring robustness in handling diverse conversational scenarios. Experimental validation demonstrated the system's effectiveness in generating accurate and contextually relevant responses.

[3] Poliakov and Shvai (2024) proposed Multi-Meta-RAG, an improved Retrieval-Augmented Generation (RAG) model that enhances multi-hop query resolution using database filtering with LLM-extracted metadata. By integrating Neo4j vector databases and metadata-driven chunk selection, the model significantly improves retrieval accuracy and response generation, as demonstrated on the MultiHop-RAG benchmark. Experimental results show notable gains in retrieval precision and LLM-generated response accuracy, particularly with GPT-4 and Google PaLM. The study highlights metadata filtering as a key technique for reducing hallucinations and improving multi-hop reasoning in RAG-based systems.

[4] L. K. Maddali (2024) compares Retrieval-Augmented Generation (RAG) and Long Context Models in enhancing generative AI. RAG integrates external knowledge retrieval for accurate, updated responses, while Long Context Models extend attention mechanisms for coherence over long texts. The study explores hybrid approaches for improving knowledge-intensive tasks like summarization and question-answering, highlighting future advancements in retrieval and memory efficiency.

[5] Bhawana Meena (2023) explores the impact of Artificial Intelligence (AI) on women empowerment in India, analyzing its role in addressing gender disparities, improving access to education and healthcare, fostering economic independence, and promoting gender equality. The study evaluates various AI-driven initiatives and case studies, highlighting both opportunities and challenges in leveraging AI for social advancement. Key areas of focus include gender biases in AI algorithms, ethical concerns, and the role of AI in skill development, employment, and safety. The findings underscore the importance of inclusive AI development to prevent bias and ensure equitable benefits. The paper concludes that while AI has transformative potential for women's empowerment, strategic policies and responsible AI deployment are essential for maximizing its impact.

3. METHODOLOGY

The development of FemNet follows a structured approach integrating Retrieval-Augmented Generation (RAG), Natural Language Processing (NLP), and vector-based search techniques to create an AI-driven chatbot for women's empowerment. The methodology is divided into four key phases: data collection and preprocessing, retrieval and response generation, system implementation, and evaluation.

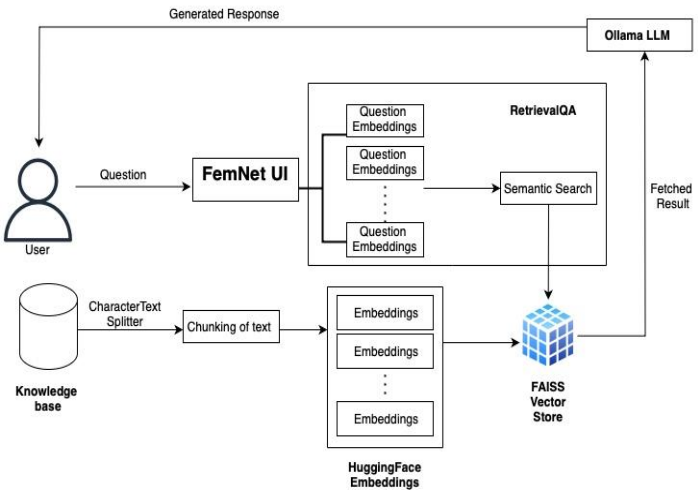

Fig -1: System Architecture

3.1. Data Collection and Preprocessing

To ensure accurate and contextually relevant responses, FemNet utilizes a curated knowledge base of Academic articles, legal documents, and healthcare guidelines related to women's rights and well-being; Government

policies, NGO reports, and expert-authored resources for authoritative insights.The collected data undergoes several NLP-based preprocessing techniques to enhance retrieval efficiency:

- Text Cleaning by removal of unnecessary symbols, redundant data, and stopwords.
- Tokenization & Lemmatization where conversion of text into structured components while maintaining semantic integrity is done.
- Transformation of processed text into high-dimensional vector embeddings using Hugging Face models for semantic search.
- The text is split into smaller manageable chunks using a LangChain's CharacterTextSplitter. Chunking ensures that relevant contextual information is maintained in the embeddings.
- Each chunk is converted into high-dimensional vector embeddings using Hugging Face models for semantic search.
- These embeddings are indexed and stored as an organization of vectorized data using FAISS (Facebook AI Similarity Search) for efficient and scalable retrieval.

