Architecture & Technology

- Firebase is a potential option for developing the web app
  - Many benefits, could quickly build and scale our business
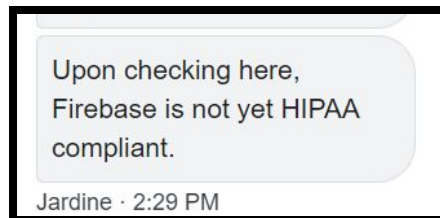 - However, currently not HIPAA compliant. See chat below.

> Upon checking here, Firebase is not yet HIPAA compliant.
>
> Jardine · 2:29 PM

Image 01: Google One Support Chat regarding
HIPAA compliance of Firebase

  - Firebase has not yet implemented all of the physical, technical, and administrative safeguards required under HIPAA.

- We would establish a Business Associate Agreement (BAA) with either Azure or AWS
  - AWS has fantastic documentation and it's easy to envision the architecture using their services
    - Dicom Systems Unifier allows for de-identification and migration of patient data for use in deep learning applications -- PERFECT for scaling our product
      - Update: As of 10/07/2020, this is also offered through Azure
  - Avoid integrating both - increased cost, latency, support

Example Architecture:
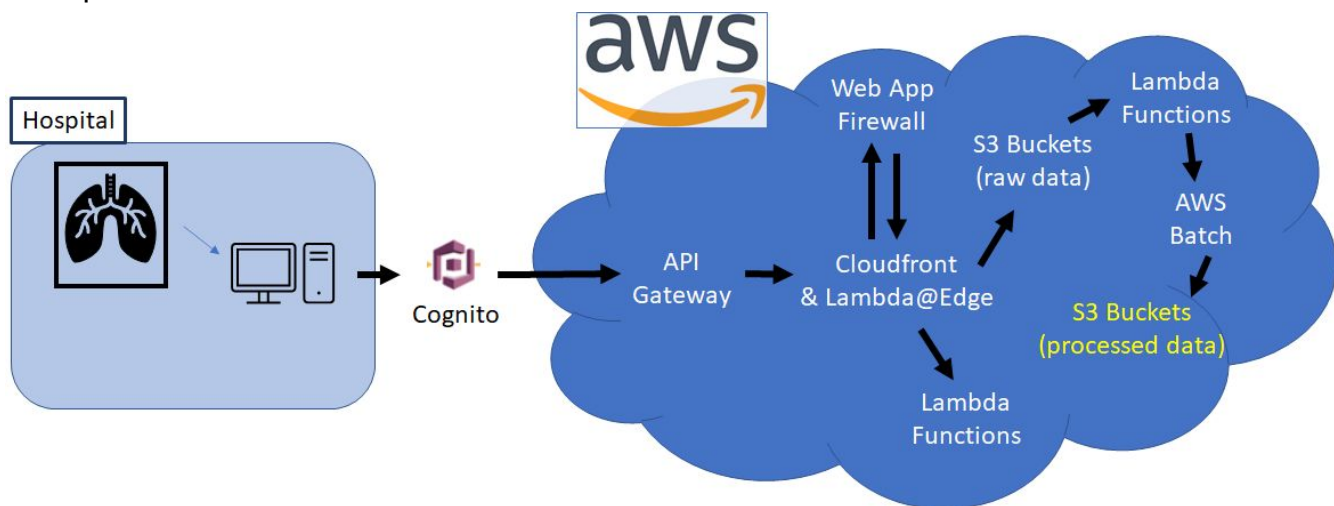
Minimum Viable Product (MVP)

Our MVP for this algorithm will read in data, perform basic preprocessing steps, and process the data in a way that is consistent with the performance criteria for the Kaggle competition.

MVP User Stories

As a clinician, I want a HIPAA-compliant means of uploading and processing patient data using this software to ensure the confidentiality of patient records.

As a hospital administrator, I want efficient, cross-platform software that operates within existing hospital infrastructure.

As a radiologist, I would like a way to verify the result and provide additional comments to the treating physician.

As a primary care physician, I want to have a secure way to log in to the software and view the results and interpretation of the CTPA scans for my patient.

As an emergency medicine physician, I want to have ready access to results and interpretation so I can efficiently administer the care the patient needs.

Demonstration

PENet (relies on SCC to run; output below)

User Story: As a radiologist, I want to upload my patient's raw DICOM CTPA scan and be able to determine his or her probability of PE for triage purposes.

Input: Individual patient's CT Pulmonary Angiography scan (DICOM)
Output: Probability of PE

```
Reading input dicom...
Formatting input for model...
Loading saved model...
Sending model to GPU device...
Evaluating study...
Probablity of having Pulmonary Embolism: 0.3009664714336395
(ctpe) [meganmp@scc-k01 PENet]$
```

Goal: Generate baseline from pre-trained algorithm. Train with our data and compare performance. Determine optimal operating point threshold for sensitivity and specificity for triage.