Skin Cancer Diagnosis using Artificial Intelligence on the Cloud

Team 45
Megan Eberle
Breann Grant
Bariture Ibaakee
Evan Nim
Alexander Lafontaine
Abigail Thompson

Advisor
Ashraf Gaffar

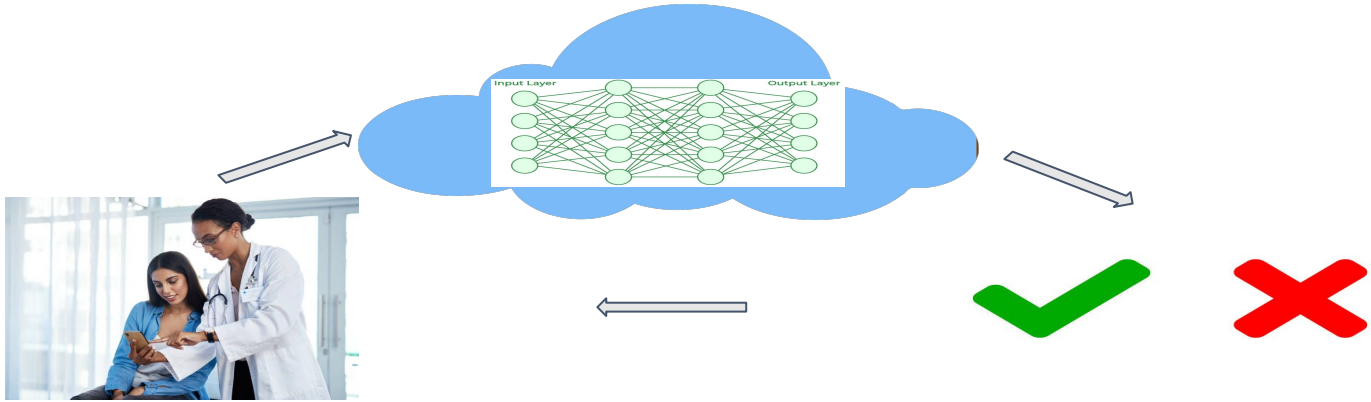
Project Goal

The goal of our project was to develop a mobile application that utilizes Artificial Intelligence hosted on the cloud to analyze photos of skin, rapidly determining the presence or absence of skin cancer with an accuracy greater than that of a doctor's visual assessment.

Additionally, the project will compare the effectiveness of two cloud providers in hosting the AI for this application.

Intended Use

- Meant for doctors, not patients
- Tool to supplement visual analysis
- Cloud provider comparison data



Design Considerations

- No patient data or images saved
- Require users to have an account with a username and password to limit access to the application.
- Mobile app as UI to allow users to take photo directly
- Cloud-hosted Artificial Intelligence for access around the world
- Cloud provider quality assessment

Challenges and Solutions

Larger models were overfitting extremely quickly, as opposed to the small Xception model.

