



# MONASH University

## FIT3164 Data Science Project Part 2

Progress Status Summary Report

Automated Health Information System

### Team MDS2

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## Project Summary

The Automated Health Information System (AHIS) is an innovative platform designed to revolutionize healthcare data management by streamlining the process of data entry and access. Our project focuses on developing a comprehensive web-based system that enables healthcare professionals to manage patient information more efficiently.

One of the key features of the AHIS is the Handwritten Text Recognition (HTR) module, which allows healthcare workers to input patient data using handwritten notes. This smart data entry approach significantly reduces manual input time, improves accuracy, and enhances the overall user experience. Additionally, the system incorporates an image cropping model to process and prepare handwritten text images before applying the HTR model, ensuring clean and accurate text recognition. By automating data entry and ensuring quick, reliable access to medical records, AHIS ultimately aims to enhance productivity, reduce administrative burden, and improve patient care.

## What has been accomplished over the winter break?

Tasks	Accomplished by	Additional Comments
Individual learning to obtain the skill set required to complete this project	Foo Kai Yan	Eunice Lee Wen Jing and Alicia Quek Chik Wen were busy with their respective Winter Unit which was more time consuming than expected
	Jesse Yow San Gene	
Research on how healthcare web application is designed and what components is required	Foo Kai Yan	Specifications like the components purpose and the attributes needed is listed down in <a href="#">Web Application Components</a>
Design how the web application would tentatively look like for certain components	Foo Kai Yan	Designs are saved in pdf in Google Drive where all members have access to it: <a href="#">Base Design</a>
Research on HTR Model	Jesse Yow San Gene	Researched how to implement the HTR model from online sources like Kaggle. Researched on datasets like IAM dataset to use for model training and testing.

### What degree of completion was achieved in comparison to previous set goals/plans?

Previous Set Goals/Plans	What was actually done	Additional Comments
The project implementation was originally scheduled to begin during the winter break.	The actual implementation of the project was initiated during Week 3.	Jesse did research on the HTR model during winter break. Alicia and Eunice were busy with their respective winter unit. Kai Yan had troubles with her laptop from Week 1 to 2 but achieved some progress during break.
At the start of the winter break, tasks were delegated: Alicia and Kai Yan will focus on the web application while Jesse and Eunice will work on the HTR model. However, upon returning from the winter break, Jesse shared challenges with the HTR model during a meeting and recommended that the team focus on the web application as a priority.	During the first week, work tasks were reallocated so that every team member could contribute to the web application. In week 3, Jesse and Eunice were unable to code after learning web application development skills, so the tasks were reassigned. Jesse will now concentrate on a pre-built HTR model while Eunice will develop an image-cutting model from scratch.	Jesse and Eunice are new to coding web applications, therefore, they need to dedicate two weeks to acquire the essential skills. Time was squandered. Therefore, in order to avoid further delays, the work was redistributed once more, resulting in a setback in the project's timeline.
The intention was to complete all components of the web application by week 7.	Work may potentially be pushed to Week 9 because of delays that occurred earlier in the project.	The project experienced a significant delay due to Kai Yan's laptop hardware problem and the redistribution of work that occurred in weeks 1 and 3.

### Weekly project progress work breakdown

Week	Progress
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Winter Break	<ul style="list-style-type: none"> <li>- Base Design of certain complicated web components is finalized.</li> <li>- Self learning for the skills needed to make the web application and HTR model is done.</li> <li>- Prepared the GitHub project for the team and set up the base code files for the web application.</li> </ul>
1	<ul style="list-style-type: none"> <li>- Redistribution of tasks where all teammates are to focus on web applications and put the HTR model on pause.</li> <li>- Jesse and Eunice learn the skills needed to build a web application.</li> <li>- Alicia relearning on the skills needed to build a web application.</li> <li>- Kai Yan has troubles with her laptop hardware.</li> </ul>
2	<ul style="list-style-type: none"> <li>- Alicia, Jesse and Eunice are still honing the skills needed to build a web application.</li> <li>- Kai Yan still has trouble with her laptop after the repair and is consulting with Lenovo customer service so no work can be done from her side.</li> </ul>
3	<ul style="list-style-type: none"> <li>- Alicia re-setup the base code files for the web application as teammates experienced errors from the initial setup.</li> <li>- Alicia created a MongoDB database for the health system and connected it to the web application.</li> <li>- Alicia completed backend patient component functions, including add, delete, update and list all patient records with creation of patient mongoose schema for patient collection. Partially completed the frontend add patient component with implementation of patient html form, required two-way data binding functions and routing for add patient component.</li> <li>- Kai Yan is still having problems with her laptop. Lenovo customer service has to consult with higher management so no progress is done.</li> <li>- Eunice configured the environment for the web-based system, installed the necessary Angular packages, and set up the MongoDB application. She also familiarized herself with the code developed by Alicia and KaiYan.</li> <li>- Jesse downloaded and installed the required packages for Angular and set up the environment for the web based system. With the help of Alicia, Jesse managed to familiarize himself with work completed by both her and Kai Yan.</li> </ul>
4	<ul style="list-style-type: none"> <li>- Alicia managed to complete 60% of the frontend web patient component. Add, delete, and list all patients is done.</li> <li>- Kai Yan managed to start her old laptop and has started coding for the</li> </ul>

	<p>medication component of the web application. Medication component of the web application has a 20% completion. Add medication is done.</p> <ul style="list-style-type: none"> <li>- Homepage has been revamped to include Patient and Medication component buttons. All homepage html is managed by Kai Yan.</li> <li>- Eunice began developing the web appointment component, focusing on implementing the add appointment functionality.</li> <li>- Jesse started developing the backend of the web encounter component, focusing on the form for patients to fill in their details to find their respective encounter.</li> </ul>
5	<ul style="list-style-type: none"> <li>- Alicia completed 80% of the patient component of the web application. Update and view patient details backend is reedited and completed, frontend is in progress with an error occurring at the frontend view patient detail component.</li> <li>- Medication component of the web application has a 60% completion rate. Add, delete, and list all medication is done. Update and view medication details have yet to be completed.</li> <li>- Homepage has been revamped to include Appointment and Encounter component buttons.</li> <li>- Eunice researched on image cropping models by exploring online resources and watching tutorial videos on implementing an image cropping model using OpenCV.</li> <li>- Jesse started testing on a prebuilt HTR on Github found by Kai Yan and Alicia. Managed to get prebuilt HTR working on his laptop after encountering multiple version errors.</li> </ul>
6	<ul style="list-style-type: none"> <li>- Alicia has resolved the error on view patient detail component. Frontend update patient component has been implemented, however an error occurred where backend update function was not invoked.</li> <li>- Kai Yan completed the medication component. Medication component of the web application has a 100% completion rate. All features of the medication component are working as expected.</li> <li>- Homepage has been revamped to include Diagnosis and Prescription component buttons.</li> <li>- Eunice began implementing the image cropping model by testing a basic cropping function to ensure its functionality.</li> <li>- Jesse used multiple test cases to test the accuracy of the prebuilt model. These included scenarios such as removing shadows from images and testing</li> </ul>

