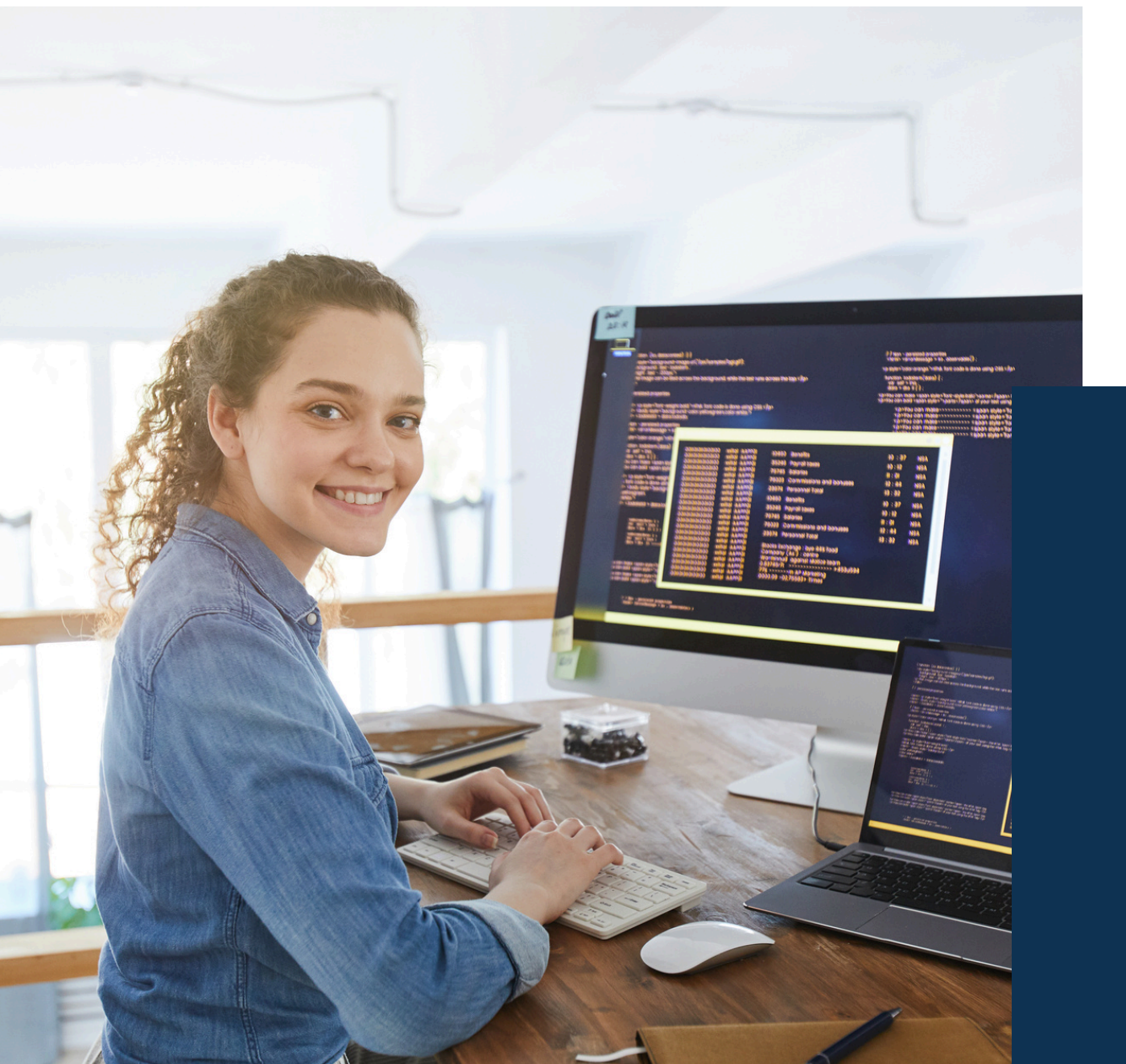


CORTEX: THE SMARTEST WAY TO USE WHAT'S ALREADY YOURS



Executive Summary



Healthcare organizations are facing an unprecedented challenge: the exponential growth of clinical data, patient records, and institutional knowledge. While these organizations possess vast repositories of information, they often struggle to transform this raw data into actionable clinical wisdom.

This white paper introduces Retrieval-Augmented Generation (RAG) technology as a transformative solution to bridge this critical gap and overcome challenges such as data silos, context preservation, and system integration, while ensuring compliance with healthcare regulations.

