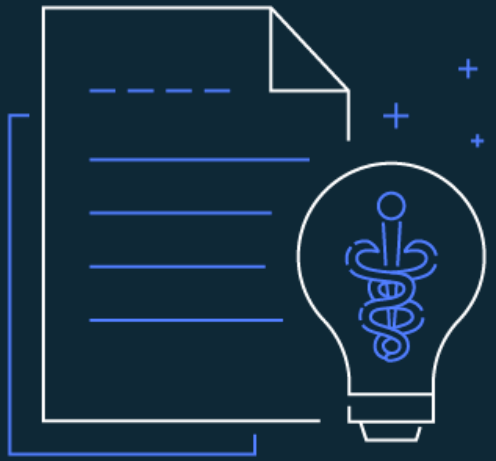
AI-Powered Health Data Masking



Arun Ravi, Product Lead, Amazon Comprehend Medical

James Wiggins, Sr. Solutions Architect, Healthcare & Lifesciences

aws

Our mission at AWS

Put machine learning in the hands of every developer

aws

AWS Healthcare Customers

aws

Customer Problem

Inclusion of protected health information (PHI)
can limit the usefulness of health data across applications

PHI is difficult to detect and remove

aws

Agenda

- Overview of AI/ML on AWS
- Medical Natural Language Processing (NLP) on AWS
- Computer vision on AWS
- AI-Powered Health Data Masking
- Demo

THE AWS ML STACK

Broadest and deepest set of capabilities

AI Services

VISION			SPEECH		LANGUAGE		CHATBOTS	FORECASTING	RECOMMENDATIONS
REKOGNITION IMAGE	REKOGNITION VIDEO	TEXTRACT	POLLY	TRANSCRIBE	TRANSLATE	COMPREHEND & COMPREHEND MEDICAL	LEX	FORECAST	PERSONALIZE

ML Services

Amazon SageMaker

Ground Truth	Notebooks	Algorithms + Marketplace	Reinforcement Learning	Training	Optimization	Deployment	Hosting

ML Frameworks + Infrastructure

FRAMEWORKS	INTERFACES
TensorFlow, mxnet, PYTORCH	GLUON, Keras

INFRASTRUCTURE

EC2 P3 & P3DN | EC2 G4 EC2 C5 | FPGAS | DL CONTAINERS & AMIs | ELASTIC CONTAINER SERVICE | ELASTIC KUBERNETES SERVICE | GREENGRASS | ELASTIC INFERENCE | INFERENTIA

aws

Amazon Comprehend Medical

1.2 B unstructured clinical documents created per year

Critical information “trapped” in these documents

Difficult to extract insights

aws

Amazon Comprehend Medical

Medical Named Entity and Relationship Extraction (NERe API)

Entities

- Medication
- Medical condition
- Test, Treatments and Procedures
- Anatomy
- Protected Health Information (PHI)

Relationship Extraction

- Medication and dosage
- Test and result
- Many more

Entity Traits

- Negation
- Diagnosis, Sign or Symptom

Protected Health Information Identification (PHId API)*

Service is HIPAA Eligible and “Stateless”, no customer data stored

*This API extracts Protect Health Information only at lower cost.

Distill a complex process into a simple API call

aws

Use Cases

Patient & population health analytics

PHI Compliance

Revenue cycle management (Medical Coding)

Clinical Trial management

Pharmacovigilance

What else?

aws

AWS Blog Posts about Amazon Comprehend Medical

Extract and visualize clinical entities using Amazon Comprehend Medical

In this example, we demonstrate how you can use Amazon Comprehend Medical to extract clinical entities and visualize them on a Kibana dashboard.

Identifying and working with sensitive healthcare data with Amazon Comprehend Medical

In this blog post, we'll demonstrate how you can use a combination of Amazon Comprehend Medical, AWS Step Functions, and Amazon DynamoDB to identify sensitive health data and help support your compliance objectives.

De-identify medical images with the help of Amazon Comprehend Medical and Amazon Rekognition

In this blog post, for the actual machine learning and prediction, we will be using Amazon Rekognition to extract text from the images and Amazon Comprehend Medical to help us to identify and detect the PHI.

Map clinical notes to the OMOP Common Data Model and healthcare ontologies using Amazon Comprehend Medical

In this blog post we'll explore how you can use Amazon Comprehend Medical to read notes from OMOP, extract medical insights, and write them back into OMOP using SNOMED ontological codes to enhance patient and population observational health data.

aws

Amazon Comprehend Medical Scientific Papers

Improving Hospital Mortality Prediction with Medical Named Entities and Multimodal Learning

In this study, we explore how clinical text can complement a clinical predictive learning task.

End-to-end Joint Entity Extraction and Negation Detection for Clinical Text

Negative medical findings are prevalent in clinical reports, yet discriminating them from positive findings remains a challenging task for information extraction.