	with thicker pens to evaluate the model's performance under different conditions.
7	<ul style="list-style-type: none"> <li>- Alicia completed the patient component, and all identified bugs have been resolved.</li> <li>- Alicia added a date time pipe to change the display format of default date for frontend.</li> <li>- Alicia is currently progressing on diagnosis and consultation components, with a completion rate of 5%. Successfully created the mongoose schema models for both components, and work on the backend functions for the diagnosis component is partially complete.</li> <li>- Kai Yan completed the prescription component. Prescription component of the web application has a 100% completion rate. All features of the prescription component, including add, delete, display, update, and list all prescriptions, are working as expected.</li> <li>- Appointment component of the web application has a 5% completion rate. The api routing, model/schema, and controller are the only completed parts for the appointment component. Base files for the add, display, list, and update components are added.</li> <li>- Eunice implemented the image cropping model on the customized patient registration form, tailoring the cropping function to accurately extract relevant fields from the form.</li> <li>- Jesse integrated word beam search decoding to enhance the model's accuracy. Additionally, he began training the model with his own dataset to determine if it achieves higher accuracy compared to the prebuilt HTR model.</li> </ul>
8	<ul style="list-style-type: none"> <li>- After Kai Yan and Alicia's discussion, a physician/doctor component is determined to be a required feature and hence a simple one is added. Kai Yan will be responsible for this component.</li> <li>- Kai Yan completed the physician component. Physician component of the web application has a 100% completion rate. All features of the physician component, including add, delete, display, update, and list all physicians, are working as expected.</li> <li>- Appointment component of the web application has a 80% completion rate. Add, list, delete and update appointments are done.</li> <li>- Alicia completed backend diagnosis and consultation components, including add, delete, update and list all records for respective components and router</li> </ul>

	<p>link for each component.</p> <ul style="list-style-type: none"> <li>- Alicia completed consultation components and its 5 functionality with 100% completion rate. The functionalities include update, delete, list, add and view.</li> <li>- Alicia completed diagnosis components and its 5 functionality with 100% completion rate. The functionalities include update, delete, list, add and view.</li> <li>- Eunice integrated the results from the cropped image fields of the image cropping model into the HTR model and evaluated the recognition accuracy. While some words were successfully recognized, others were not. To improve performance, Eunice made adjustments to the customized patient registration form and refined the image cropping model accordingly.</li> <li>- Jesse trained the HTR model using different dataset to attempt to improve accuracy of the HTR model. However, the model failed to outperform the pre-built HTR model in accuracy and consistency. Jesse also assisted Eunice in understanding the HTR model and setting it up on her laptop.</li> </ul>
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### Short Overview on remaining tasks to be completed before semester ends

The primary tasks left for the web application in Week 8 and beyond are finishing the login page, appointment, encounter, and diagnosis features. Besides that, the development of the automated features for the HTR model and image-cutting model is also currently wrapping up. Furthermore, testing the results of the image-cutting model with the HTR model will be conducted, followed by refining the model to improve overall accuracy. Following the finalization of the HTR model, the image-cutting model, and other components of the web application, the final step involves integrating the image-cutting and HTR models into the web app and ensuring their proper functionality.

## Individual Progress Status Summary Report 1

Name: Foo Kai Yan

Student ID: 33085625

Tasks Attempted / Accomplished	Completion Status	Time Taken to complete the task	Extra Comments
<b>Web Application Personal Progress Breakdown</b>			
Designed base design for certain components for the	100%	2 weeks	Done simultaneously with the relearning of FIT2095 unit during Winter Break



web application			
Note down the specification for each required components	100%	2 days	Done during Winter Break
Relearning on FIT2095 Full Stack Development unit content for building the web application	100%	2 weeks	Done simultaneously with the listing of components details during Winter Break
Successfully implement the home/landing page	100%	2 days	The Previous version was modified to add more sections (eg. About Us)
Successfully implement backend and frontend medication component and its required function	100%	2 weeks	Medication function include: <ol style="list-style-type: none"> <li>1. Adding medication ✓</li> <li>2. List all medication ✓</li> <li>3. Delete medication ✓</li> <li>4. Update medication ✓</li> <li>5. Display medication ✓</li> </ol>
Successfully implement backend and frontend prescription component and its required function	100%	3 days	Prescription function include: <ol style="list-style-type: none"> <li>1. Adding prescription ✓</li> <li>2. List all prescription ✓</li> <li>3. Delete prescription ✓</li> <li>4. Update prescription ✓</li> <li>5. Display prescription ✓</li> </ol>
Successfully implement backend and frontend appointment component and its required function	100%	5 days	Appointment function include: <ol style="list-style-type: none"> <li>1. Adding appointment ✓</li> <li>2. List all appointment ✓</li> <li>3. Delete appointment ✓</li> <li>4. Update appointment ✓</li> <li>5. Display appointment ✓</li> </ol>
Successfully implement backend and frontend	100%	2 days	Physician Function include: <ol style="list-style-type: none"> <li>1. Adding physician ✓</li> <li>2. List all physician ✓</li> </ol>

physician/doctor component and its required function			3. Delete physician ✓ 4. Update physician ✓ 5. Display physician ✓
<b>FIT3164 Assessments Personal Progress Breakdown</b>			
Interim Presentation	100%	2 days	Presented our current project progress and demonstrated our current web application on Week 5's Wednesday 10am to Mr Soo Wooi King.
Project Management Report	100%	4 days	Successfully completed and submitted the 3000 words report, pre-declaration and final-declaration forms.

## Individual Progress Status Summary Report 2

Name: Alicia Quek Chik Wen

Student ID: 33045240

Tasks Attempted / Accomplished	Completion Status	Time Taken to complete the task	Extra Comments
<b>Web Application Personal Progress Breakdown</b>			
Relearning on Full Stack Development content for building the web-based system.	100%	2 weeks	Relearning on Full Stack Development content for building the web-based system using MEAN stack framework.
Research and found a prebuilt Handwritten Text Recognition model to be used	100%	1 day	Research on prebuilt Handwritten Text Recognition models to be used to integrate into our health information system.
Implement backend and frontend patient	100%	3 weeks	Patient function include: 1. Adding patient ✓

component and its function			2. Listing patient ✓ 3. Delete patient ✓ 4. Update patient ✓ 5. View patient details ✓ Made the update patient component be auto filled with old data to enable easier change without rewriting everything.
Made the web-system a Progressive Web App	100%	1 day	Made the web application installable and allowed it to work on any platform with a standards-compliant browser, including desktop and mobile devices.
Implement backend and frontend diagnosis component and its function	100%	2 days	Diagnosis function include: 1. Adding diagnosis ✓ 2. Listing diagnosis ✓ 3. Delete diagnosis ✓ 4. Update diagnosis ✓ 5. View diagnosis details ✓
Implement backend and frontend consultation component and its function	100%	3 days	Consultation function include: 1. Adding consultation ✓ 2. Listing consultation ✓ 3. Delete consultation ✓ 4. Update consultation ✓ 5. View consultation details ✓
Implement Login page component	5%	In-progress	Watched youtube video to implement login page
<b>FIT3164 Assessments Personal Progress Breakdown</b>			
Interim Presentation	100%	2 days	Presented our current project progress and demonstrated our current web application on Week

			5's Wednesday 10am to Mr Soo Wooi King.
Project Management Report	100%	4 days	Successfully completed the 3000 words report.

