Z Care

Supervised by:
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Dr. Asmaa Hashem

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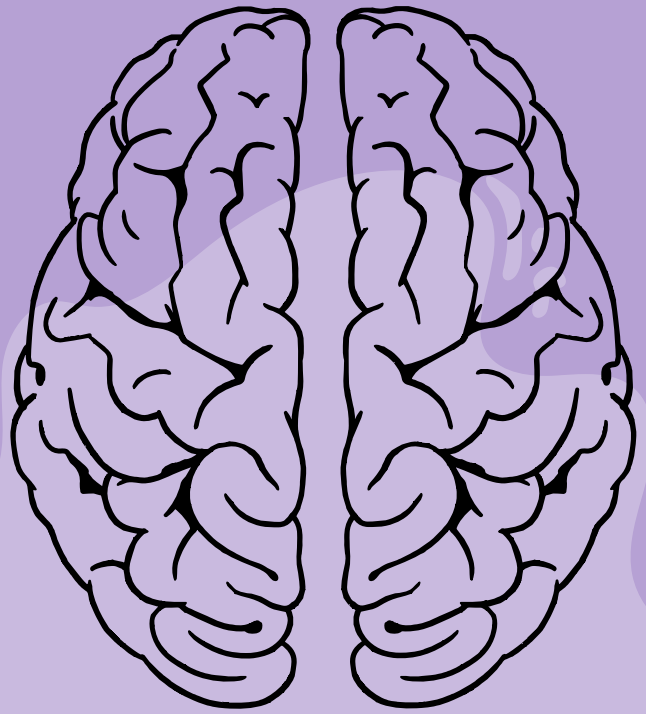
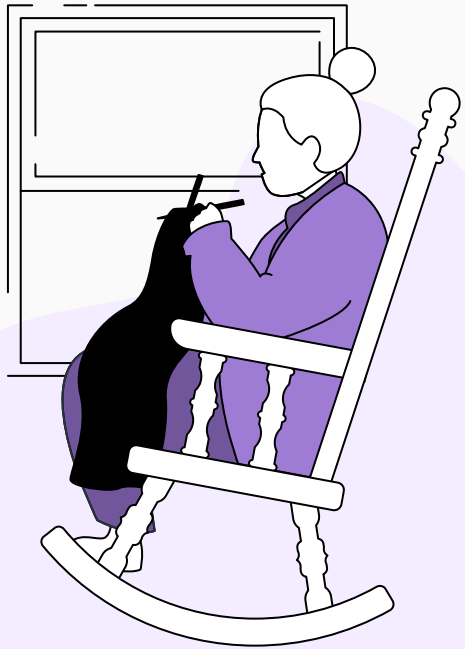


Alzheimer

A slowly progressing, but devastating disease.

01

introduction

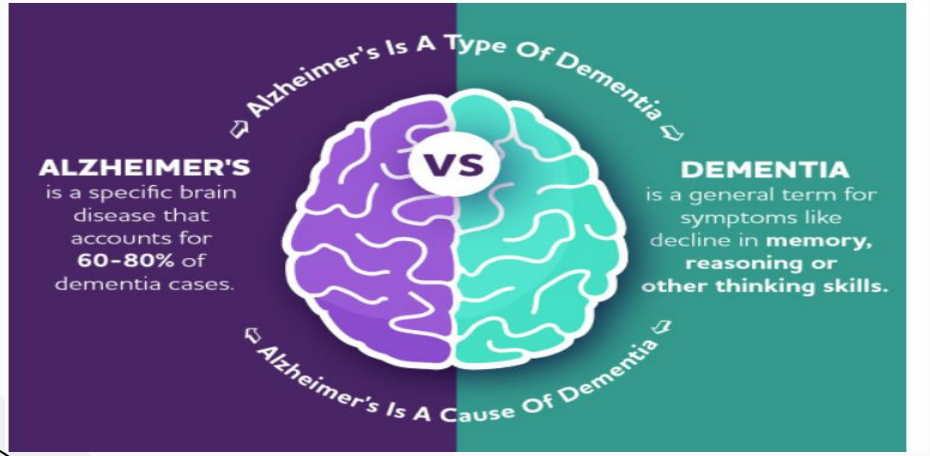


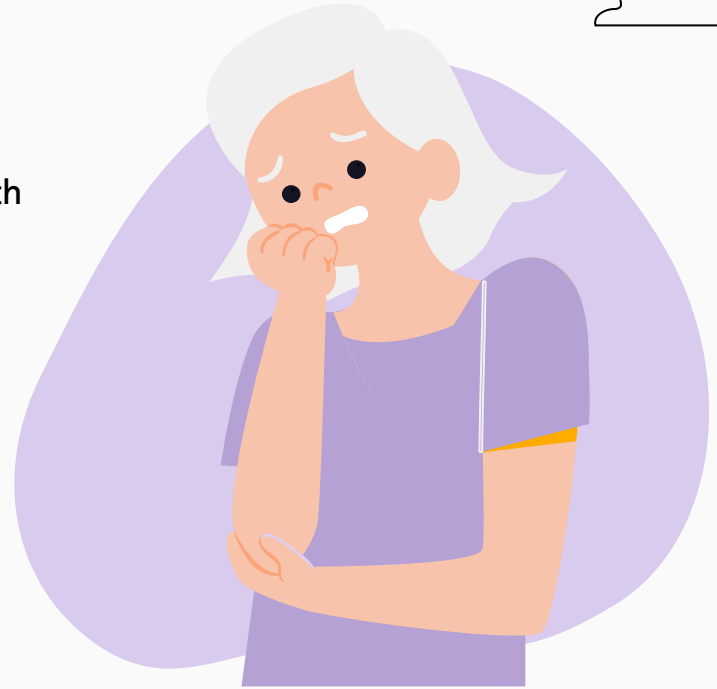
INTRODUCTION

Dementia is most common in people over the age of 65. The risk of Alzheimer's disease and other types of dementia increases with age, affecting an estimated 1 in 14 people over the age of 65 and 1 in every 6 people over the age of 80.