Discover the Path to Humanizing your Knowledge

Instant AI-powered knowledge:

Integrate with any data source, knowledge base and repositories

Enterprise-grade security:

Full customer-hosted option with data encryption and access controls.

No vendor lock-in:

Bring your own LLM, cloud, and infrastructure while using Cortex's flexible API.

Multi-channel integration:

Deploy AI assistants across chat, telephony, and search platforms.

Cost-effective AI implementation:

Forget build costs and eliminate the need for complex AI development.

Actionable Insights:

Leverage our real-world case studies to understand user pain points and maximize efficiency through AI modalities.

This whitepaper equips you to:

- Identify hidden productivity
 - “Designing RAG architectures that understand clinical context and terminology
- “Integrating existing knowledge bases with modern AI capabilities
- “Maintaining data privacy and security in AI-powered systems
- “Measuring and optimizing system performance in clinical settings
- “Framework for selecting appropriate AI modalities
- Building user adoption across different healthcare roles within your development process.



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Introduction

Healthcare generates vast amounts of data, yet accessing critical information quickly remains a challenge. U.S. healthcare professionals make an estimated 158 high-impact decisions daily, while physicians spend nearly half their time on documentation, reducing the time available for patient care. The overwhelming data burden, staffing shortages, and inefficiencies demand an intelligent solution to streamline workflows and improve care quality.

With increasing data complexity and administrative burden, AI-driven bots are transforming how healthcare organisations interact with data, patients, and internal processes. However, traditional AI chatbots often lack real-time knowledge retrieval, struggle with accuracy, and fail to integrate seamlessly into existing systems.

Challenges Reshaping the US Healthcare

- **Too Much Time Spent on Calls, Not Enough on Patients** - Administrative burdens take up nearly 15% of U.S. healthcare expenditures, with staff spending hours on scheduling, insurance verification, and routine patient inquiries.
- **Doctors Drowning in Documentation** Physicians spend up to 49% of their workday on EHR documentation, leaving less time for patient care.
- **Technology Should Work for Doctors, Not Against Them** The current state of the EHR is frequently pinpointed by physicians as the single most important stressor in patient care and nearly 75% with burnout symptoms identify the EHR as a source.
- **Too Much Data, Too Little Time** Medical knowledge is doubling, making it nearly impossible for physicians to keep wit guidelines, ongoing drug trials and treatment plans without AI assistance

The Need for RAG Powered AI Bots

To overcome these challenges, healthcare organizations need AI solutions that are fast to implement, cost-effective, and secure—without the burden of complex infrastructure or workflow disruptions. Traditional AI systems often require extensive customization, high operational costs, and significant changes in how professionals interact with technology



Retrieval Augmented Generation

The Evolution of AI in Healthcare



AI systems were historically focused on processing and analyzing data. A paradigm shift happened with the advent of Generative AI models. Gen AI refers to a range of techniques that can generate new content based on the training data combined with the additional context provided by users. These models not only automate routine tasks like writing emails and generating content but also deal with more complex tasks such as analyzing patient data for health risks.



**RAG ENABLED AI BOTS
DYNAMICALLY PULL REAL-TIME
INFORMATION FROM INTERNAL
DATABASES, RESEARCH PAPERS,
GUIDELINES AND EXTERNAL
SOURCES BEFORE GENERATING A
RESPONSE**

The Solution

RAG Powered AI Bots

- By using RAG-powered AI bots, healthcare organizations can:
Reduce hallucinations and enhance operational efficiency through AI responses in real-time, fact-checked data.
- Ensure compliance by referencing trusted sources (HIPAA-compliant medical records, guidelines, and policies).
- Improve decision-making with context-aware, accurate, and reliable AI-powered insights

Chatbot Without RAG
 User What are the symptoms of Gullian Barre Syndrome
 Bot Guillain-Barré Syndrome is a rare neurological disorder where the body's immune system attacks nerves. Symptoms include weakness, tingling in the legs, and, in severe cases, paralysis.
Has there been any recent breakout and updated guidelines for the treatment
I do not have access to current medical guidelines or information on recent outbreak but here are some sources
Source of information
Generated response based on training data

Chatbot With RAG
 User What are the symptoms of Gullian Barre Syndrome
 Bot Guillain-Barré Syndrome is a rare neurological disorder where the body's immune system attacks nerves. As per CDC latest guidelines these are the symptoms
Has there been any recent breakout and updated guidelines for the treatment
Yes, there has been a recent outbreak in India. Please find the latest treatment plan from Mayo Clinic and internal data
Source of information
<div> <div>Source 1</div> <div>Source 2</div> <div>Source 3</div> </div>