## Individual Progress Status Summary Report 3

Name: Eunice Lee Wen Jing

Student ID: 33250979

Tasks Attempted / Accomplished	Completion Status	Time Taken to complete the task	Extra Comments
AHIS Personal Project Breakdown			
Learning full-stack development for building the web application	100%	3 weeks	Completed the learning content from FIT2095.
Researching on the Handwritten Text Recognition (HTR) Model	100%	2 weeks	Research on pre-built HTR models available online.
Research on image processing	100%	1 Week	Research on cropping relevant image fields from patient registration forms and appointment forms before implementing the HTR Model has been done.
Implement image processing for HTR Model	100%	3 days	Customized the patient registration form and implemented the cropping function, ensuring that specific fields are accurately extracted for further processing.
Improve the image	90%	In-Progress	Redesigned the patient registration

processing model			form without a colored background to improve accuracy. The image processing model was rebuilt and tested with the HTR model, showing improved results. Further optimization is ongoing.
Integrate the Image Cropping Model with the pre-built HTR Model	80%	In-Progress	Merging cropped images with the HTR model for text recognition. Continuing to refine for better accuracy.
<b>FIT3164 Assessments Personal Progress Breakdown</b>			
Interim Presentation	100%	2 days	Presented our current project progress and software demo on Week 5's Wednesday 10am to Mr Soo Wooi King.
Project Management Report	100%	4 days	Successfully completed the 3000 words report.

## Individual Progress Status Summary Report 4

Name: Jesse Yow San Gene

Student ID: 32794649

Tasks Attempted / Accomplished	Completion Status	Time Taken to complete the task	Extra Comments
Acquiring full-stack development skills to build comprehensive web applications.	100%	3 weeks	Learning FIT 2095 lecture material given by teammates to build the website application.

Finding datasets for HTR model	100%	1 week	Acquired suitable datasets to be used for the HTR model.
Interim Presentation	100%	2 days	Presented our current project progress and conducted a software demonstration on Wednesday of Week 5 at 10 am.
Project Management Report	100%	4 days	Successfully completed the 3000 words report.
Testing and understanding prebuilt HTR model implementation from Github	100%	2 weeks	<p>Successfully set up and tested the Handwritten Text Recognition (HTR) model on my test cases that yielded promising results.</p> <p>Tested on:  Model trained on text line images ✓  Model trained on word images ✓</p> <p>Findings so far:</p> <ul style="list-style-type: none"> <li>• Shadows had to be removed from images and clear image capture (obviously) for higher accuracy.</li> <li>• Works well on different coloured writings.</li> <li>• Works moderately on cursive writings.</li> <li>• Does not work well on punctuation and symbols.</li> </ul> <p>Models show somewhat accurate results. To further enhance the model's accuracy and symbol recognition, additional training will</p>

			<p>be conducted.</p> <p>Week 8 Added a few more test cases into evidence.</p>
Integrated CTC Word Beam Decoding Algorithm to prebuilt model	100%	2 days	<p>Findings recorded in evidence that this algorithm has better accuracy when recognizing cursive writings. However, it performs lower than the prebuilt model in standard writing and extremely poorly in recognizing symbols.</p> <p>Therefore, I decided not to include it in the prebuilt model.</p>
Training pre built model with own dataset	100%	1 week	<p>Used a variant of the IAM dataset from Kaggle. Training time took the whole day as the dataset is 1 GB. Findings are recorded in evidence where it performs poorly overall test cases. Therefore, not using this model for the final phase.</p> <p>Updated week 8: No amount of additional training was able to outperform the prebuilt model. Therefore, the prebuilt model will be used for the final phase of the project.</p>
Integrate the Image Cropping Model with the pre-built HTR Model	80%	In-Progress	<p>Merging cropped images with the HTR model for text recognition. Continuing to refine for better accuracy. Assisting Eunice to complete this by the end of this week.</p>