This preprocessing pipeline ensures FemNet's knowledge base remains structured, relevant, and optimized for retrieval and response generation.

3.2. Retrieval and Response Generation

FemNet employs a RAG-based architecture, combining retrieval-based search with generative AI models to enhance response quality. It involves the following:

Retrieval:

- The input query(question) is preprocessed and converted into a vector representation for semantic understanding.
- The vectorized query is compared with stored document embeddings in the FAISS (Facebook AI Similarity Search) vector store.
- FAISS performs a fast nearest-neighbor search to find the most relevant document chunks.
- Document Retrieval: The system extracts relevant passages from indexed resources, prioritizing accuracy and contextual relevance.
- The top-ranked document chunks from FAISS are retrieved and passed to the next stage.

Response Generation

- The retrieved content is fed into a Large Language Model (LLM), such as Hugging Face Transformers, which synthesizes structured responses.
- The retrieved document chunks from FAISS are sent to Ollama LLM, which acts as the language model for response generation.
- Ollama LLM thus processes the user query alongside the retrieved context. and generates a well-structured, informative response.

By integrating retrieval-based AI with generative models, FemNet enhances response accuracy, contextual understanding, and real-time information synthesis.

4. RESULTS

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 0 :
 "Breast Health and Breast Cancer: Empowering Women
 through Awareness and Early
 Detection
 Breast health is a critical aspect of women's overall
 well -being, and one of the most pressing
 health concerns for women today is breast cancer.
 Breast cancer is the most common cancer
 diagnosed in women worldwide, with millions of new
 cases every year. De spite the severity
 of this disease, early detection through regular
 mammograms, self -exams, and medical
 consultations can significantly improve outcomes.
 Breast cancer awareness and education are
 vital to empowering women, helping them recognize risk
 facto rs, understand the importance
 of early screening, and take proactive steps to
 maintain their health.
 Understanding Breast Cancer: Causes and Risk Factors
 Breast cancer occurs when cells in the breast begin to
 grow uncontrollably, forming a tumor.
 While the exact cause of breast cancer is not fully
 understood, several risk factors have been"
 1 :
 "Breast cancer occurs when cells in the breast begin
 to grow uncontrollably, forming a tumor.
 While the exact cause of breast cancer is not fully
 understood, several risk factors have been
 identified that increase the likelihood of developing
 the disease. T hese risk factors include
 both genetic and lifestyle elements. One of the most
 well -known genetic factors is the
 presence of mutations in the BRCA1 and BRCA2 genes,
 which significantly raise a woman's
 risk of developing breast cancer. Women with a family
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Fig -2: Chunks of 1000 token each are created to be made into vector embeddings