INTRODUCTION

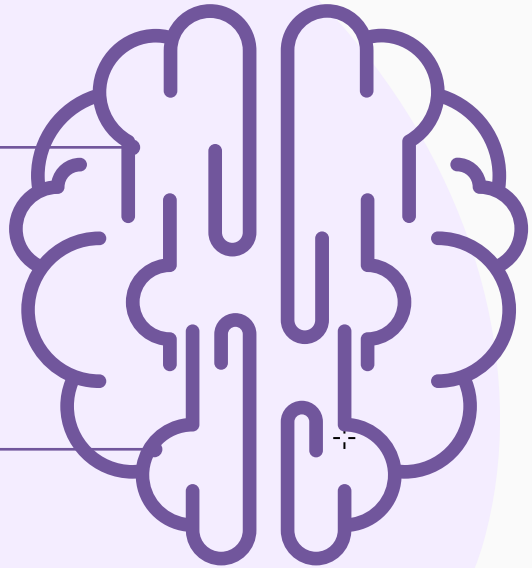
Dementia is the name for a group of symptoms associated with an ongoing decline of brain functioning. It can affect memory, thinking skills, and other mental abilities.

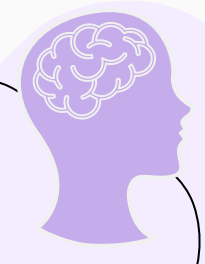




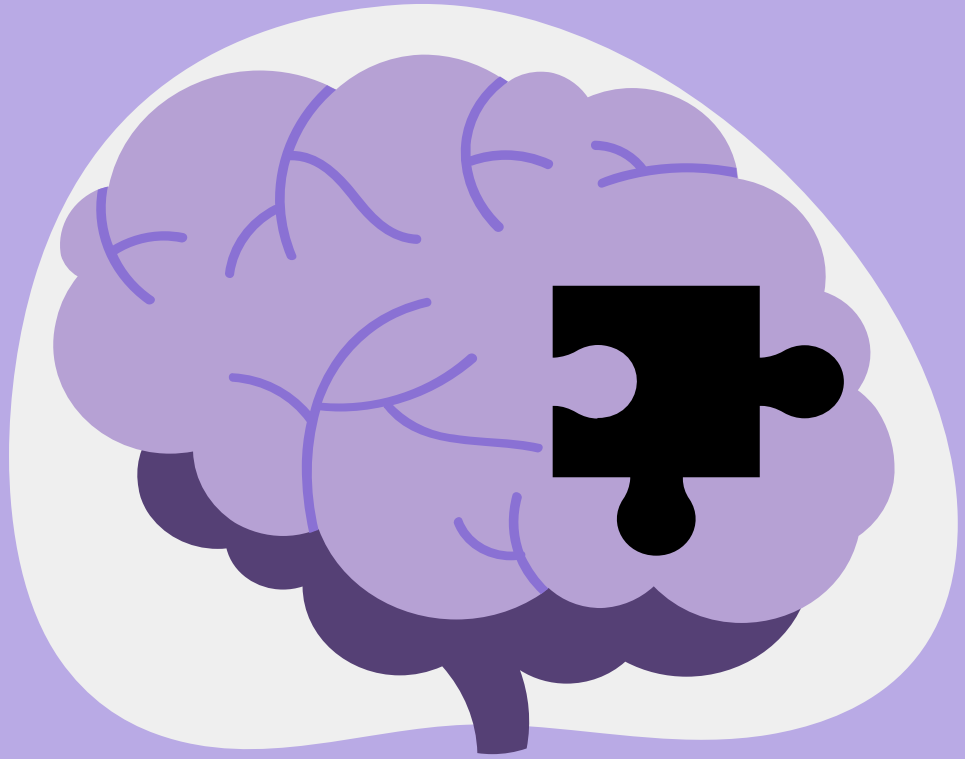
55 million

10 million





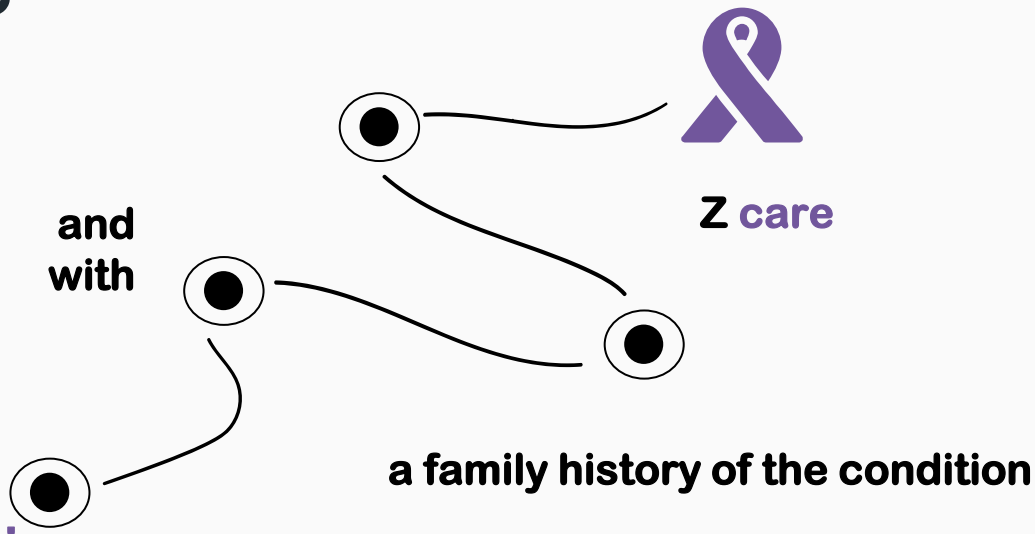
02.Problem Definition



Problem Definition

Age

lifestyle factors and conditions associated with cardiovascular disease



Z care

a family history of the condition

People with Down's syndrome are at a higher risk of developing Alzheimer's disease.

03. Project objective

Project objective

Developing an automated helpful system.

Diagnose Alzheimer’s disease in its early stages Accurately using:

Deep learning would give us the ability to

- Slow the disease progression with medicine and exercises.
- Maintain mental function

Make it easier for caregivers to take care of the patient

04.

Literature review

Accuracy 66.7%

Using **MRI, FDG-PET, CSF, & genetic** features, with Hybrid (CNN & RNN).

Weiming Lin.2021

Shangran Qiu.2022

Using **MRI with CNN**.