## Evidence of progress:

### Web Component: Coding Progression

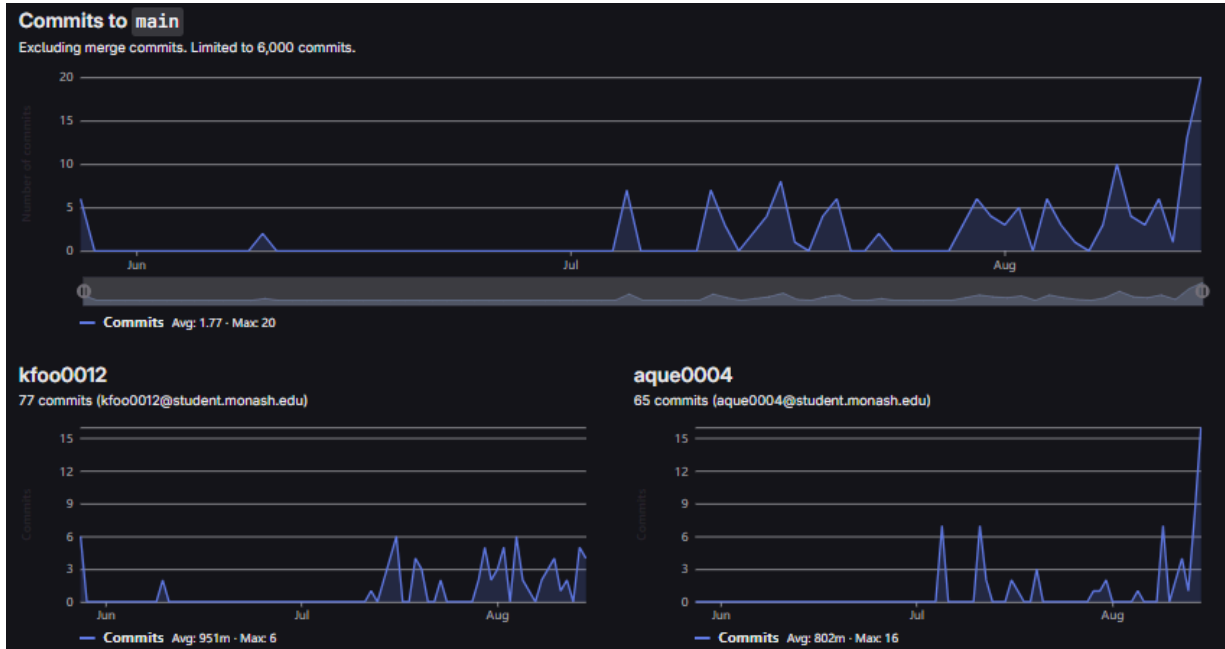


Image taken on 12th September 2024 from GitLab Contributor Analytics

### Code Snippet - Web Component



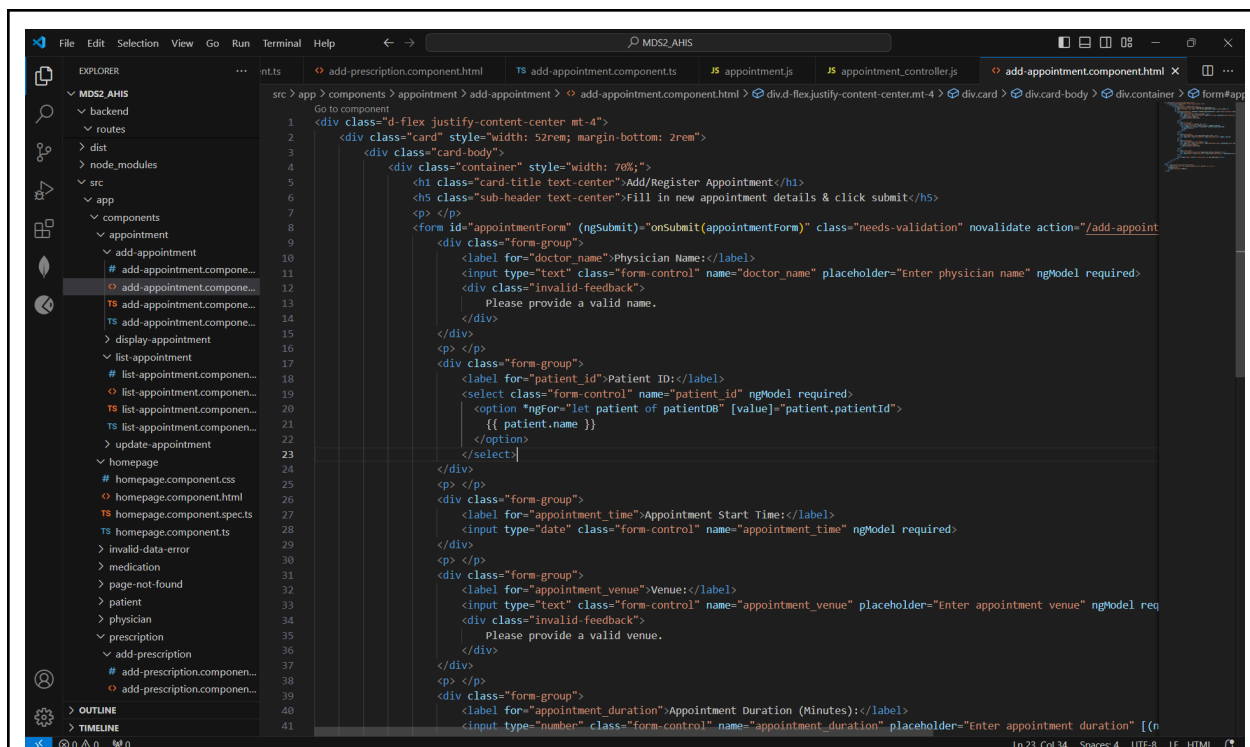
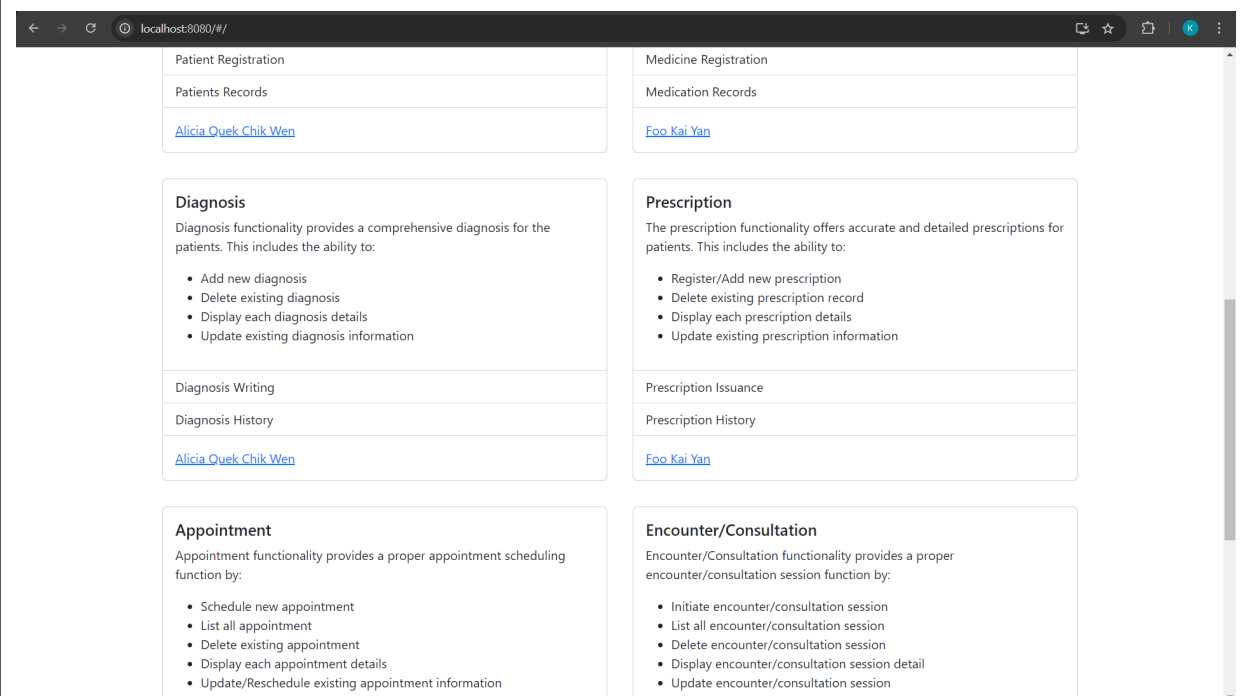


Image taken on 12th September 2024 from Visual Studio Code

## Web Application HomePage



## Code Snippet - Image Cropping Model

```
requirements.txt  model.py  AHIS_CropModel.py
1 import numpy as np
2 import cv2
3 import os
4
5 # Load the image
6 image_path = r'C:\Users\Eunice Lee\OneDrive - Monash University\Desktop\FYP Image Processing\AHIS_Form_1.jpg'
7 image = cv2.imread(image_path)
8
9 # Check if the image is loaded correctly
10 if image is None:
11     print(f"Error: Unable to load image at {image_path}")
12 else:
13     # Convert the image to grayscale
14     gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
15
16     # Apply Gaussian blur to remove noise
17     blurred = cv2.GaussianBlur(gray, (5, 5), 0)
18
19     # Apply adaptive thresholding to get a binary image
20     binary_image = cv2.adaptiveThreshold(blurred, 255, cv2.ADAPTIVE_THRESH_GAUSSIAN_C, cv2.THRESH_BINARY_INV, 11, 2)
21
22     # Updated list of field names and their corresponding coordinates
23     fields_coordinates_adjusted = {
24         'First Name': (218, 418, 1028, 74),
25         'Last Name': (219, 499, 1027, 74),
26         'IC/Passport': (221, 576, 1024, 71),
27         'Date of Birth': (219, 653, 1024, 72),
28         'Gender': (222, 738, 1028, 78),
29         'Nationality': (228, 884, 1024, 72),
30         'Race': (222, 882, 1024, 72),
31     }
```

Image taken on 12th September 2024 from PyCharm.