AI Powered Healthcare Bots

Transforming Data into Clinical Wisdom

Retrieval-Augmented Generation (RAG) integrates real-time information retrieval with language model capabilities, ensuring that AI chatbots generate fact-based, dynamic responses rather than relying on static pre-trained knowledge through a **three-step process**:

Indexing

Finding shelves of your AI's library. Your library is built with accurate and extensive information from all data sources – internal and external

Retrieval

Finding the right books when needed, most relevant information that fits for the task from all knowledge sources

Generation

Synthesising this knowledge into coherent contextually accurate responses based on the retrieved data

1

2

3

Transforming Clinical Data into Wisdom

- Physicians can use chatbots to instantly retrieve patient history, allergies, and medication records through secure AI-driven searches in their history
- Augment in with latest guidelines, drug trials etc and translate into documentation enhancing experience and compliance

Improved Patient Experience

- **Personalized Communication:** RAG can generate personalized responses based on patient history and preferences across languages removing additional barriers and enhancing patient/physician experience.
- **24/7 Availability:** RAG powered systems can offer round-the-clock support, answering patient queries and provide information outside office hours enhancing engagement

Enhanced Front Desk Operations

- **Automated Responses:** Handling high-call volumes by providing automated, accurate responses to common patient inquiries, appointment scheduling, prescription refills and general information.
- **Multilingual Capability:** With real-time translation, communication is seamless from appointment booking to diagnosis and further procedures.



CORTEX : Header from one pager

Apply, Qualify and Build for Free

What is Cortex

Cortex is an enterprise-grade RAG platform provides Bots at your Service that runs entirely in your infrastructure, integrates seamlessly with your LLMs and vector databases, and powers AI-driven chat, search, and telephony experiences. Deploy in weeks —not months—without the cost, complexity, and risk of building from scratch.

Key Differentiators

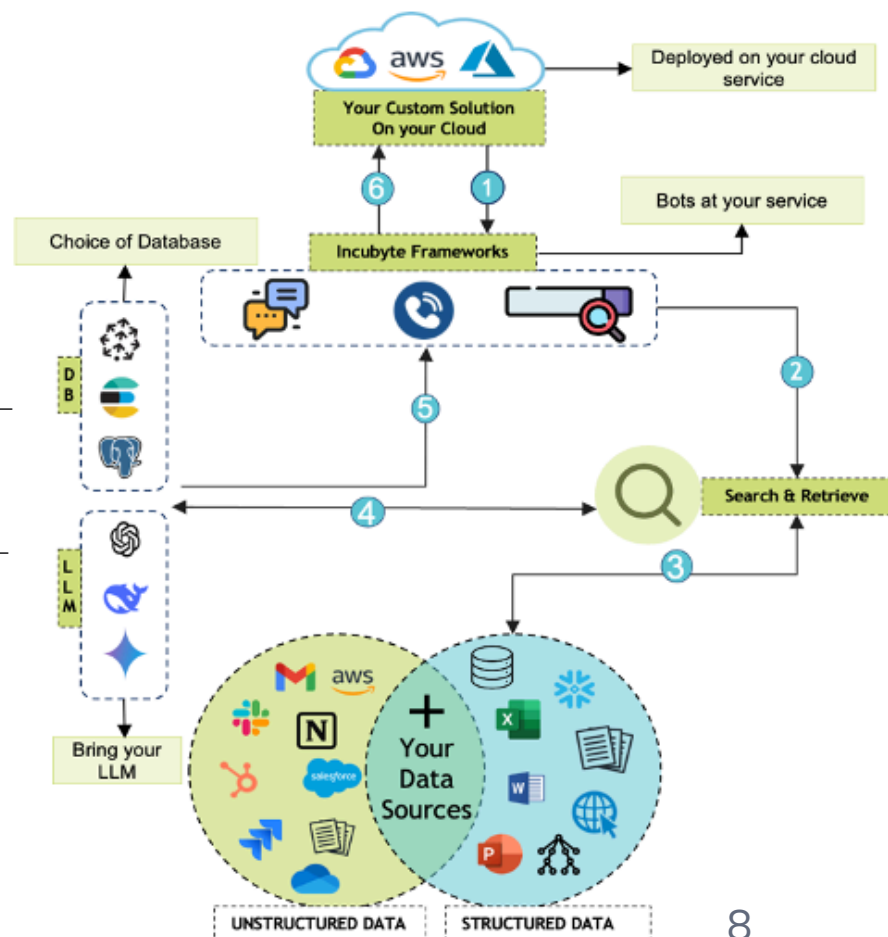
- Infrastructure Flexibility – Deploy in your own cloud or on-premises environment.
- Multi-LLM Compatibility – Use GPT-4, Claude, Llama or proprietary models, enables easy switching/upgrade to new models
- Custom Vector Database Support – Works with Pinecone, FAISS, Chroma DB, or SQL
- Enterprise Security & Compliance – Designed for HIPAA and data protection.