Accuracy 69.2%

Zhou, P. et al. 2020

PET and MRI images and distinguish between severity using CNN and SVM

Accuracy of 87%

Accuracy of 91 %

MRI, PET & CSF data with Using SAE,DBM & SVM

fnagi.2019

Accuracy of 91 %

using **MRI data** with Using autoencoder Accuracy of 91 %

Ju et al.2017




Shen et al.2019

distinguish AD From mild cognitive impairment using PET data Using Deep Belief Network

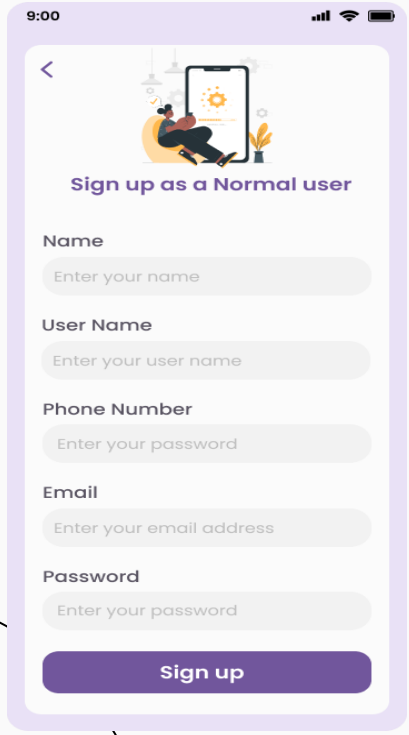
Accuracy of 86%

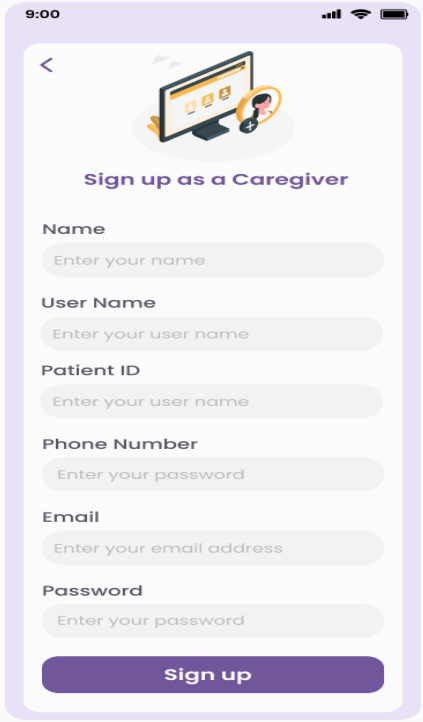
05.

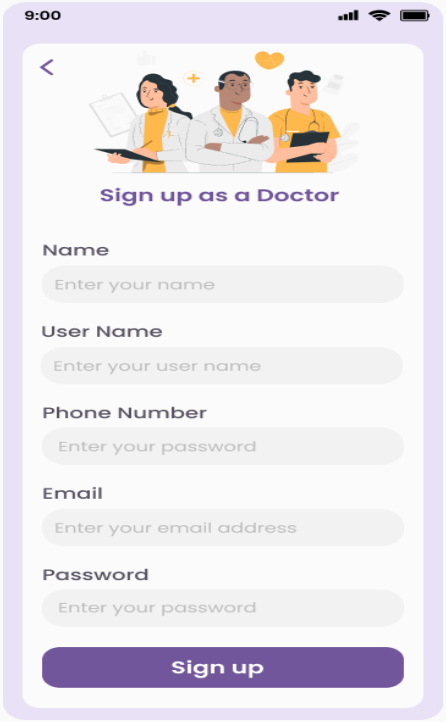
Proposed System

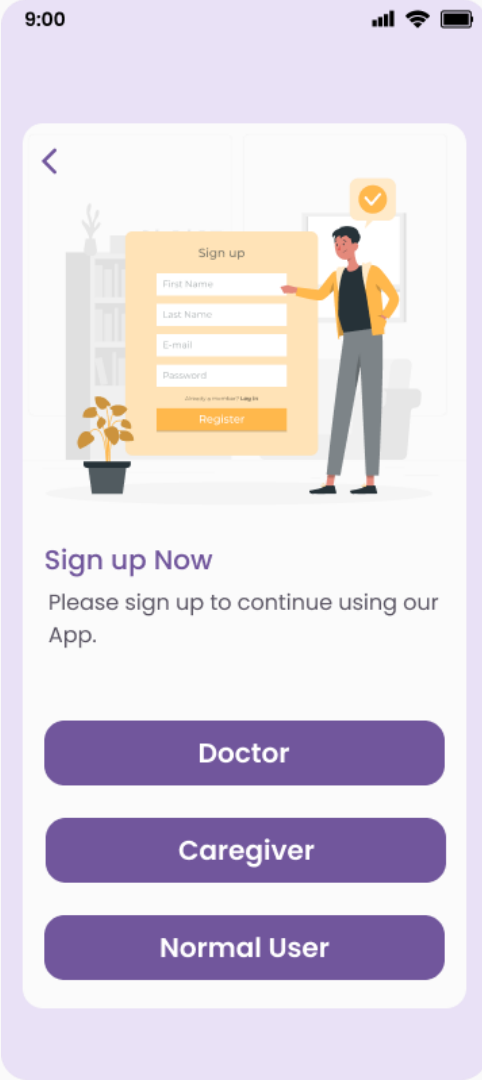

KINEMASTER

Sign Up Functions









Login Functions

9:00

Login as a Caregiver

User Name

Enter your user name

Password

Enter your password

Forget password?

Login

Don't have an account? Sign up

9:00

Login as a Normal user

User Name

Enter your user name

Password

Enter your password

Forget password?

Login

Don't have an account? Sign up

9:00

Login as a Doctor

User Name

Enter your user name

Password

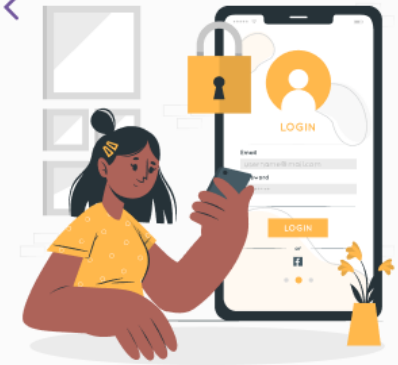
Enter your password

Forget password?

Login

Don't have an account? Sign up

9:00



Login Now

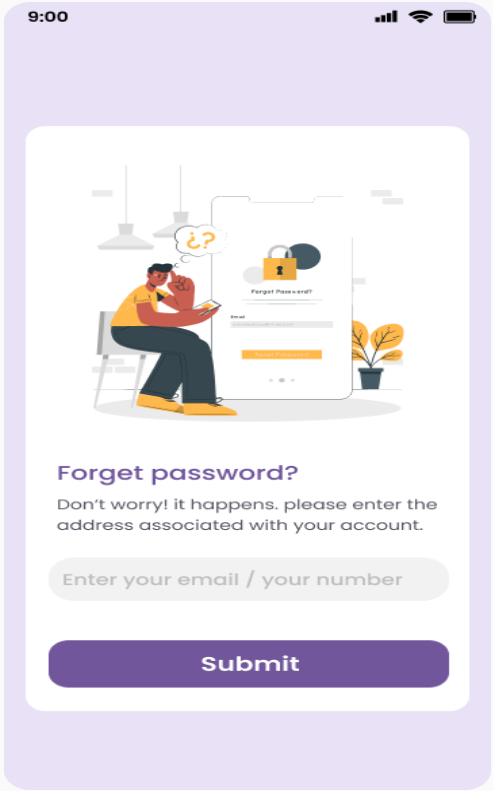
Please sign up to continue using our App.