## Code Snippet - HTR Model

```
File Edit View Navigate Code Refactor Run Tools Git Window Help HTR Model - model.py
HTR Model SimpleHTR-master / src
Project
  > Final_Cropped_Fields
  > Final_Unblur_Cropped_Fields
  > corpus.txt
  > line.png
  > word.png
  > doc
  > Image_Cropping_Model
  > model
  > src
    AHIS_CropModel.py
    create_imdb.py
    dataloader.py
    main.py
    model.py
    preprocessor.py
  > gitignore
requirements.txt  model.py
16 BestPath = 0
17 BeamSearch = 1
18 WordBeamSearch = 2
19
20
21 class Model:
22     """Minimalistic TF model for HTR."""
23
24     def __init__(self,
25                  char_list: List[str],
26                  decoder_type: str = DecoderType.BestPath,
27                  must_restore: bool = False,
28                  dump: bool = False) -> None:
29
30         """Init model: add CNN, DNN and CTC and initialize TF."""
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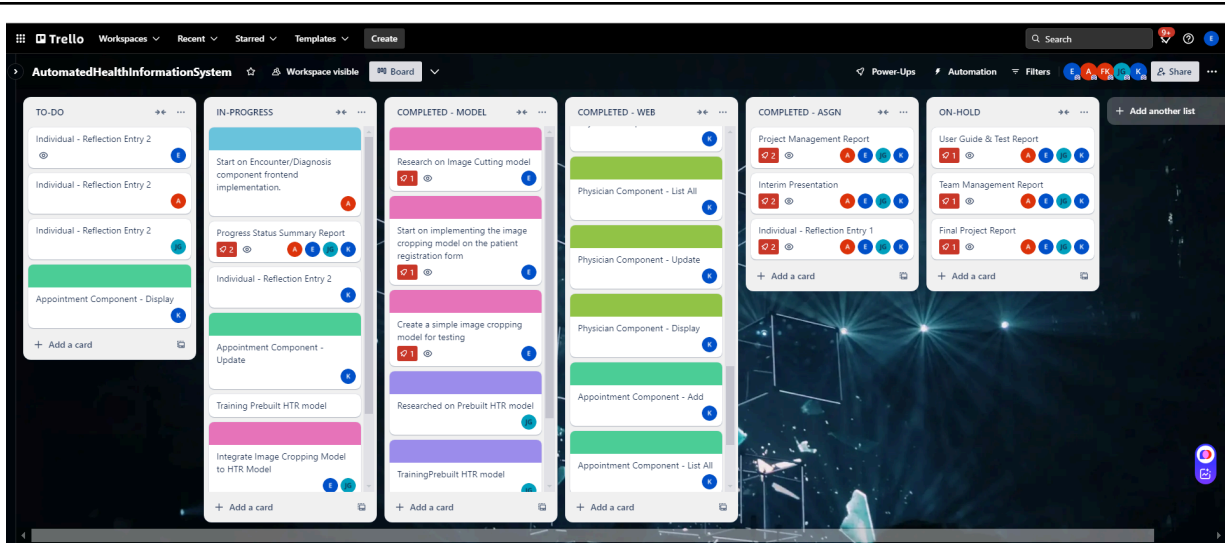


Image taken on 13th September 2024 from the team’s Trello Board

## Writing FIT3164 Assessment Report

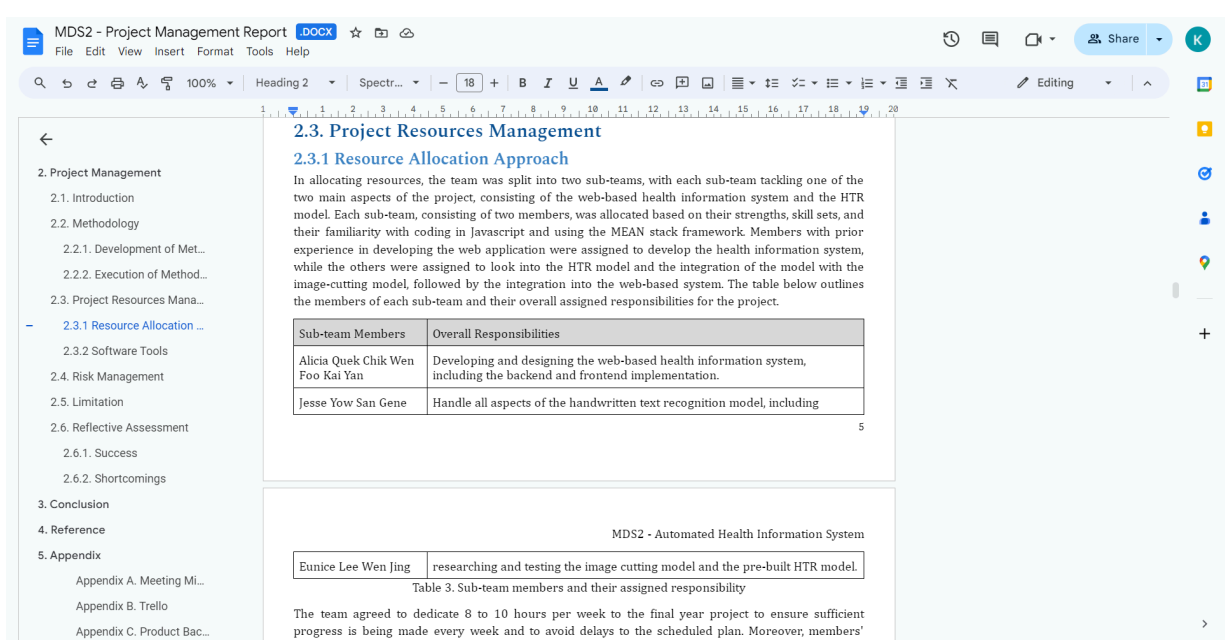


Image taken on 12th September 2024 from the first assessment for FIT3164

## Weekly Progress Update to supervisor via Discord

MDS2 - Automated Heal...

# progress-status-summary-report

HAPPENING NOW

Progress Status Summary Report (5%)

Monash Moodle

Event Details

6 Events

INFORMATION

# announcements

# link-resources

TEXT CHANNELS

# general-chat

# meeting-plans

# off-topic

# progress-status-s...

VOICE CHANNELS

online-meetinggg

16 August 2024

Kal Yan

@Supervisor

16/08/2024 22:25

Hi Sir, this is the weekly progress status summary report (psr, yes we short form cus its too long :3) it consist of what we have done for the fyp since winter break until now including week 3 and 4

MDS2 - Progress Status Summary Report.docx.pdf

2.04 MB

23 August 2024

Kal Yan

@Supervisor

23/08/2024 11:45

Hi Sir, this is the weekly progress status summary report (psr) for week 5

It consist of update on what we have done since the last update

MDS2 - Progress Status Summary Report.docx.pdf

3.52 MB

31 August 2024

Alicia Mango

@Supervisor

31/08/2024 14:07

Hi Dr Fermi, this is the weekly progress status summary report (psr) for week 6. It consist of update on what we have done since the last update

MDS2 - Progress Status Summary Report.docx (2)...

3.79 MB

1 September 2024

MDS2 - Automated Heal...

# progress-status-summary-report

HAPPENING NOW

Progress Status Summary Report (5%)

Monash Moodle

Event Details

6 Events

INFORMATION

# announcements

# link-resources

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# progress-status-s...

VOICE CHANNELS

online-meetinggg

31 August 2024

MDS2 - Progress Status Summary Report.docx.pdf

3.52 MB

Alicia Mango

@Supervisor

31/08/2024 14:07

Hi Dr Fermi, this is the weekly progress status summary report (psr) for week 6. It consist of update on what we have done since the last update

MDS2 - Progress Status Summary Report.docx (2)...

3.79 MB

1 September 2024

Fermi

01/09/2024 17:50

Can you also indicate the work breakdown for each week progress?

3 September 2024

Jesse

03/09/2024 23:10

Hi sir, the work breakdown is included in the psr that we have been giving u each week

Fermi

03/09/2024 23:46

Ah yes, sorry I didn't notice the progress table is actually individual. All good then

9 September 2024

Alicia Mango

@Supervisor

09/09/2024 15:44

Hi Dr Fermi, this is the weekly progress status summary report (psr) for week 7. It consist of update on what we have done since the last update

Alicia Mango

09/09/2024 15:54

MDS2 - Progress Status Summary Report.docx (1)...

4.75 MB

Ready when you are...

No Quest progress yet

White\_FOX

Idle

Message #progress-status-summary-report

📁

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⚙️

Meeting Minutes Work Responsibilities

Meeting Minutes Roaster						
	A	B	C	D	E	F
1						
2		<b>Meeting Minutes Numbering</b>	<b>Task Allocation</b>	<b>Completion Status</b>		
3		Meeting Minutes 1	Alica	Completed		
4		Meeting Minutes 2	Kai Yan	Completed		
5		Meeting Minutes 3	Eunice	Completed		
6		Meeting Minutes 4	Jesse	Completed		
7		Meeting Minutes 5	Alica	Completed		
8		Meeting Minutes 6	Kai Yan	Completed		
9		Meeting Minutes 7	Eunice	Completed		
10		Meeting Minutes 8	Jesse	Not Started		
11		Meeting Minutes 9	Alica	Not Started		