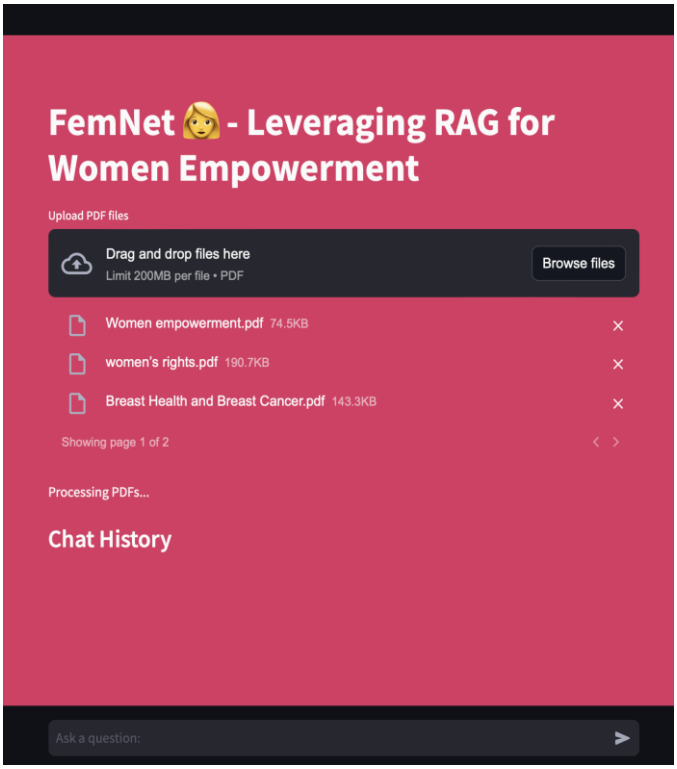

Fig -3:Application Interface

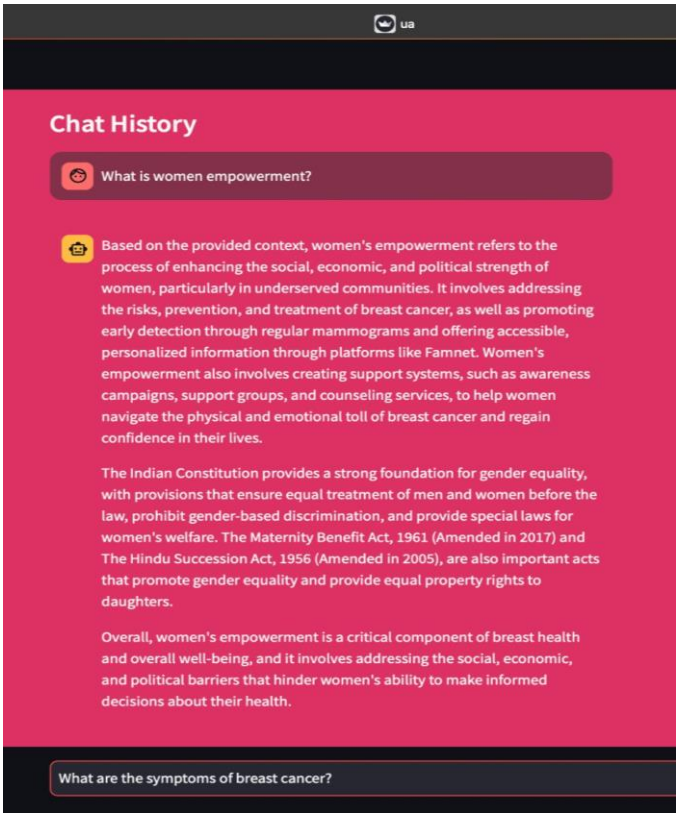

Fig -4:Response Generated for Question Asked

5. FUTURE SCOPE

Since RAG implementation requires high computational power, we had to access limited data. Thus, one key area of improvement is the expansion of the knowledge base, where the chatbot can integrate with government databases, research papers, NGOs, etc. The chatbot can also incorporate multimodal AI to analyze images, infographics, and legal forms. Moreover, integrating sentiment and emotion analysis will allow the chatbot to respond empathetically, particularly for sensitive queries.

A voice-enabled chatbot using speech-to-text (STT) and text-to-speech (TTS) can make the platform more accessible, especially for visually impaired users or those with low literacy levels. Additionally, support for multiple formats such as Word documents, websites, audio transcripts, and scanned images through OCR (Optical Character Recognition) can enhance the chatbot's capabilities.

FemNet has the potential to evolve into a comprehensive AI-driven assistant for women's empowerment. By integrating advanced AI, security, personalization, multilingual support, and real-world applications, the chatbot can become a powerful tool for education, legal assistance, career growth, and safety.

5. CONCLUSIONS

FemNet demonstrates and is a simulation of the power of AI in empowering women by providing reliable and contextually relevant information across key domains such as education, health, legal rights, and career development. The system efficiently integrates Retrieval-Augmented Generation (RAG) with a structured pipeline for information retrieval and response generation. The chatbot's workflow, as outlined in the system flow, ensures a seamless user experience—from query processing through FemNet's UI to retrieving embeddings from the FAISS vector store and generating refined responses via the Ollama LLM.

By leveraging HuggingFace embeddings and semantic search, FemNet enhances the accuracy of retrieved content, ensuring that users receive precise and informative answers. The structured backend efficiently handles text chunking, embedding, and retrieval processes, optimizing response relevance. The web-based interface facilitates smooth user interaction, reinforcing accessibility and ease of use.

This project exemplifies AI's role in social empowerment by bridging the information gap for women. The structured retrieval approach enhances efficiency, while

the chatbot's design ensures scalability for broader applications. Future enhancements will focus on

expanding the knowledge base, refining retrieval accuracy, and integrating multilingual support to maximize impact. FemNet stands as a promising AI-driven tool for fostering gender equality and supporting women's empowerment.

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