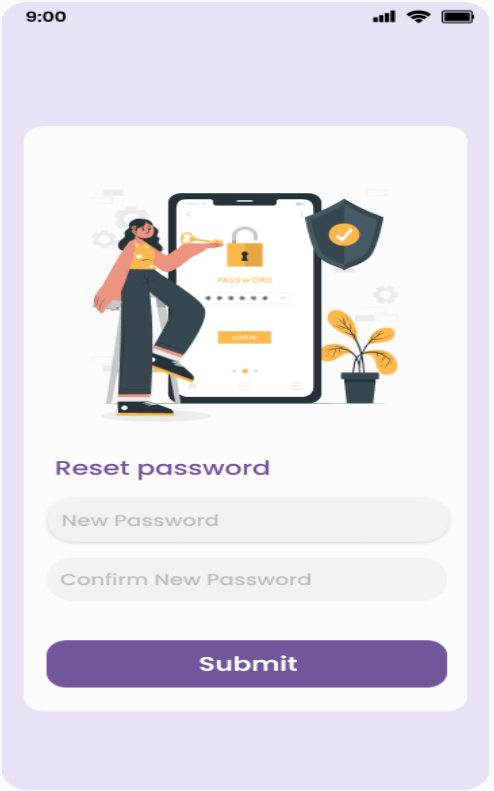
Doctor

Caregiver

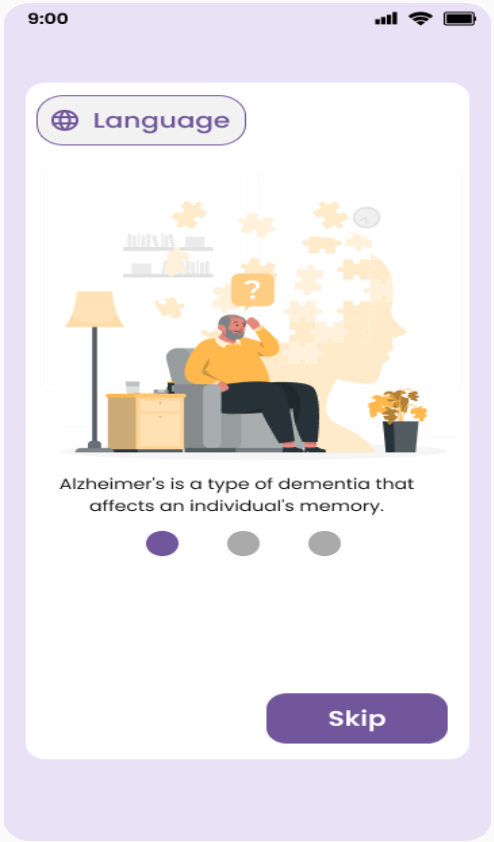
Normal User

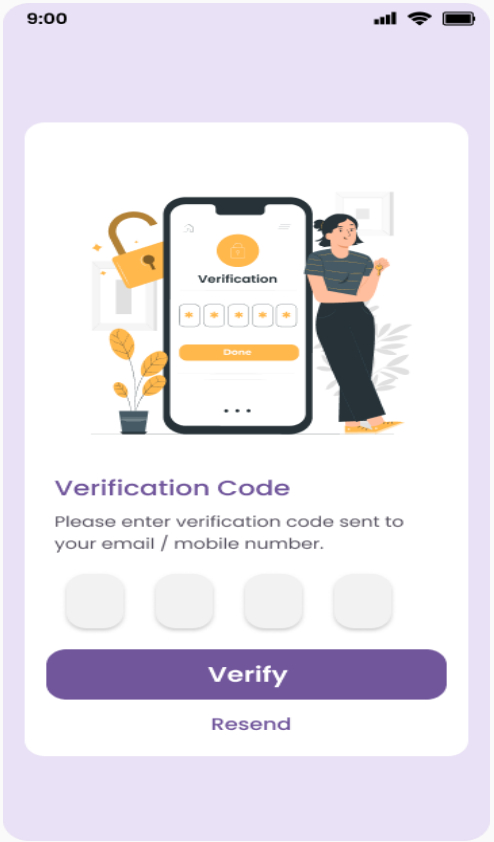
Passwords Functions



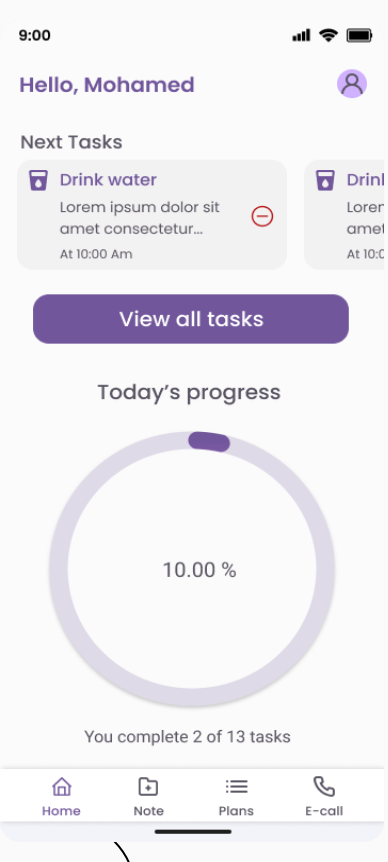


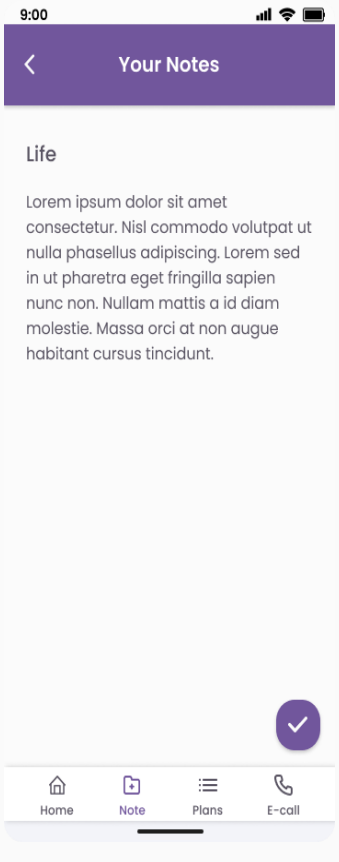