12		Meeting Minutes 10	Kai Yan	Not Started		
13						
14						

Image taken on 12th September 2024 from the team’s Meeting Minutes Roaster

## Meeting Minutes

MDS2 - Meeting Minutes						
	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

Image taken on 12th September 2024 from the team’s Meeting Minutes Document

## Research done on HTR Model

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<http://www.ijert.org>

ISSN: 2278-0181  
Vol. 9 Issue 05, May-2020

### B. Model Overview:

We use a NN for our task. It consists of a convolutional neural network (CNN) layers, recurrent neural network (RNN) layers, and a final Connectionist Temporal Classification (CTC) layer.

Fig. 2: Overview of HTR

In this project, we've taken 5 CNN (feature extraction) and a pair of RNN layers and a CTC layer (calculate the loss). first, we've to preprocess the pictures in order that we are able to reduce the noise.

width=128  
height=32

length=32  
"house"

length=32  
"house"

features=256

chars=80

time-steps=32

CNN 5 layers

RNN 2 layers

CTC loss

CTC decode

0.123...

house

### Equation 1:

$$NN: M \rightarrow (C_1, C_2, \dots, C_n)$$

$$W \times H \quad 0 \leq n \leq L$$

Eq. 1: The Neural Network was written as a mathematical function that maps an image M to a character sequence (c1, c2, ...).

### C. Operations:

**CNN:** The input image is given to the CNN layers. These layers are trained to take out relevant features from the image. Each layer consists of three operations. First, the convolution operation, 5x5 filter is used in the first two layers and 3x3 filter used in the last three layers to the input. Then, the non-linear RELU function is applied. At last, a pooling layer summarizes image regions and outputs a downsized(smaller) version of the input. While the height of image size is reduced by 2 in each layer, feature channels are added, so that the output feature sequence has a size of 32x256.

**RNN:** The feature sequence consists of 256 features per time-step, the RNN propagates relevant information through this sequence. The favored Long Short-Term Memory (LSTM) implementation of RNNs is employed because it is in a position to propagate information through longer distances and provides more robust training-characteristics than vanilla RNN. The RNN output sequence is mapped to a matrix of 32x80. The IAM dataset contains 79 different characters, further one additional character is required for the CTC operation (CTC blank label), so that there are 80 entries for every of the 32 time-steps.

**CTC:** while training the NN, the CTC is given the RNN output matrix and also the ground truth text and it computes the loss value. While inferring, the CTC is just given the matrix and it decodes it into the ultimate text. Both the bottom truth text and also the recognized text are often at the most 32 characters long.

**Data:**

**Input:** It is a gray-value image of size 128x32. Usually, the pictures from the dataset don't have exactly this size, therefore we resize it (without distortion) until it either contains a width of 128 or a height of 32. Then, we place the image in a (white) target image of size 128x32. This process is shown in Fig. 3. Finally, we will normalize the gray-values of the image so that it could simplify the task for the NN. Data augmentation can

MDS2 - Task Distribution

File Edit View Insert Format Data Tools Extensions Help

Menus

100%

123

Cambr...

11

B

I

A

100%

123

Cambr...

11

B

I

A

E27

Completed

	A	B	C	D	E	F	G	H
2		Component	Function	Person Responsible	Progress Status			
3		Patient	Register Patient	Alicia	Completed			
4			Patient List	Alicia	Completed			
5			Delete Patient Record	Alicia	Completed			
6			Update Patient Details	Alicia	Completed			
7			View Patient Details	Alicia	Completed			
8		Medication	Add Medication	Kai Yan	Completed			
9			Medication List	Kai Yan	Completed			
10			Delete Medication Record	Kai Yan	Completed			
11			Update Medication Details	Kai Yan	Completed			
12			View Medication Details	Kai Yan	Completed			
13		Diagnosis	Add Diagnosis	Alicia	Completed			
14			Diagnosis List	Alicia	Completed			
15			Delete Diagnosis Record	Alicia	Completed			
16			Update Diagnosis Details	Alicia	Completed			
17			View Diagnosis Details	Alicia	Completed			
18		Prescription	Add Prescription	Kai Yan	Completed			
19			Prescription List	Kai Yan	Completed			
20			Delete Prescription Record	Kai Yan	Completed			