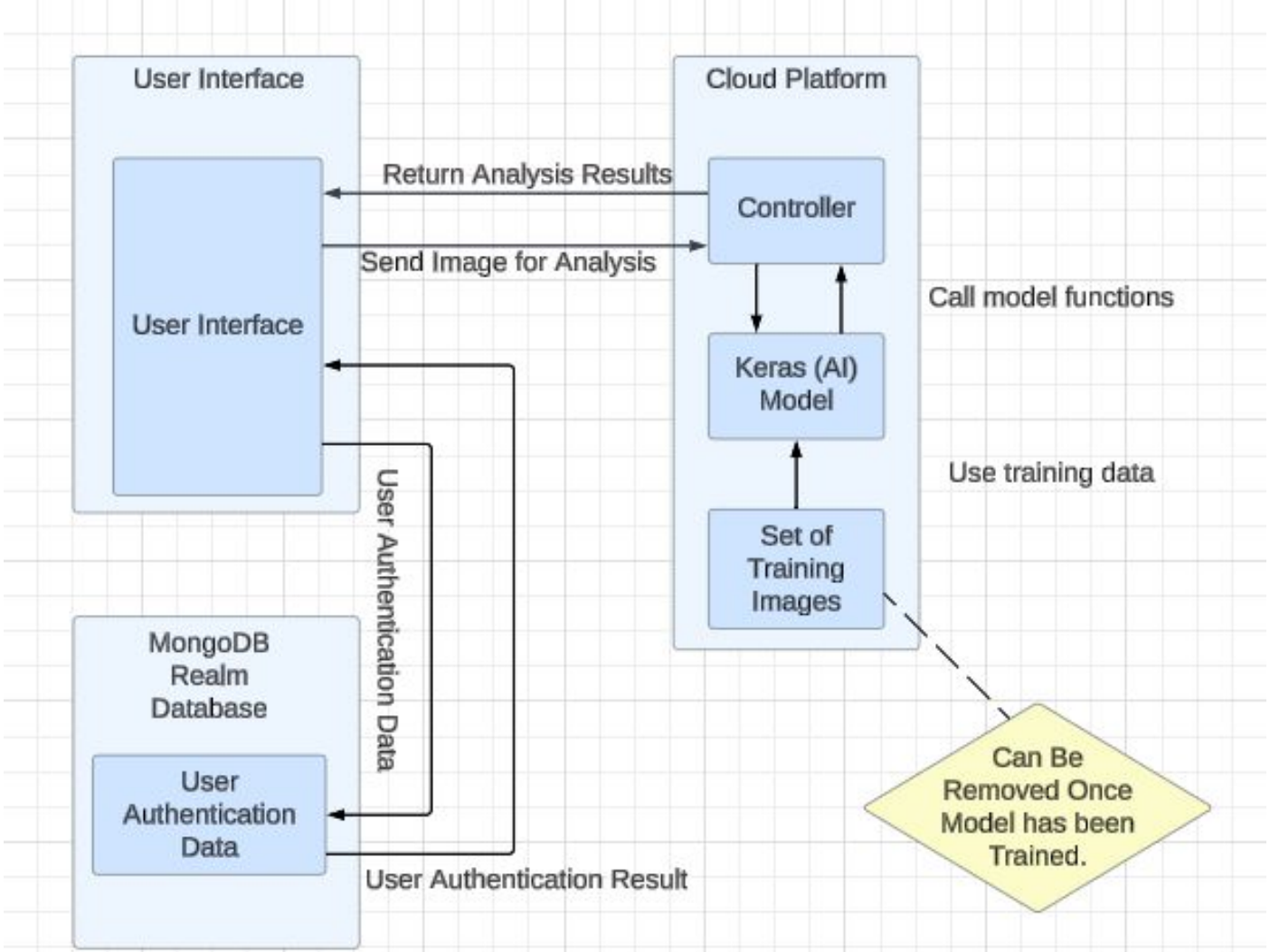
- We experimented with pre-processing variables and read literature about how these larger models work since data augmentation was not enough.
- We increased the amount of the training dataset from 20,000 to 30,000.
- After some modifications, a bigger Xception model was finally implemented.

