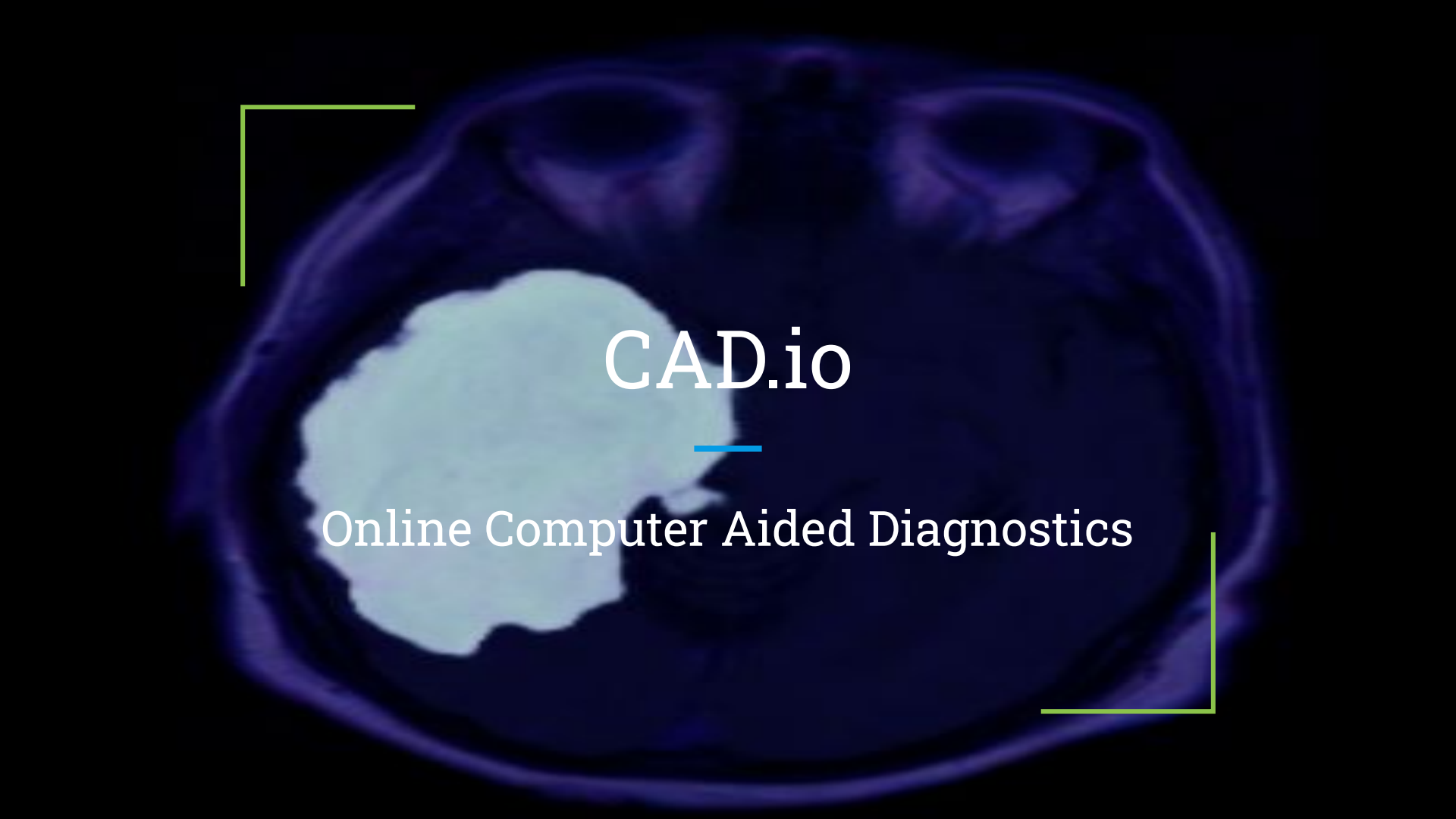


CAD.io

Online Computer Aided Diagnostics

Purpose

Provide radiologists in developing countries with mobile web software for viewing and diagnosing medical images
Provide free and simple AI assisted diagnostics
Some countries have only 1 radiologist for every 2.5 million people