21			Update Prescription Details	Kai Yan	Completed			
22			View Prescription Details	Kai Yan	Completed			
23		Appointment	Add Appointment	Kai Yan	Completed			
24			Appointment List	Kai Yan	Completed			
25			Delete Appointment Record	Kai Yan	Completed			
26			Update Appointment Details	Kai Yan	Completed			
27			View Appointment Details	Kai Yan	Completed			
28		Encounter / Consultation	Add Consultation	Alicia	Completed			
29			Consultation List	Alicia	Completed			
30			Delete Consultation Record	Alicia	Completed			
31			Update Consultation Details	Alicia	Completed			
32			View Consultation Details	Alicia	Completed			
33		Physician / Doctor	Add Physician	Kai Yan	Completed			
34			Physician List	Kai Yan	Completed			
35			Delete Physician Record	Kai Yan	Completed			
36			Update Physician Details	Kai Yan	Completed			
37			View Physician Details	Kai Yan	Completed			

Component

Person Responsible

Patient

Alicia

Medication

Kai Yan

Diagnosis

Alicia

Prescription

Kai Yan

Appointment

Kai Yan

Encounter / Consultation

Alicia

Physician / Doctor

Kai Yan

<div> <div>MDS2 - Task Distribution</div> <div> <div>File</div> <div>Edit</div> <div>View</div> <div>Insert</div> <div>Format</div> <div>Data</div> <div>Tools</div> <div>Extensions</div> <div>Help</div> </div> </div> <div> <div>75%</div> <div>£</div> <div>%</div> <div>0.0</div> <div>123</div> <div>Actor</div> <div>10</div> <div>B</div> <div>I</div> <div></div> </div>				
M99				
	A	B	C	D
1	An Automated Health Information System			
2	Team: MDS02		Supervised by: Dr. Muhammad Fermi Pasha	
3	Task Description	Person In Charge	Progress Status	
74	FIT3164 Data Science Project Part 2			
75	Assessment 1			
76	Cover Page, Table of Contents, Team Members, Subheadings & Word count	Kai Yan	Completed	
77	Brief introduction to your project and team members & project management [2, 3a]	Eunice Lee	Completed	
78	Project management methodology.[3b]	Kai Yan	Completed	
79	Project resources used in execution, management, and planning. [3c]	Alicia Quek	Completed	
80	Risk Management & Discussion of limitation of project management [3d, 3e]	Jesse Yow	Completed	
81	Reflective Assessment of success and shortcomings of project management [3f]	Eunice Lee	Completed	
82	Conclusion [4]	Eunice Lee	Completed	
83	References, Appendix	Everyone	Completed	
84	Teamwork Contribution Table FINAL	Everyone	Completed	
85	Assessment 2			
86	Documen Structure	Kai Yan	Completed	
87	Brief Recap / Project Summary	Eunice Lee	Completed	
88	Overall Team Progress (Weekly project progress work breakdown table)	Everyone	In-Progre...	
89	Individual Work Breakdown	Everyone	In-Progre...	
90	Short Overview on remaining tasks to be completed before semester ends	Kai Yan	Completed	
91	Week 3 - Weekly PSSR Submission to Fermi	Everyone	Completed	
92	Week 4 - Weekly PSSR Submission to Fermi	Everyone	Completed	
93	Week 5 - Weekly PSSR Submission to Fermi	Everyone	Completed	
94	Week 6 - Weekly PSSR Submission to Fermi	Everyone	Completed	
95	Week 7 - Weekly PSSR Submission to Fermi	Everyone	Completed	
96	Week 8 - Weekly PSSR Submission to Fermi	Everyone	Not Start...	
97	Assessment 3			
98				
99				
100				
<div> <div>+</div> <div>≡</div> <div>FYP Unit Assignment Tasks Distribution</div> <div>Web Components Work Distribution</div> </div>				

Image taken on 12th September 2024 from the team’s task distribution sheet

Gantt Chart

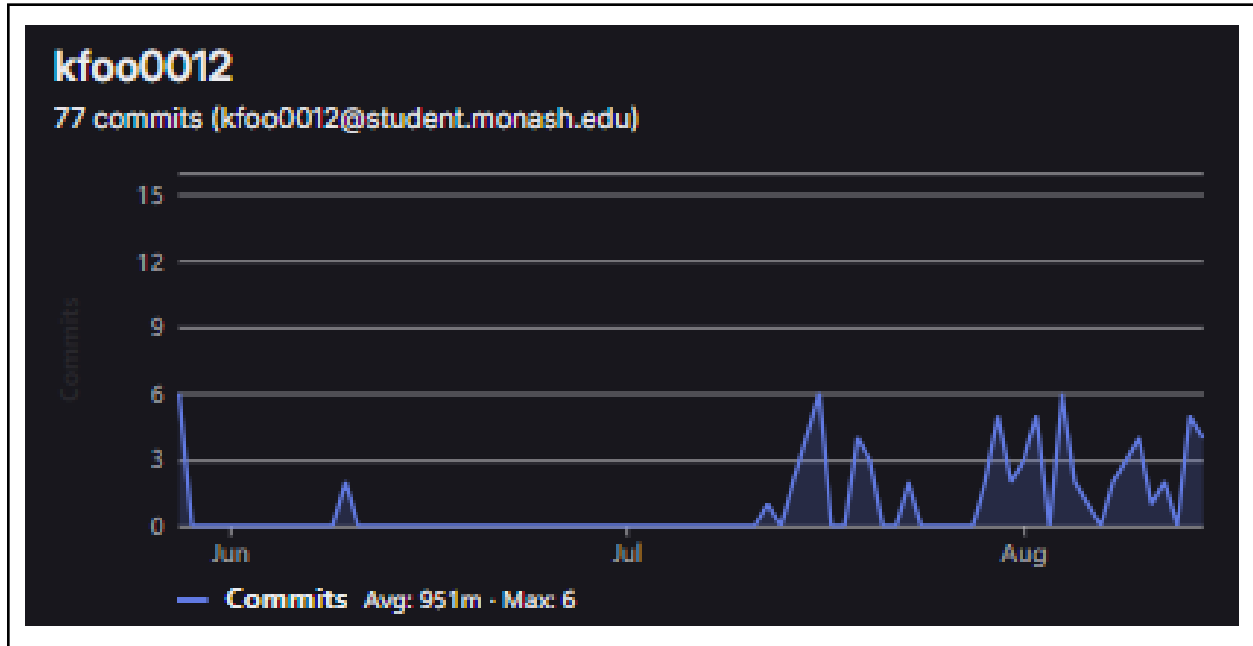
MDS2 - Gantt Chart.pdf



## Individual Evidence of progress:

Name: Foo Kai Yan

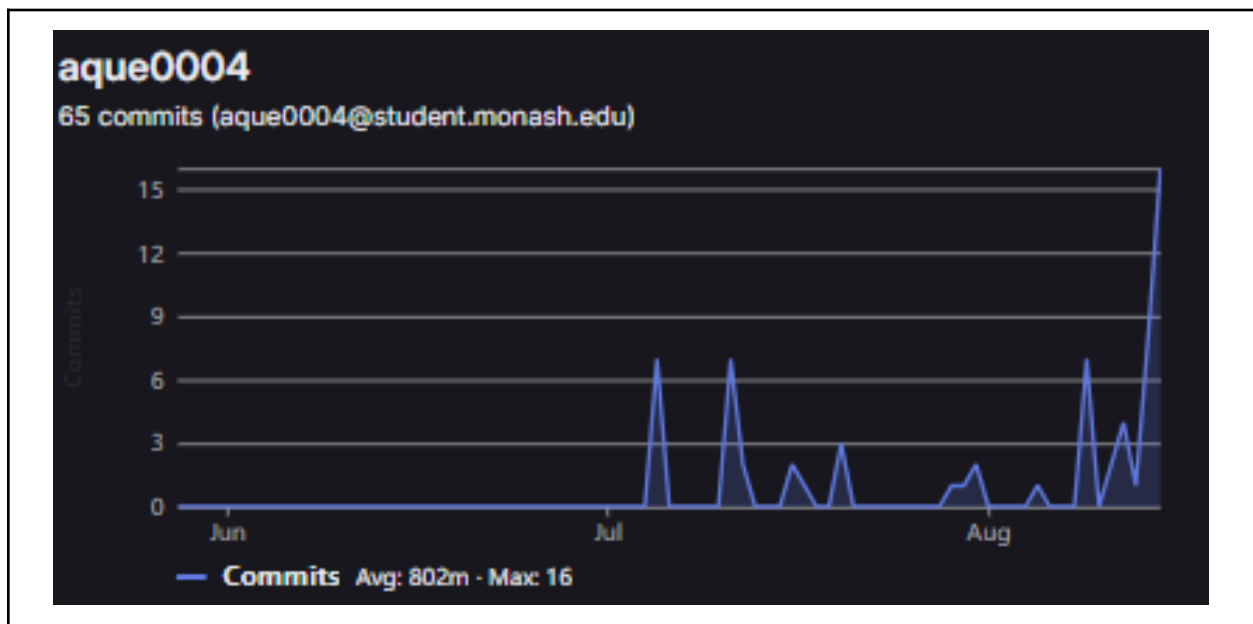
Student ID: 33085625



## Individual Evidence of progress:

Name: Alicia Quek Chik Wen

Student ID: 33045240



# Individual Evidence of progress:

Name: Eunice Lee Wen Jing

Student ID: 33250979

Research and learn how to crop an image using OpenCV

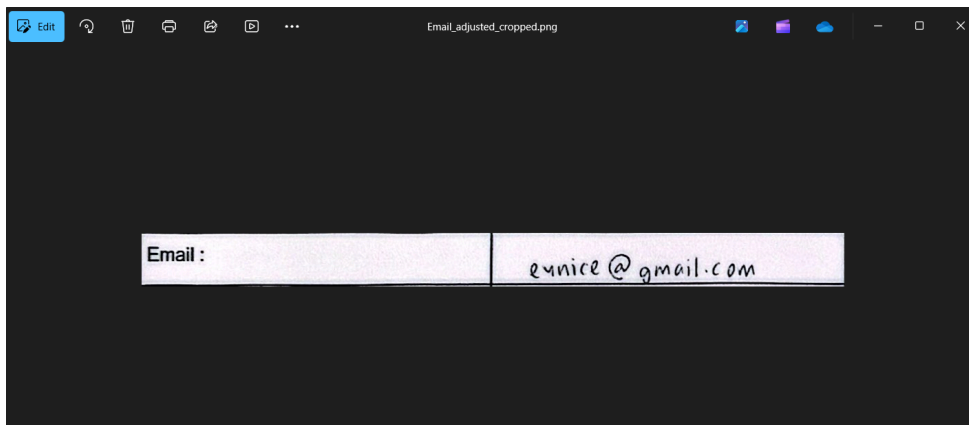
Website : <https://learnopencv.com/cropping-an-image-using-opencv/>

Watched various Youtube OpenCV Python Tutorials

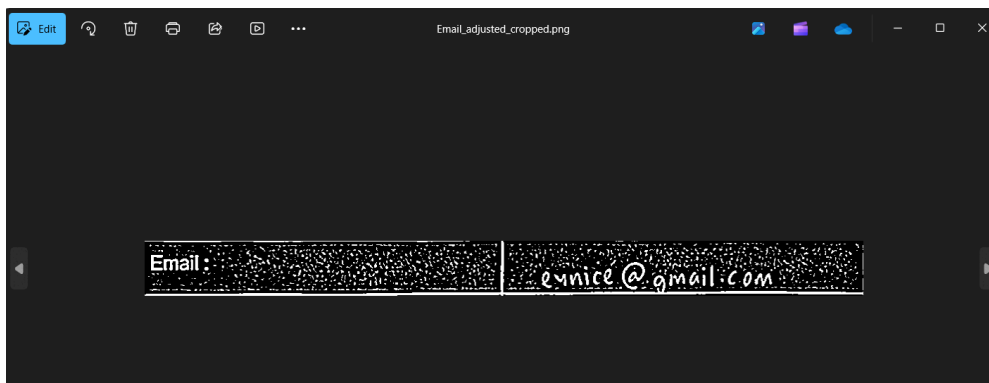
Link:

<https://www.youtube.com/watch?v=qCR2Weh64h4&list=PLzMcbGfZo4-lUA8uGjeXhBUUzPYc6vZRn&index=1>

<https://www.youtube.com/watch?v=TGQcDaZ56ao>



This is an example of the result for the cropped image of the Email field.



This is the clear and unblurred version of the cropped image.



These are the outcomes of the cropped image model (clear & unblurred version) for the patient registration form.