Languages & Verification code

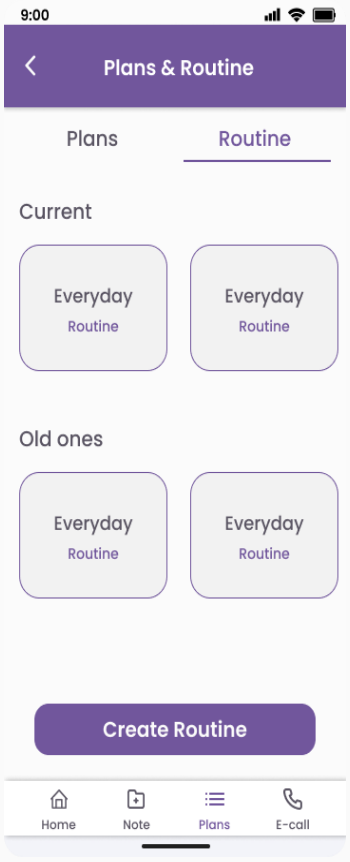


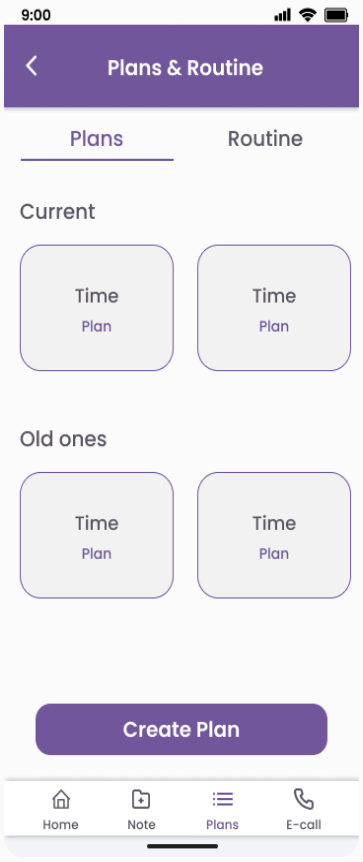


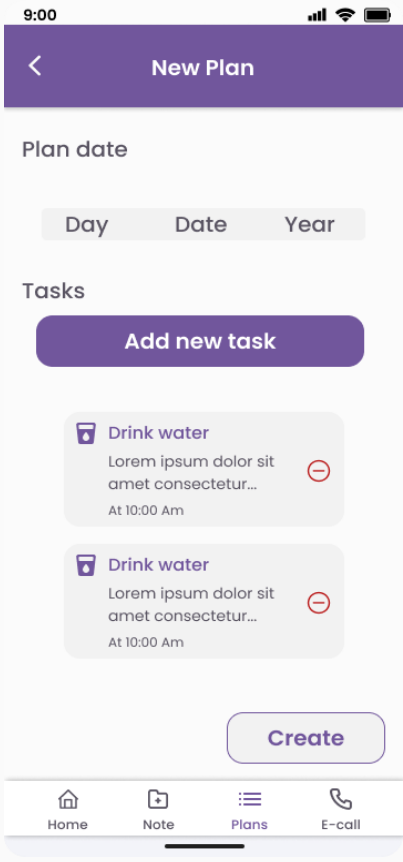
Normal User Features



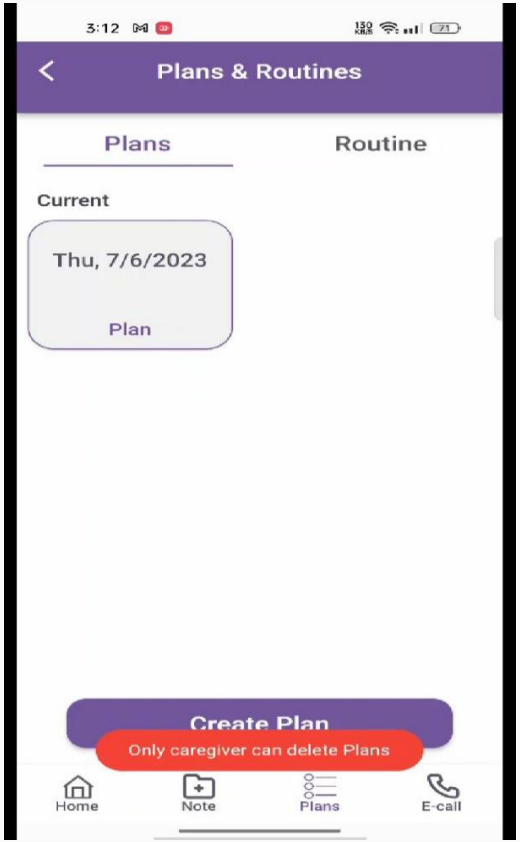


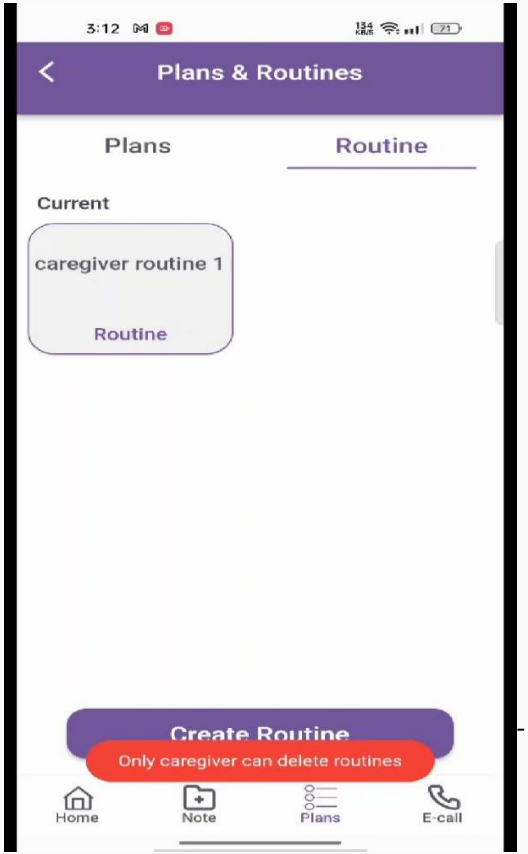