How Cortex Works

RAG API Platform (Core Processing Layer)

- 01 User submits a query.
- 02 System retrieves relevant structured and unstructured data
- 03 Key information is extracted for context.
- 04 Query is enriched with contextual details.
- 05 Enhanced query is sent to the LLM.
- 06 LLM generates a precise, context-aware response.
- 07 Final response is delivered to the user.

High Level Architecture



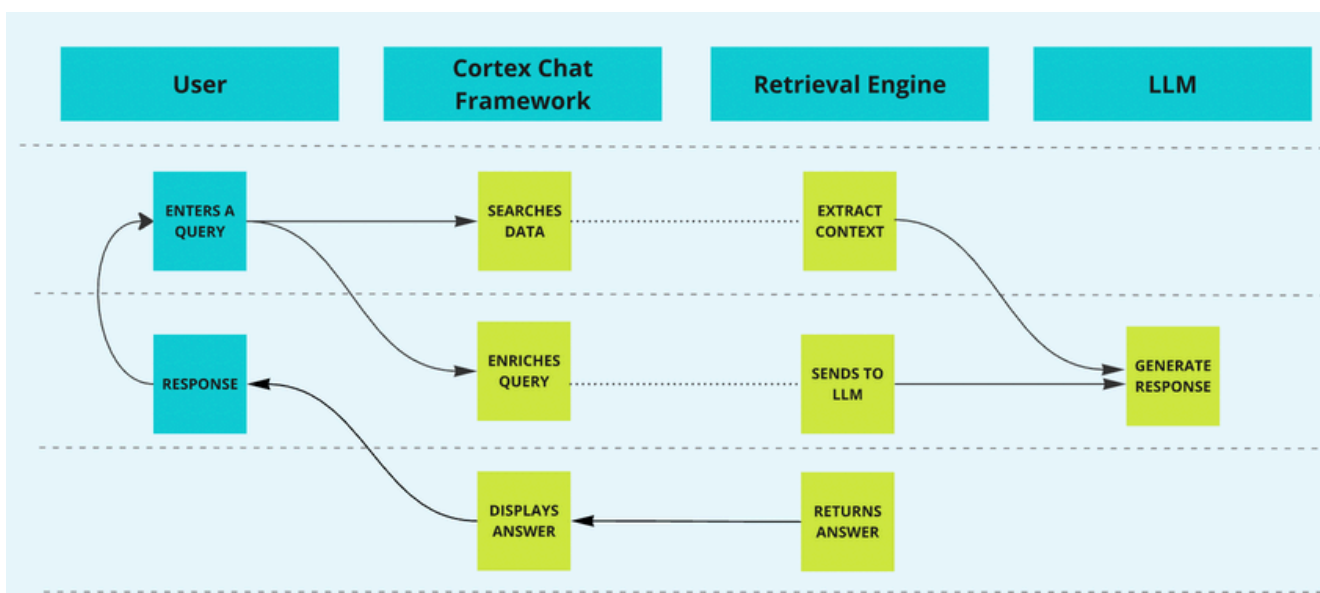


> CORTEX CHAT FRAMEWORK

The Cortex Chat Framework enables organizations to embed AI conversational agents that interact seamlessly with internal knowledge bases and external data sources. Designed for enterprise-grade knowledge retrieval, it allows users to ask complex queries and patients can book/cancel appointment as well as handle insurance pipeline seamlessly. The framework serves as an endpoint for workers across layers to handle patient appointments, answer routine queries, access relevant information quickly.

“Chatbots can handle upto 30% of live communication and almost 80% of routine tasks delivering answers three times faster on average”

The following flow chart represents the working of the Cortex Chat Framework



01 User Submits a Query - A doctor, admin or support staff asks a question via the chat interface related to guidelines, trials, patient history or protocol/plan.

02 Cortex's RAG API Gathers Relevant Data- Cortex's Retrieval-Augmented Generation (RAG) engine searches across Internal documentation (EHRs, policies), External data connectors, unstructured (PDFs, Notes, Transcripts)

03 Query Enrichment & Context Processing- The retrieved data is analysed for context and semantically powered information is prioritized.