Dataset

- 3929 total brain MRI images in .tiff format from 112 patients
- Each image comes with a corresponding segmentation mask outlining the glioma (brain tumor)
- All images consisted of RGB color channels with 0-255 intensity range
- All images were 256x256 pixels

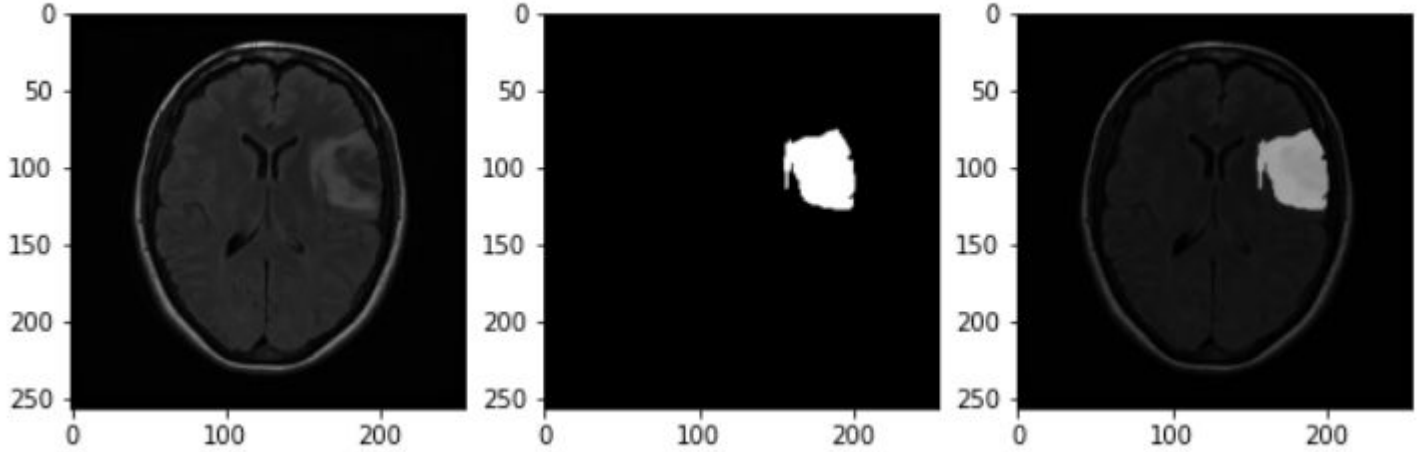
Model

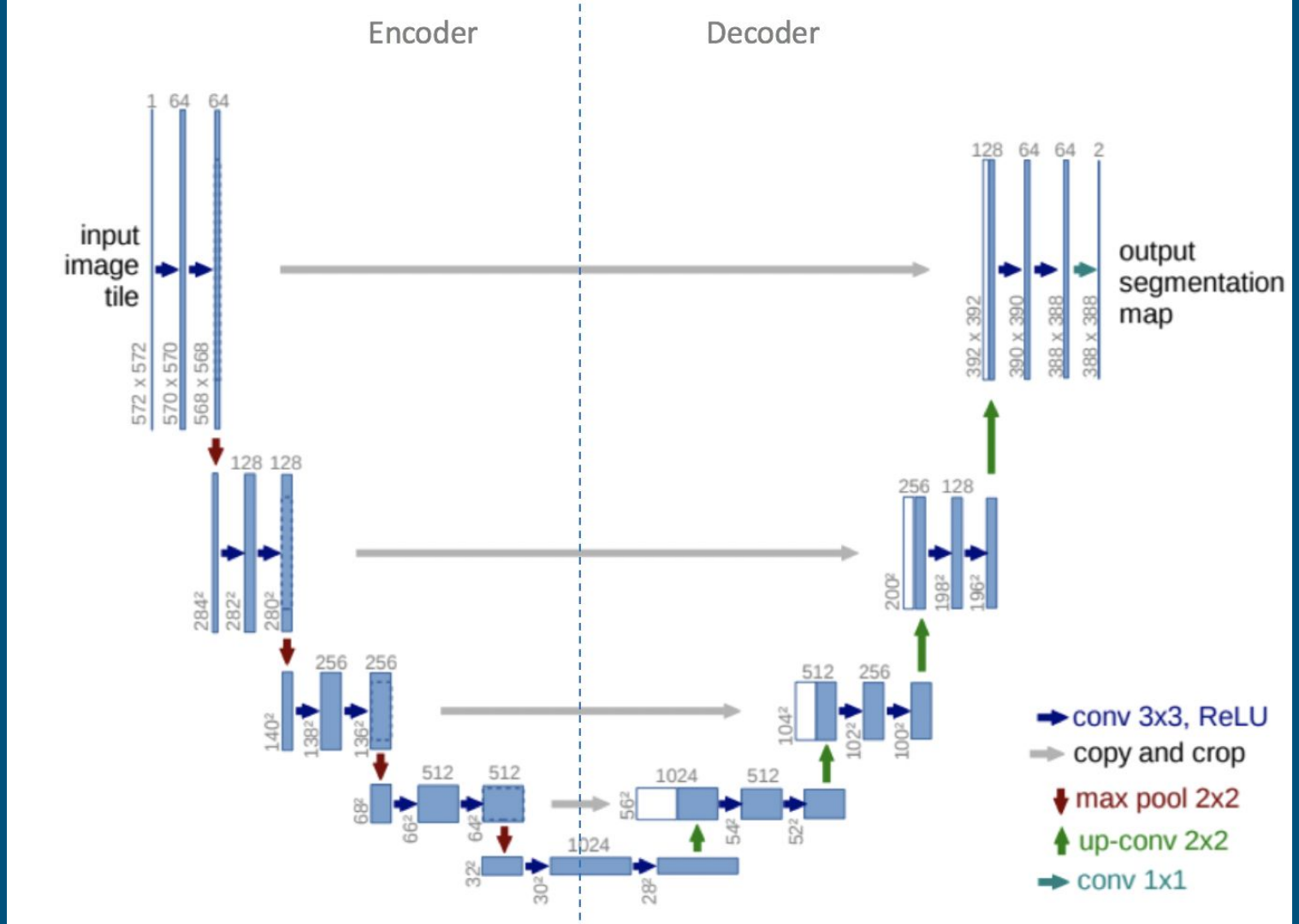
The Model used for prediction was a convolution neural network designed for image segmentation called a U-Net

The model consists of 5 downsampling (convolutional) layers followed by 4 upsampling layers followed by a convolutional activation layer with 2 classes

Trained on 30 epochs

<matplotlib.image.AxesImage at 0x7fd85817ed10>




Encoder
Decoder
input image tile
output segmentation map
conv 3x3, ReLU
copy and crop
max pool 2x2
up-conv 2x2
conv 1x1