Dynamic Transfer Learning for Named Entity Recognition

State-of-the-art named entity recognition (NER) systems have been improving continuously using neural architectures over the past several years. However, many tasks including NER require large sets of annotated data to achieve such performance. In particular, we focus on NER from clinical notes, which is one of the most fundamental and critical problems for medical text an

Relation Extraction using Explicit Context Conditioning

Relation Extraction (RE) aims to label relations between groups of marked entities in raw text. Most current RE models learn context-aware representations of the target entities that are then used to establish relation between them.

aws

Resources

To learn more about Amazon Comprehend Medical, visit: https://aws.com/comprehend/medical/

Amazon Comprehend Medical Deep Dive Video:
https://youtu.be/cJ3eUPOXV4Q

To learn more about how AWS can help healthcare organizations:
https://aws.amazon.com/health/

Amazon Rekognition

Amazon Rekognition applies machine learning to extract information from images and video

Images

Video

aws

Amazon Rekognition Features

Faces

Celebrities

Labels

Text

Moderation

Activities

Paths

Scenes

aws

AI-Powered Health Data Masking

Amazon Comprehend Medical PHId API

aws comprehend-medical detect-phi --region us-east-1 --text “<Insert Text Here>”

Mr. Smith is a 63-year-old gentleman with coronary artery disease and hypertension. He currently lives in Seattle and works as a teacher. His PCP, Dr. John, works at the University of Washington

In addition to extracting PHI, the PHId API identifies relevant patient identifiers described in HIPAA Safe Harbor method of de-identification

Protected Health Information (PHI)

Mr. Smith: **Name**

63: **Age**

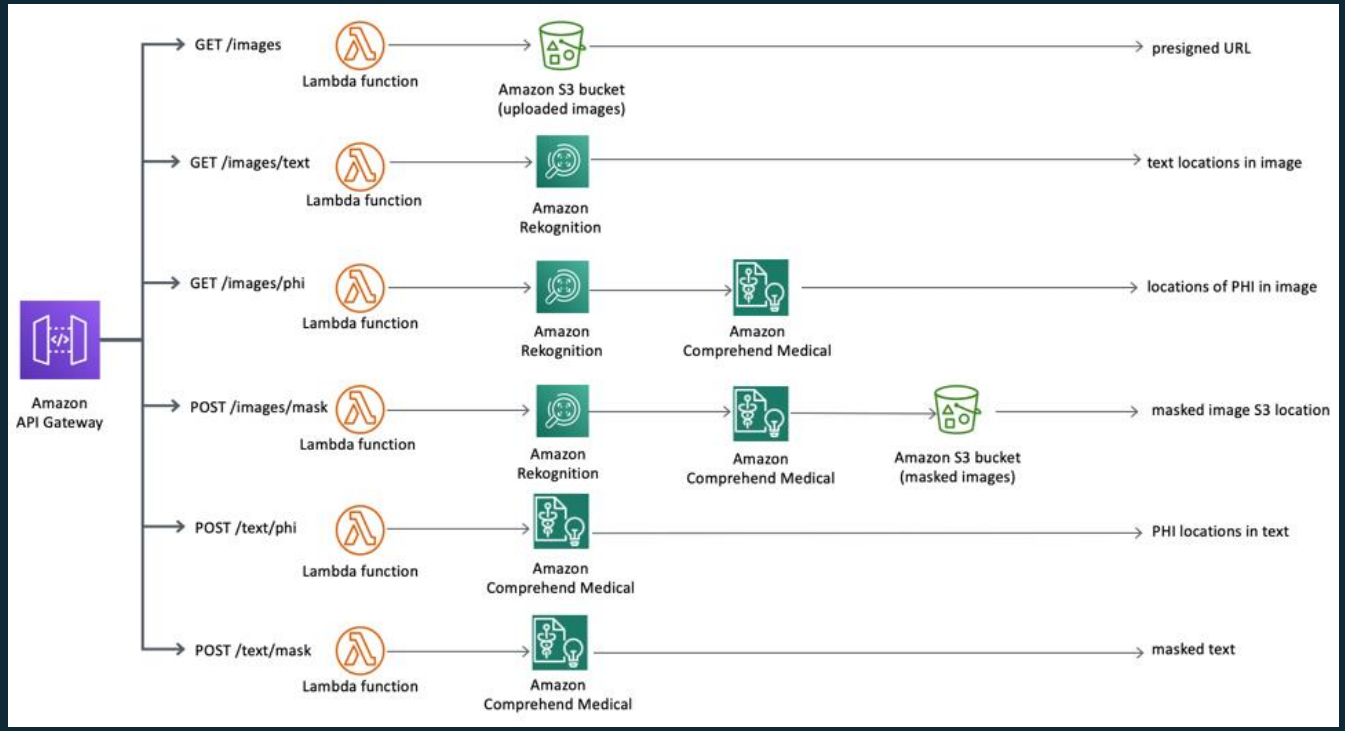
Seattle: **Address**

Teacher: **Profession**

John: **Name**

University of Washington: **Address**

AI-Powered Health Data Masking Architecture



Demo

AI-Powered Health Data Masking Use Cases

Research Data Lake

Enhance Existing Applications

Regulatory Compliance

Healthcare collaboration

What else?

aws

What we covered

- Overview of AI/ML on AWS
- Medical Natural Language Processing (NLP) on AWS
- Computer vision on AWS
- AI-Powered Health Data Masking
- Demo

aws

How can the AI-Powered Health Data Masking solution,

or other AI/ML services from AWS

help your organization?

Questions