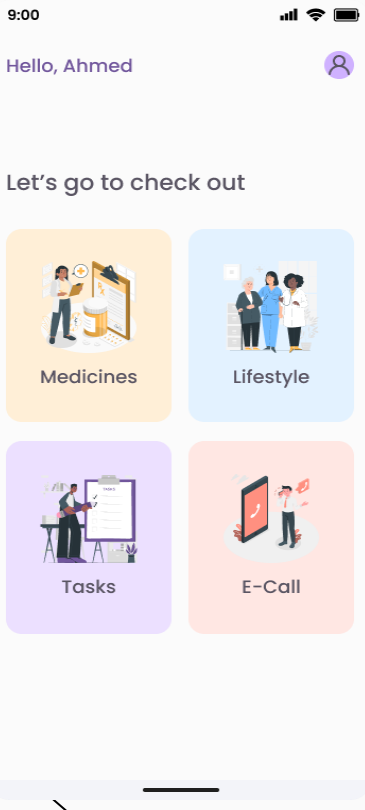


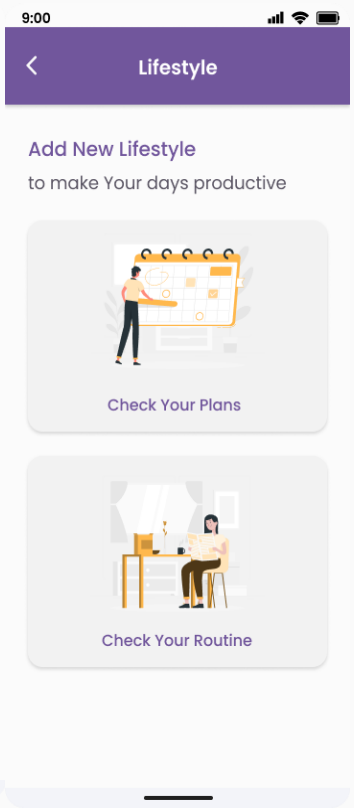
Patient Features

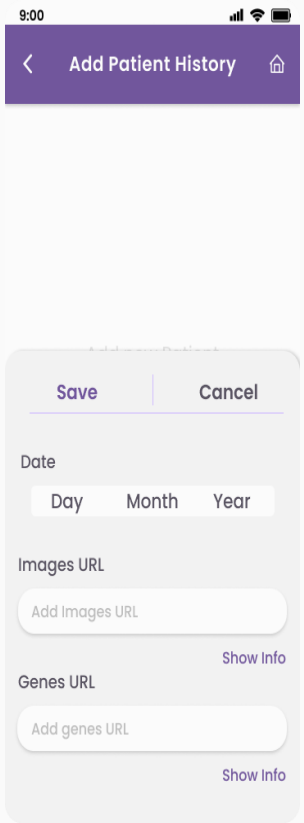


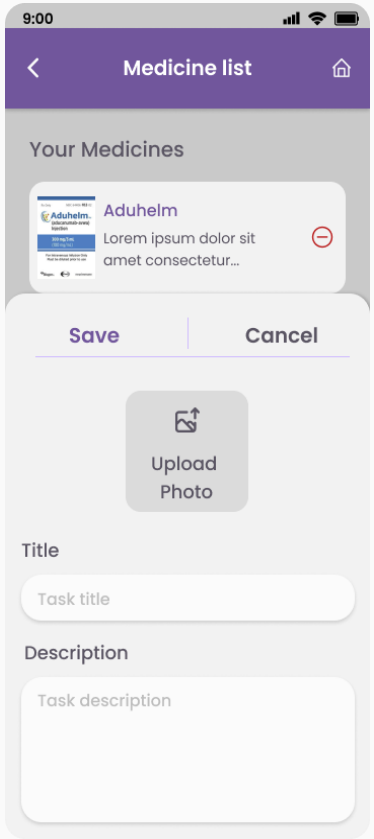


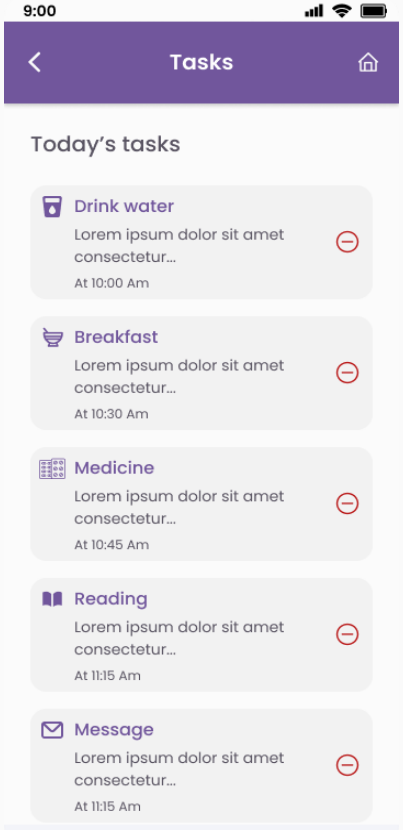
Care Giver Features











