**Research on AI Models**

**A. Rule-Based AI Model**

✅ **Best for:** Simple question-answering and structured workflows  
🔹 Uses predefined rules and decision trees  
🔹 Works well for **FAQs, appointment booking flows**  
🔹 **Example:** If the user asks *“Book an appointment”*, the bot follows a fixed flow

🚫 **Limitations:** Cannot handle complex conversations or context

**B. Machine Learning-Based Model (NLP + ML)**

✅ **Best for:** Understanding user intent and extracting appointment details  
🔹 Uses **Natural Language Processing (NLP)** for text understanding  
🔹 Classifies user queries into **intents** (e.g., *"Book appointment," "Cancel appointment"*)  
🔹 Extracts **entities** (Doctor Name, Date, Time)  
🔹 Can be trained on **historical chat data**

🔹 **Common ML Models for NLP:**

* **Naive Bayes Classifier** – Simple intent classification
* **SVM (Support Vector Machine)** – Used for text classification
* **Logistic Regression** – Predicts structured outputs (appointment confirmation)

🚫 **Limitations:** Requires labeled training data

**C. Deep Learning-Based Model**

✅ **Best for:** Complex, human-like conversations  
🔹 Uses deep neural networks (DNNs) for text processing  
🔹 Handles complex, multi-turn dialogues  
🔹 Can learn **context** and improve over time

🔹 **Common Deep Learning Architectures:**

* **RNN (Recurrent Neural Networks)** – Captures sequential text relationships
* **LSTM (Long Short-Term Memory)** – Better for remembering long-term dependencies
* **Transformers (BERT, GPT-4, T5, etc.)** – State-of-the-art models for NLP

🚫 **Limitations:**

* Requires **large datasets**
* High **computational power**

🔹 **Example Models:**

* **BERT** (Google) – Used for intent recognition
* **GPT-4** (OpenAI) – Used for chat-based conversations

**D. Hybrid AI Model (Rule-Based + ML)**

✅ **Best for:** Combining **structured responses** and **NLP-based conversations**  
🔹 Uses **rule-based flows** for common questions  
🔹 Uses **ML & deep learning** for understanding complex user queries  
🔹 Works **best for chatbots in healthcare**

🔹 **Example:**

1. If the user asks **“What are the clinic hours?”** → Rule-based response
2. If the user asks **“Book an appointment with Dr. Sharma at 4 PM”** → NLP extracts details and ML predicts the best response

🚫 **Limitations:** Requires integration between different AI models