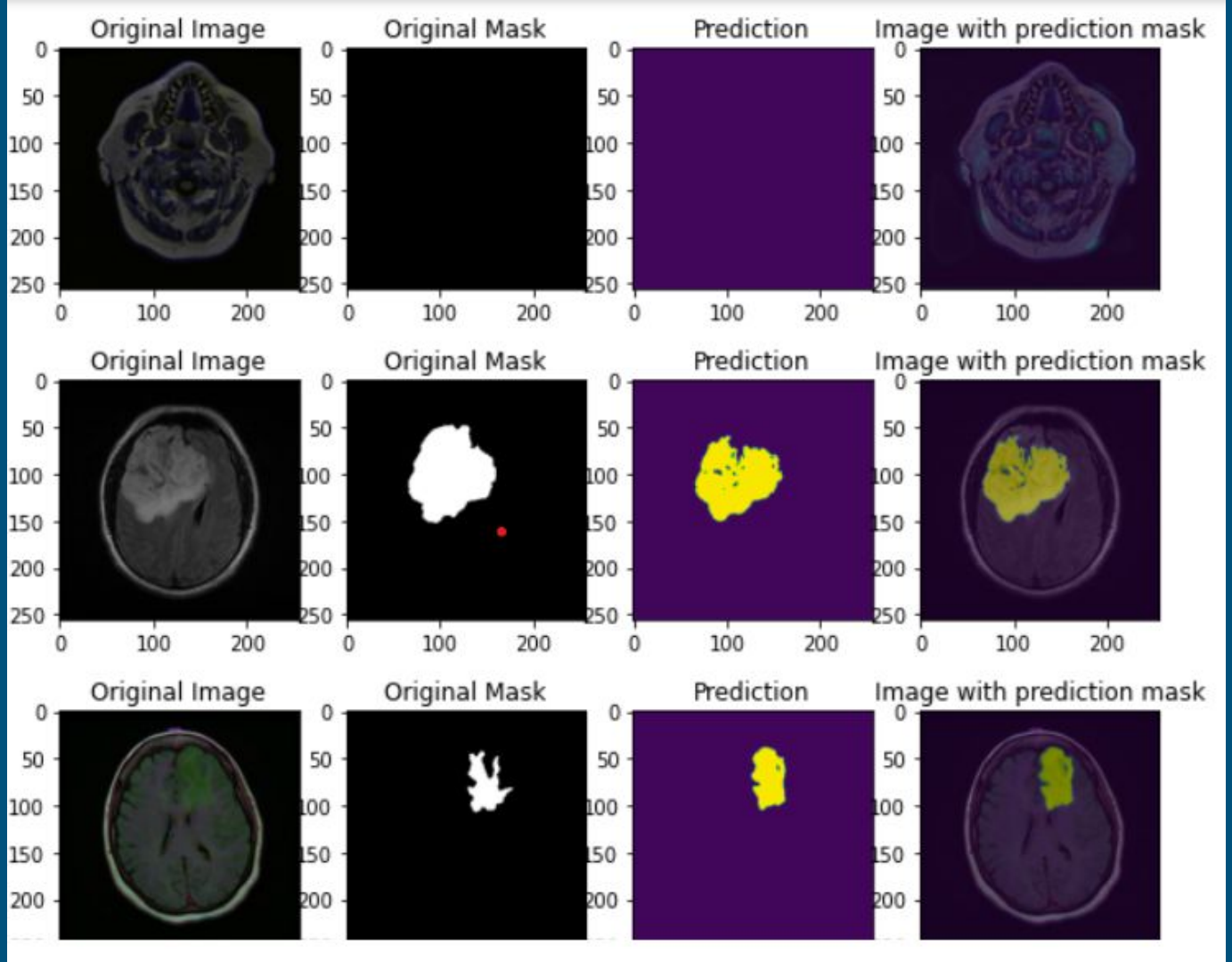
Performance

Performance for image segmentation was measured in and DICE score (pixelwise f1 score)

Performance was evaluated using 10% of the total data for testing and 20% of the remaining training data for validation

The model achieved 0.851 DICE coefficient on the testing data, 0.832 on validation data and 0.839 on training data.

(K-fold cross validation was not used because model training took several hours)


Original Image
Original Mask
Prediction
Image with prediction mask
Original Image
Original Mask
Prediction
Image with prediction mask
Original Image
Original Mask
Prediction
Image with prediction mask

Web Application

A viewing application was programmed in javascript using the Tensorjs and Cornerstone libraries

Images were pushed into a queue and displayed on a webpage one at a time

The mousewheel could be used a change the image and “scroll through” the 3d scan

A button allows the user to scan the displayed image for tumors and overlays the corresponding segmentation mask

All processing is handled client side

Demo:

Future Work

Supporting more image file types

Adding additional models for different types of predictions

Adding more tools to aid diagnosis (pixel coordinate system, marker/draw tool, zoom, MPR)

Improve Scan time (currently takes ~10 seconds per image)