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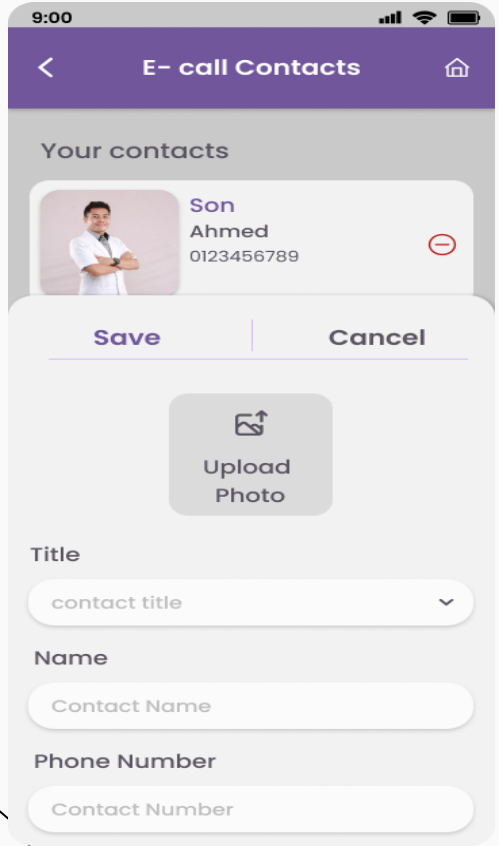
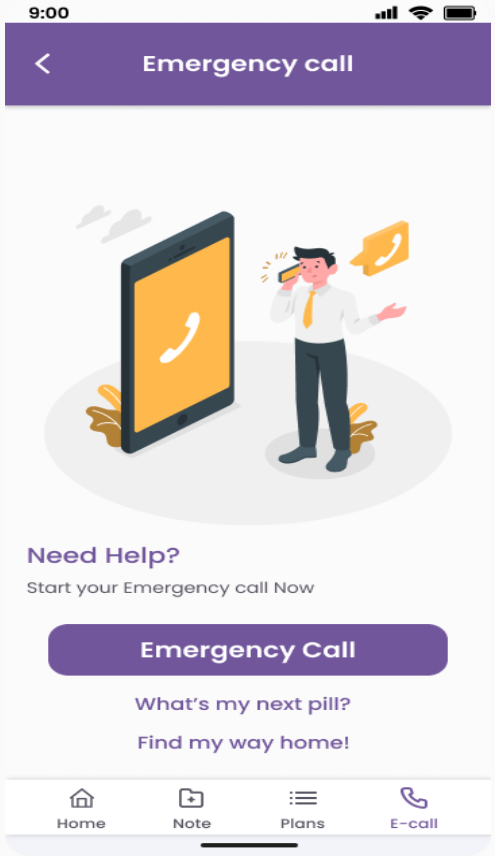
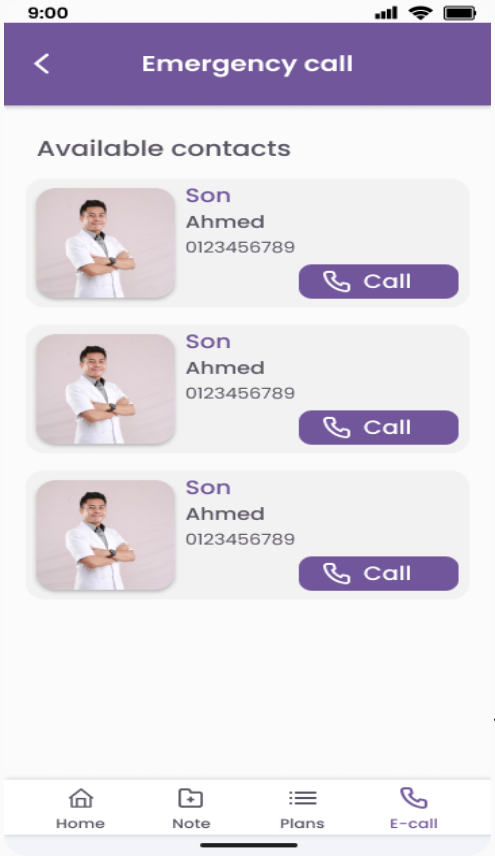
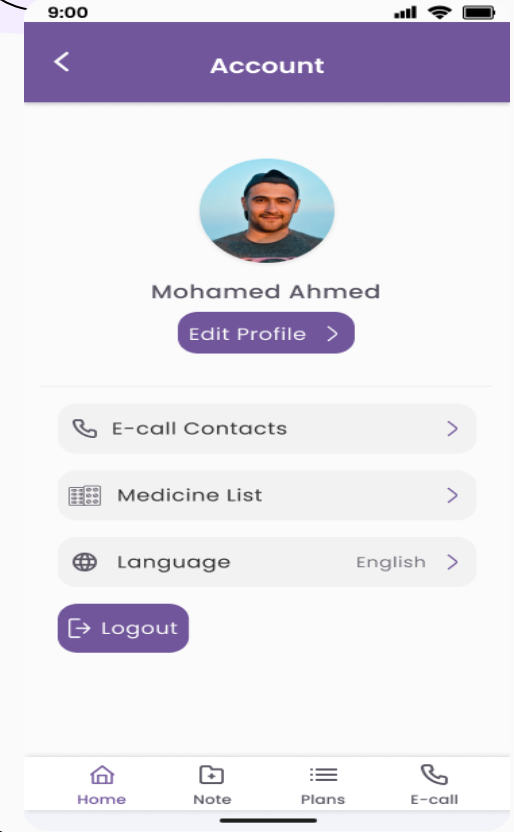
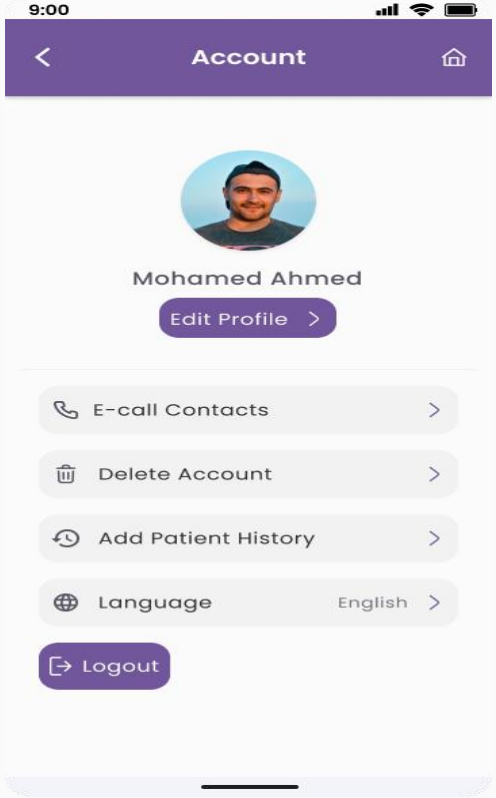