04 LLM Generates a Context-Aware Response-The enhanced query is sent to your LLM for response generation.

05 Response Delivered to the User- The answer appears instantly with citations and can be refined for follow-up.



> Use Case

Scenario :

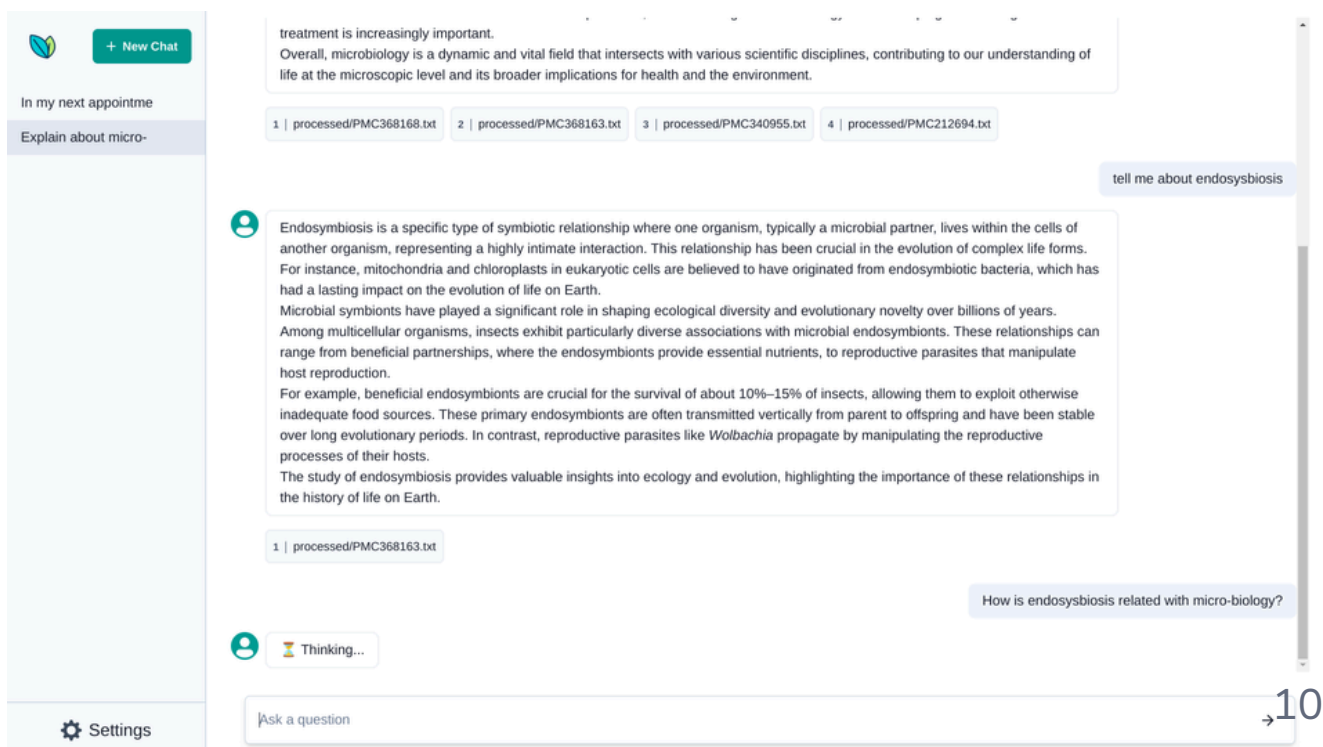
1. A front desk employee needs quick access to patient information, drug interactions, and treatment records during a patient consultation. Manually searching EHRs and stored data is time-consuming and inefficient.
2. A doctor wants to search immediate & specific information on a disease . Data volume and recency is difficult to cope with leading to a time-consuming and erroneous .

Business Solution:

The Cortex Chat Framework enables instant AI-powered knowledge retrieval, allowing receptionists to ask natural language queries and receive accurate, real-time responses from their own knowledge base relevant to the patient. Physicians can access information on any disease and possible correlation with backed answers

Business Value:

- Reduces time doing routine tasks and unnecessary friction to access right data
- Enhances diagnostic accuracy by pulling real-time, context-aware recommendations
- Seamless EHR integration ensures quick access to patient-specific treatment plans



The screenshot displays the Cortex Chat Framework interface. On the left, a sidebar contains a '+ New Chat' button, a user profile icon, and a list of chat topics: 'In my next appointme' and 'Explain about micro-'. The main chat area shows a conversation. The user's message is 'tell me about endosymbiosis'. The system's response is a detailed paragraph about endosymbiosis, including its definition, historical impact, and examples. Below the response, there are four numbered links: '1 | processed/PMC368168.txt', '2 | processed/PMC368163.txt', '3 | processed/PMC340955.txt', and '4 | processed/PMC212694.txt'. The user's next message is 'How is endosymbiosis related with micro-biology?'. The system is currently 'Thinking...'. At the bottom, there is a 'Settings' gear icon and a 'Ask a question' input field. A large number '10' is visible in the bottom right corner.



