Project Workflow: GenAI-Powered Patient Summarization System

## **Introduction**

The goal of this project was to enhance patient care and operational efficiency for a leading healthcare provider through AI-driven automation. Traditional documentation processes were slow and inconsistent, leading to inefficiencies in patient care. By leveraging Generative AI and cloud services, we implemented a streamlined, automated solution to generate patient summaries, ultimately improving care outcomes and reducing administrative burdens.

## **Technology Stack**

* Frontend: React (User Interface)
* Backend: Python (FastAPI for API development)
* Database: AWS RDS (PostgreSQL for structured data storage)
* AI Model: BioGPT (specialized for healthcare text generation)
* Cloud Services: AWS (Lambda, S3, Bedrock, SageMaker, DynamoDB, Step Functions)
* Security: AWS IAM, Cognito (for authentication and role-based access control)
* Deployment: AWS ECS (containerized deployment using Docker)
* Logging & Monitoring: AWS CloudWatch, X-Ray for performance tracking

## **Project Workflow**

### **1. Data Ingestion & Integration**

* Patient data is collected from Electronic Medical Records (EMR) systems.
* Healthcare professionals' notes and structured data from AWS RDS (PostgreSQL) are extracted.
* AWS Lambda processes incoming data and stores it securely in AWS S3.

### **2. Data Preprocessing & Storage**

* Data undergoes transformation (removal of redundant details, structuring patient encounters).
* Processed data is stored in AWS DynamoDB for quick retrieval.
* Metadata and indexing are handled using AWS OpenSearch for efficient querying.

### **3. AI-Driven Patient Summarization**

* BioGPT (hosted on AWS SageMaker) generates initial patient summaries.
* The model is fine-tuned using AWS Bedrock to align with domain-specific healthcare terminology.
* Summaries are stored in AWS S3, with reference metadata indexed in DynamoDB.

### **4. Human-in-the-Loop Review & Refinement**

* Summaries are presented to healthcare professionals via a React-based UI.
* Users can review, edit, and approve summaries before they are finalized.
* Edited summaries are stored and version-controlled in AWS S3.

### **5. Care Plan Updates & Automation**

* AWS Step Functions orchestrate the workflow for bi-weekly patient summary updates.
* Every 14 days, a summary of the last two weeks is auto-generated and compared with historical data.
* Updates are pushed to caregivers in real-time through a notification system using Amazon SNS.

### **6. Deployment & Monitoring**

* The application is containerized and deployed on AWS ECS with Fargate.
* AWS CloudWatch monitors system performance and logs API activity.
* AWS X-Ray provides insights into request latencies and system bottlenecks.

## **Results & Impact**

### **Enhanced Patient Care**

* Reduced time spent on documentation, allowing healthcare professionals to focus on patient care.
* Improved accuracy in patient history and medical summaries.

### **Operational Efficiency**

* Automated summarization reduced administrative workload by 60%.
* Bi-weekly patient summary generation improved care coordination and continuity.

### **Cost Savings**

* Reduction in manual documentation led to 20% cost savings in operational expenses.
* Increased provider retention by minimizing administrative burden.

## **Conclusion**

By leveraging AWS cloud services and BioGPT, we successfully automated patient summarization for a leading healthcare provider. The AI-driven approach enhanced data accuracy, reduced documentation time, and improved care efficiency. The adoption of GenAI and cloud-based automation resulted in better patient outcomes and a streamlined workflow, marking a significant transformation in home healthcare service delivery.

Some health specialized model ---

### **. BioGPT (Microsoft)**

* Developed by Microsoft Research, BioGPT is a transformer-based model trained on biomedical literature.
* Best for: Medical text generation, summarization, and entity recognition.
* Use Case in Our Project: We could fine-tune BioGPT to summarize patient notes and generate structured reports from unstructured EMR data.

### **MedPaLM 2 (Google DeepMind)**

* MedPaLM 2 is a GPT-like model specialized for healthcare applications, trained on medical Q&A and clinical guidelines.
* Best for: Medical conversations, summarization, and patient data processing.
* Use Case in Our Project: Providing context-aware summaries of patient encounters for healthcare professionals.

**ClinicalBert(Bert)**