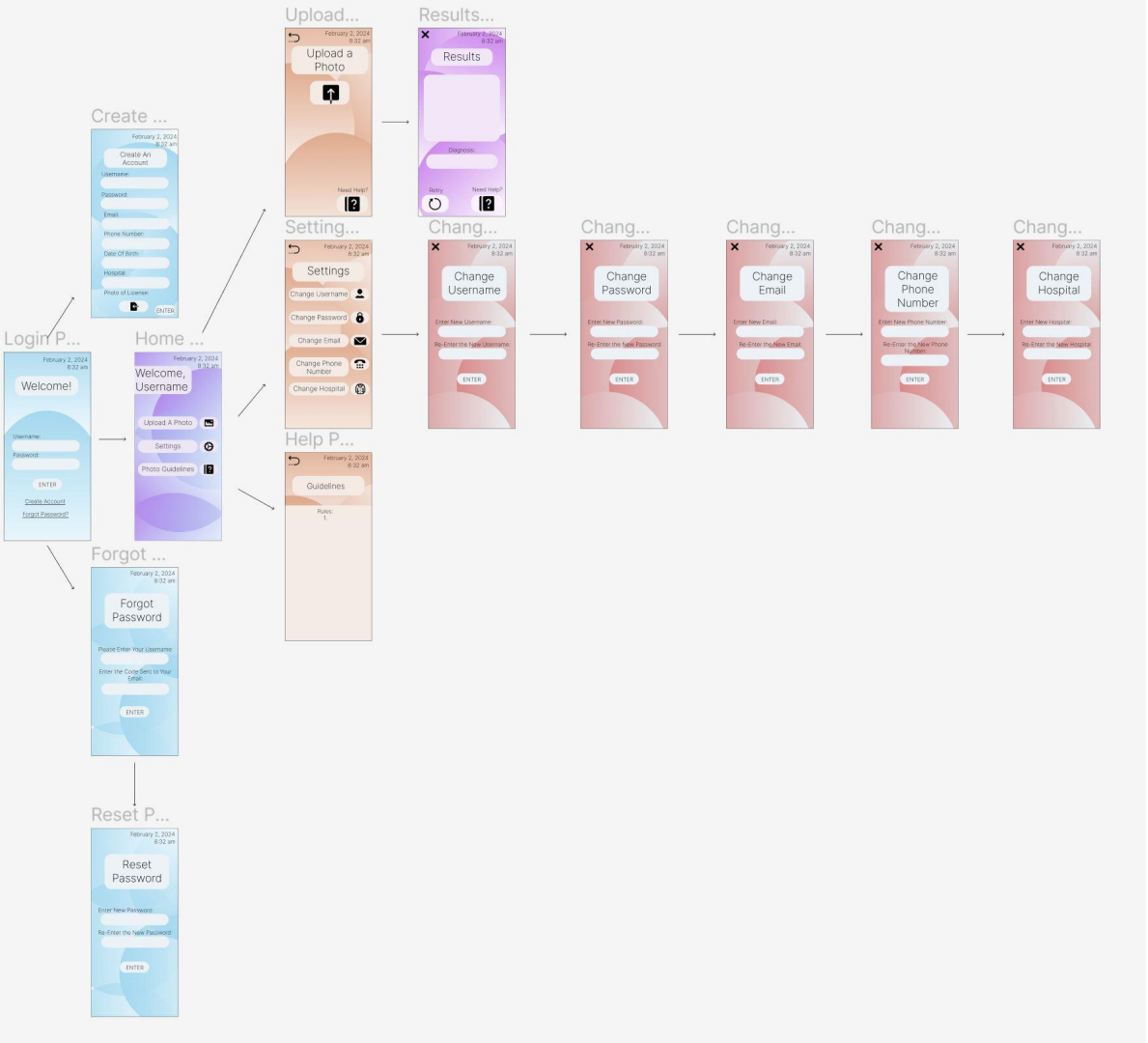
Could not use Tensorflow GPU

- Despite not being as efficient, Tensorflow with CPU maintained consistency

Implementing the frontend to an iOS app using Swift.

- We researched solutions for this but since access to a MacOS was extremely limited and we could not find a way to use Swift without a MacOS we decided to switch to Android and use Android Studio to implement the frontend.


User Interface
User Interface
Cloud Platform
Return Analysis Results
Controller
Send Image for Analysis
Call model functions
Keras (AI) Model
Use training data
Set of Training Images
User Authentication Data
MongoDB Realm Database
User Authentication Data
User Authentication Result
Can Be Removed Once Model has been Trained.


Upload...
Upload a Photo
Need Help?
Results...
Results
Diagnosis:
Retry
Need Help?
Create ...
Create An Account
Username:
Password:
Email:
Phone Number:
Date Of Birth:
Hospital:
Photo of License:
ENTER
Setting...
Settings
Change Username
Change Password
Change Email
Change Phone Number
Change Hospital
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Enter New Username:
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Change Phone Number
Enter New Phone Number:
Re-Enter the New Phone Number:
ENTER
Chang...
Change Hospital
Enter New Hospital:
Re-Enter the New Hospital:
ENTER
Login P...
Welcome!
Username:
Password:
ENTER
Create Account
Forgot Password?
Home ...
Welcome, Username
Upload A Photo
Settings
Photo Guidelines
Help P...
Guidelines
Rules:
1.
Forgot ...
Forgot Password
Please Enter Your Username:
Enter the Code Sent to Your Email:
ENTER
Reset P...
Reset Password
Enter New Password:
Re-Enter the New Password:
ENTER

Cancer Model Overview

- Utilized Keras and TensorFlow Library
- Trained model with a dataset of 30,000 images
- Used the Xception Model
- Implemented a small version of the Xception model to start writing the code structure and everything necessary to train the model and make predictions with it.
- After a successful code implementation, the A.I. model was transitioned to a more standard version of the Xception model with an added layer at the end for image classification.
- Models were trained on AWS and GCP for 5 iterations with a batch of 1