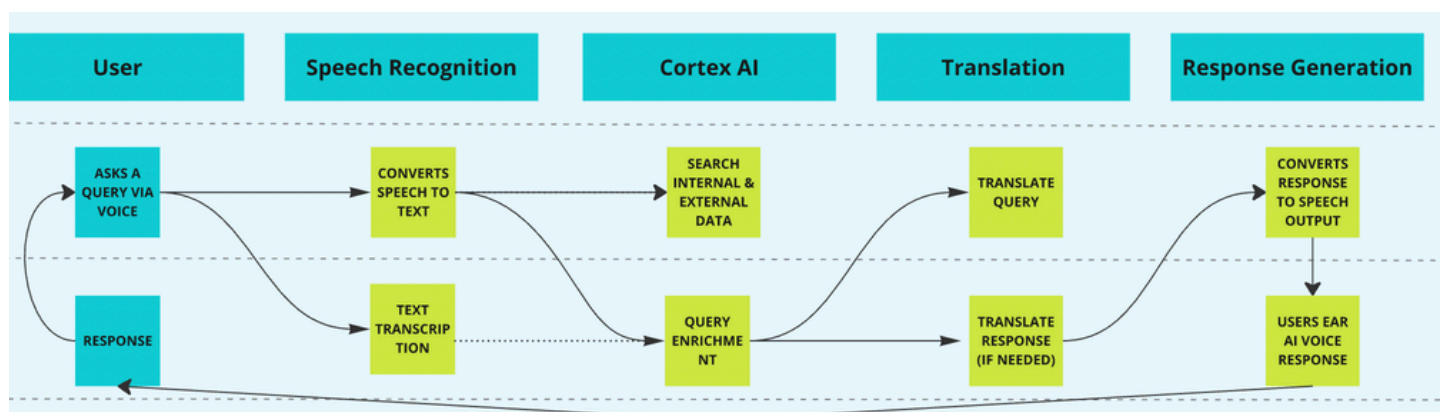
> CORTEX VOICE FRAMEWORK

The Cortex Voice Framework enables organizations to deploy AI-driven telephony integration that provide real-time, context-aware responses by accessing both internal knowledge bases and external data sources.

Calls are handled in real time catering to patient queries, routine front-desk calls and moreover real-time translation that enables cross-border interactions allowing users to ask complex questions in any language and receive accurate, data-backed responses without struggling on language.

“Voice bots in healthcare are set to increase frontdesk productivity by almost 40%”

The following flow chart represents the working of the Cortex Voice Framework



01 User interacts with Cortex through a voice-enabled system with medical queries/operational inquiries in preferred language.

02 Speech Recognition Processing converts into text using speech to text models to process intent, context and key details for transcribing

03 Cortex’s RAG engine searches across data sources and extracts relevant data

04 Query Enrichment & Context Processing- The retrieved data is analysed for context and semantically powered information is prioritized

05 LLM Generates a Context-Aware Response

06 Real-Time Translation -Cortex automatically translates the query and response ensuring accurate, contextual multilingual communication.

07 Cortex converts response into speech using text-to-speech technology enabling a clear, real-time voice response to user



> Use Case

Scenario :