```
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
2024-09-12 23:42:39.357587: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1261] Device inte
2024-09-12 23:42:39.357769: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1267]
2024-09-12 23:42:39.357978: I tensorflow/compiler/jit/xla_gpu_device.cc:99] Not creating XLA dev
Init with stored values from ../model/snapshot-13
2024-09-12 23:42:39.450454: I tensorflow/compiler/mlir/mlir_graph_optimization_pass.cc:196] None
Recognized: "M0aT T Malaysian "
Probability: 4.0240700e-06
```



The cropped image field for "Nationality" was integrated into the HTR model. The results produced by the model are highlighted with a red circle.

## Individual Evidence of progress:

Name: Jesse Yow San Gene

Student ID: 32794649

Github link: <https://github.com/githubharald/SimpleHTR?tab=readme-ov-file>

Test cases using prebuilt model



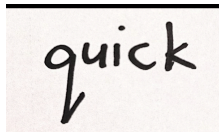
```
Recognized: "the quick brown for jumps over the leyy day"
Probability: 0.010869030840694904
```

Tested on cursive writing: 86% accurate



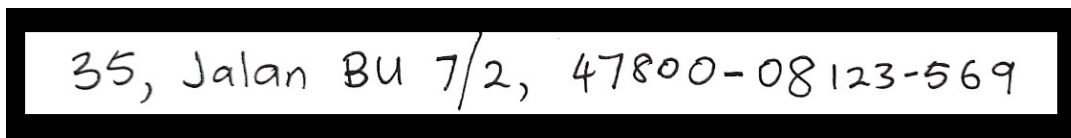
Recognized: "the quick brown fox jumps over the lazy dog"  
Probability: 0.17286165058612823

Tested on standard writing: 97% accurate



Recognized: "quick"  
Probability: 0.9378325939178467

Tested on thicker/bolder word image: 100% accurate



Recognized: "35 Jalan BU 124800-08 123-56 9"  
Probability: 0.00040390799404121935

Tested on punctuations and symbols: 83% accurate

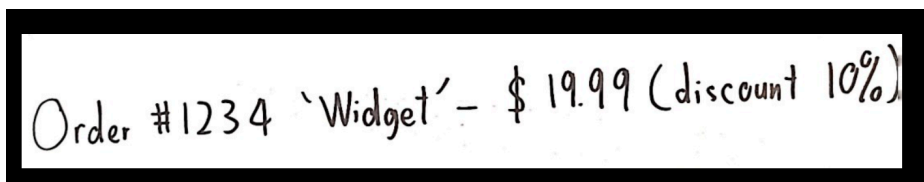
However, I could not recognize commas and slashes for addresses.



Recognized: "THE QUICK BROWN FOX"  
Probability: 0.02709522657096386

Tested on capital letters: 79% accurate

Decently accurate when comes to capital letters



Recognized: "Oide H23A wWidged -f1992 Cdncoust 10lhe"  
Probability: 6.078231667983047e-12

Tested on line with multiple symbols: 52% accurate

Extremely bad on symbols but this could be because of the nature of the test case

Test cases with CTC Word Beam Search Decoding Algorithm:



Recognized: "the quick brown for jump over the lay day"  
Probability: 1.0354198387574343e-08

Tested on cursive writing: 88% accurate

Training my own dataset:

```
[ERR:1] "real" -> "neal"  
[OK] "substitute" -> "substitute"  
[OK] "for" -> "for"  
[ERR:2] "clay" -> "day"  
[OK] "that" -> "that"  
[OK] "can" -> "can"  
[OK] "be" -> "be"  
[ERR:1] "obtained" -> "obtarined"  
[OK] "at" -> "at"  
[OK] "a" -> "a"  
[ERR:1] "comparable" -> "comsparable"  
Character error rate: 12.752772341813436%. Word accuracy: 68.64064602960968%.  
Character error rate not improved, best so far: 12.415742552728853%  
No more improvement for 25 epochs. Training stopped.  
PS D:\Uni\Y4S1\FIT 3164 - DS Project 2\Project\SimpleHTR-master\src> |
```