AWS vs GCP Testing Results

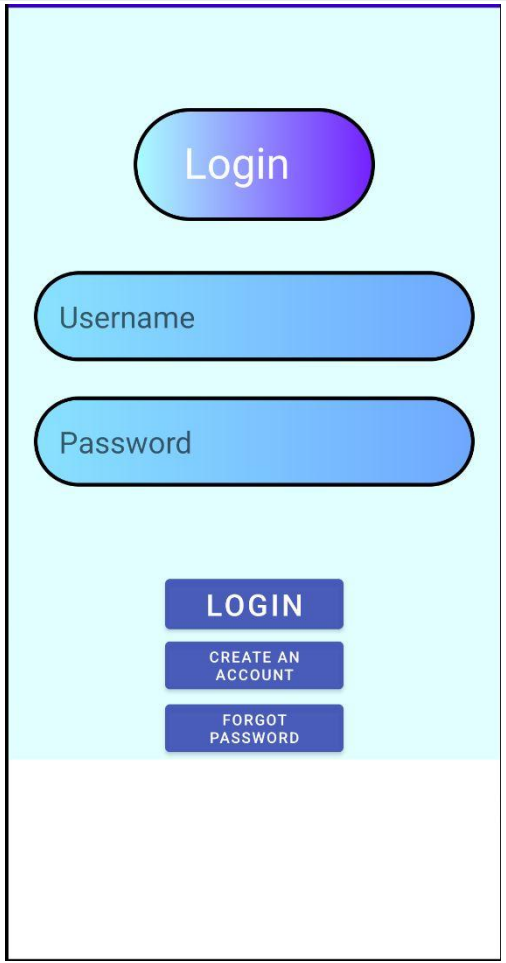
Activity	AWS Time	GCP Time
Dataset Generation	4.6235 Seconds	0.991 Seconds
Dataset PreProcessing	0.5168	0.4031
Model Building	2.0074 Seconds	1.1855 Seconds
Model Training	60.044 Hours	50.850 Hours
Model Saving	0.9682 Seconds	0.8918 Seconds
Hours per Iteration	12.0088 Hours	10.1701 Hours

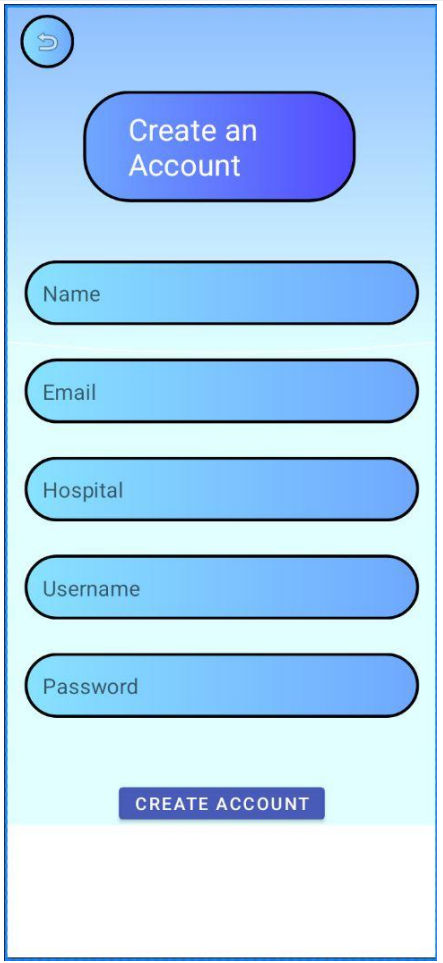
AWS vs GCP Comparisons

	AWS (Preliminary)	GCP (Preliminary)	Local
Training Accuracy	98.28%	98.28%	98.28%
Validation Accuracy	49.10%	77.19%	98.0%
Training Loss	0.984	0.0991	0.0854
Validation Loss	1692.4597	6.5616	0.6469

	AWS	GCP
Total Cost (US Dollar)	$49.80	$57.50

Demo


Login
Username
Password
LOGIN
CREATE AN ACCOUNT
FORGOT PASSWORD


Create an Account
Name
Email
Hospital
Username
Password
CREATE ACCOUNT