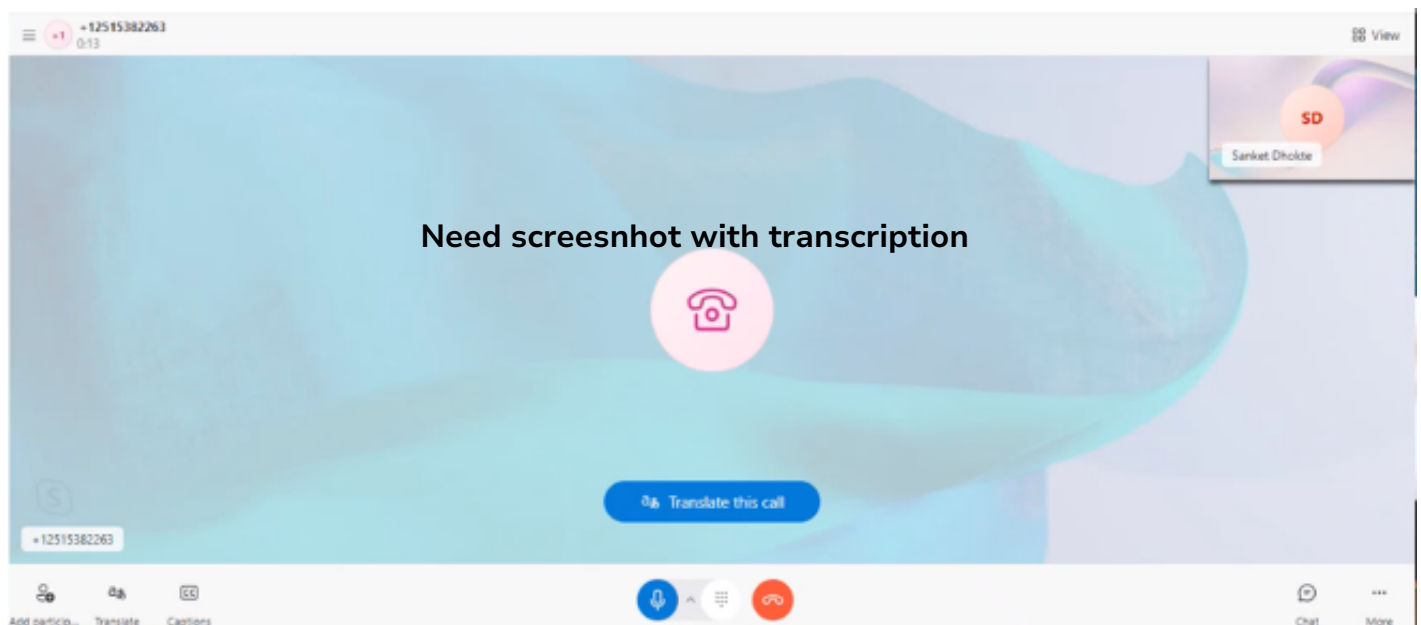
1. A non-English-speaking patient arrives at a US emergency department with severe symptoms. The physician struggles to communicate due to the language barrier, delaying critical care.
2. A non-English patient wants to book an appointment. The frontend is unable to comprehend the ask and map patient to the required physician and confirm the appointment as per schedule

Business Solution:

The Cortex Voice Framework provides real-time AI translation, allowing the physician to ask questions in English, which are instantly translated into the patient's language. The patient's responses are translated back, enabling seamless communication. The transcription happens in real-time and the record can be appended directly to the repository for future use

Business Value:

- Eliminates language barriers for timely care, human interpreter layer is eliminated
- Enhances patient safety with accurate, real-time translation.
- Reduces the cost significantly

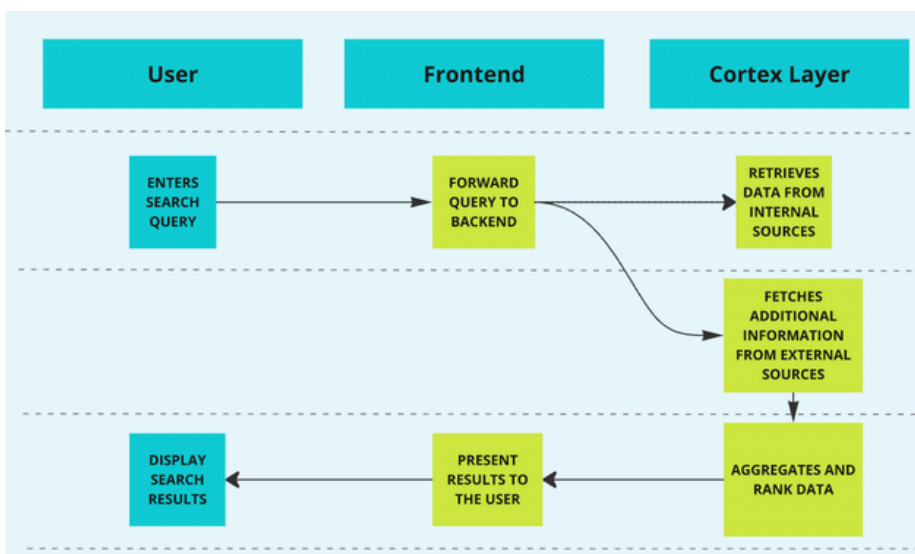




> CORTEX SEARCH FRAMEWORK

The Cortex Search Framework enables organizations to perform deep, intelligent searches across all structured and unstructured data sources, including internal knowledge bases, external research papers, regulatory documents, and proprietary datasets. Unlike keyword-based search, Cortex leverages Retrieval-Augmented Generation (RAG) and semantic search to deliver highly relevant, context-aware results in real time.

The following flow chart represents the working of the Cortex Search Framework



01 User submits a query in the search interface – your knowledge base and all sources.
 02 Retrieval engine grabs in contextual information.
 03 Query Enrichment with terminology and Re-Ranking to prioritize accurate, relevant data.

04 Query Enrichment & Context Processing- The retrieved data is analysed for context and semantically powered information is prioritized
 05 Response delivered with document, summaries and AI insights instantly.

Scenario :

A physician needs to quickly find the latest clinical guidelines, drug studies, and patient case reports across EHRs, research papers, and hospital protocols. Traditional search methods are slow and keyword-based, often returning irrelevant or outdated results.

Business Solution:

The Cortex Search Framework enables AI-powered, context-aware search, allowing users to retrieve real-time, relevant insights from internal and external medical sources embedded in their knowledge base.

Business Value:

- Faster access to critical medical knowledge
- Improved research efficiency with AI-ranked results
- Better clinical decision-making with accurate, up-to-date insights



Implementation Strategies

Adding business value at every step

- Identify a business need Select an area that negatively impacts the workflow. For instance, the productivity impact on frontline workers due to information search
- Define success Involve all cross-functional teams and ideate best possible future scenario.
- Prioritize each requirement and cluster them and map them to the root problem.
- Benchmark how to measure the value of each solution and what to validate against each Proof of Concept

Craft Incrementally

1. Conduct Short POCs which are straightforward, and business oriented with high specificity.
2. Validate that the technical solution meets the business needs. AI's potential outcomes or being highly skeptical is the norm. PoCs give way to reality avoiding excessive skepticism or expectations.
3. Anticipate risk, Assumptions, Issues and Dependencies from business, data and technical aspects.
4. Train your team incrementally and scale from pilot to test through feedback loops.
5. Conduct comparative analysis on solutions in terms of cost, performance, timelines, and cost/benefit ratio.
6. Analyze the results of PoCs to inform relevant stakeholders and inculcate in the implementation



Final Thoughts

As the volume of healthcare data grows exponentially, RAG-powered AI chatbots have become essential for organizations seeking accurate, real-time knowledge retrieval and patient interaction making AI bots invaluable for clinical support, patient engagement, and administrative automation.

Key Takeaways:

- **Accuracy & Relevance** – RAG-powered AI bots provide fact-checked, real-time responses, reducing the risk of hallucinations.
- **Enhanced Patient & Staff Experience** – AI-driven chat and voice assistants streamline communication, automate administrative tasks, and improve accessibility.
- **Scalability & Flexibility** – Cortex-powered AI bots seamlessly integrate with EHRs, regulatory databases, and internal documentation across cloud and on-prem environments.
- **Operational Efficiency** – Automating front-desk support, appointment scheduling, and patient inquiries reduces staff workload and operational costs.
- **Security & Compliance** – Built for HIPAA and enterprise security requirements, ensuring data privacy and regulatory adherence.

The future of AI in healthcare isn't just about automation—it's about building intelligent, adaptable, and reliable AI-driven interactions. With Cortex, organizations can harness RAG-powered AI chatbots without the complexity, risk, or cost of in-house development.



Further Reading

- **Video:** "Async Code Reviews are Choking Your Company's Throughput" by Dragan Stepanovic
- **Video:** "Experiencing Team Flow" by Michel Grootjans
- **Book:** "Tidy First? A Personal Experience in Empirical Software Design" by Kent Beck
- **Blog Post:** "Four Lenses of Productivity" by Abi Noda on Substack



About Incubyte

We Make Your Software Your Competitive Advantage

At Incubyte, we are a visionary software development firm that focuses on craftsmanship and innovation. We specialize in transforming visions into reality, crafting bespoke solutions for startups and SMBs, and modernizing legacy systems with a strong emphasis on accessibility and quality. Our remote-first culture champions flexibility and attracts global talent, aligning with our core values of quality and accessibility. With our expertise and dedication, we are shaping the future of tech.

We Do

Craft Software, Migrate Tech, Enhance Accessibility, Accelerate Modernization, Prioritize Craftsmanship, Support Startups

We Are

Technology Experts, Quality Driven, Strategic Partners, Pragmatically Frugal, Inclusion Focused, Growth Enablers.

We Are Not

Order Takers, Feature Factory, Legacy Maintainers, Offshoring Generalists, Overly Expensive, Quick Fixers



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