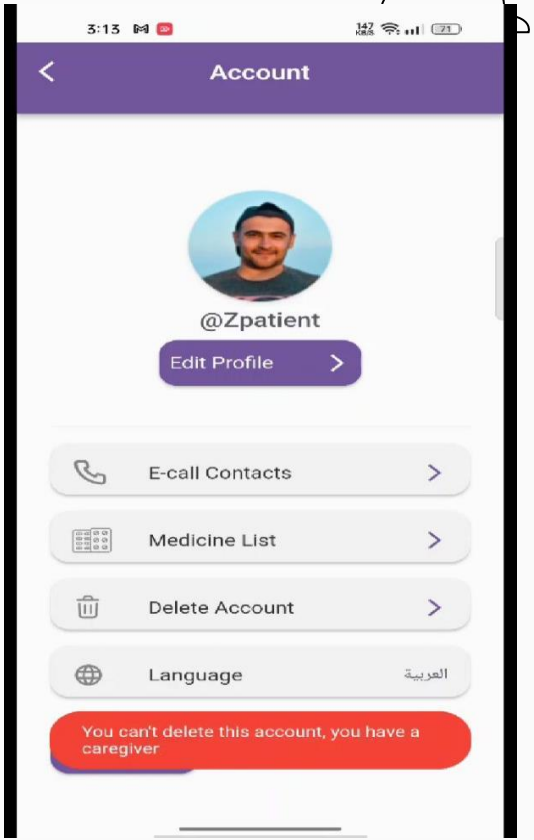




Accounts Profiles





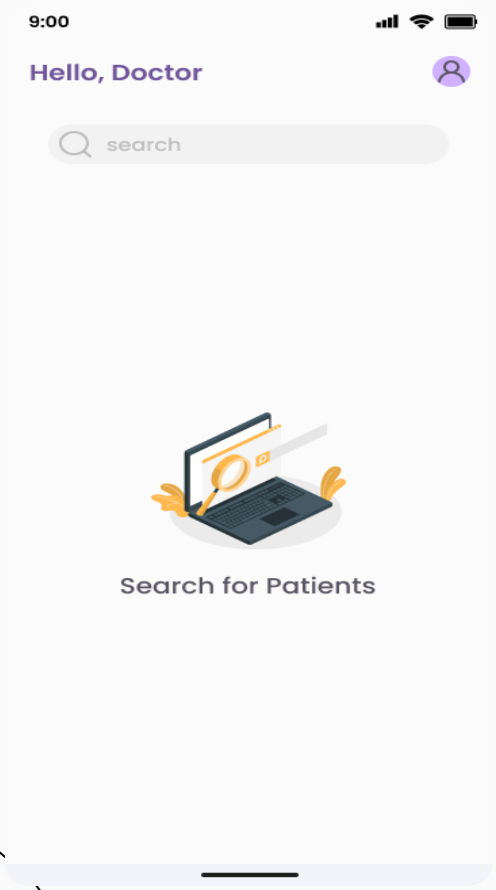


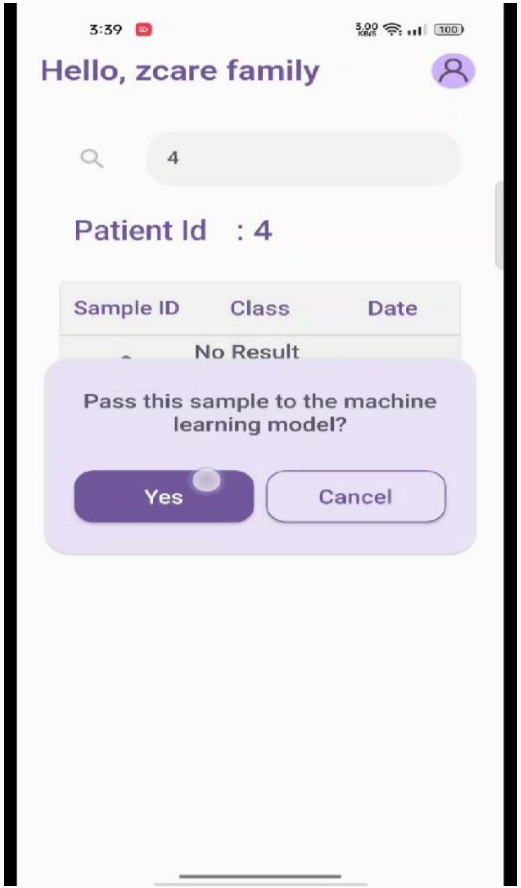
Normal User

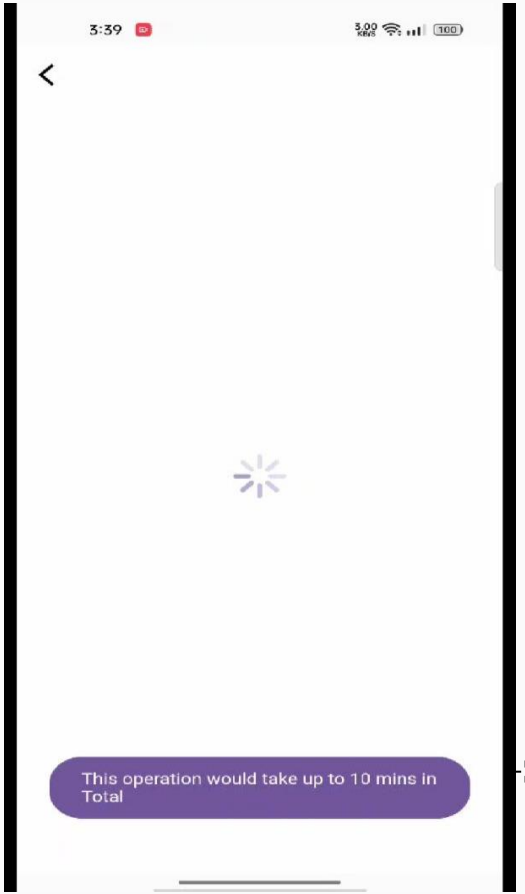
Care Giver

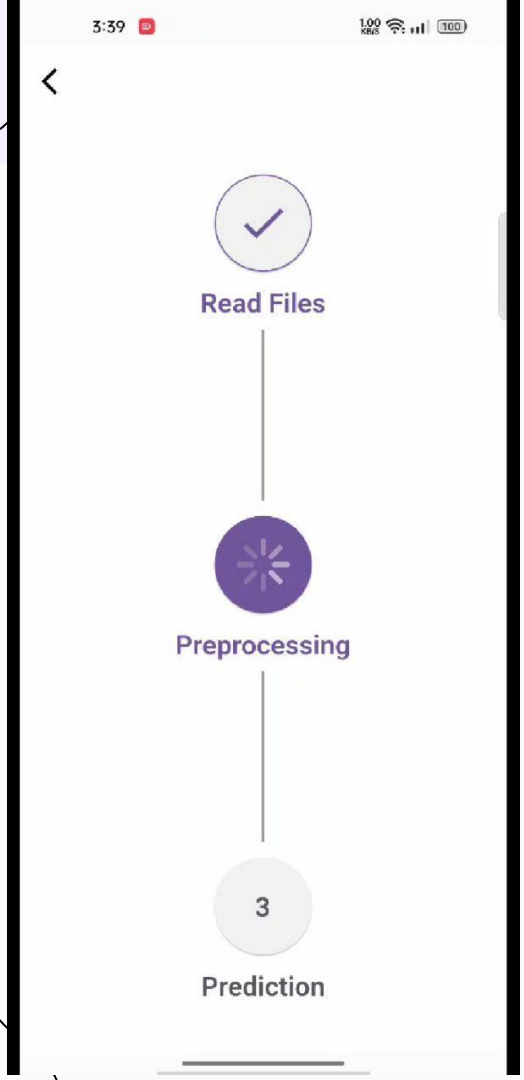
Patient

Doctor Features





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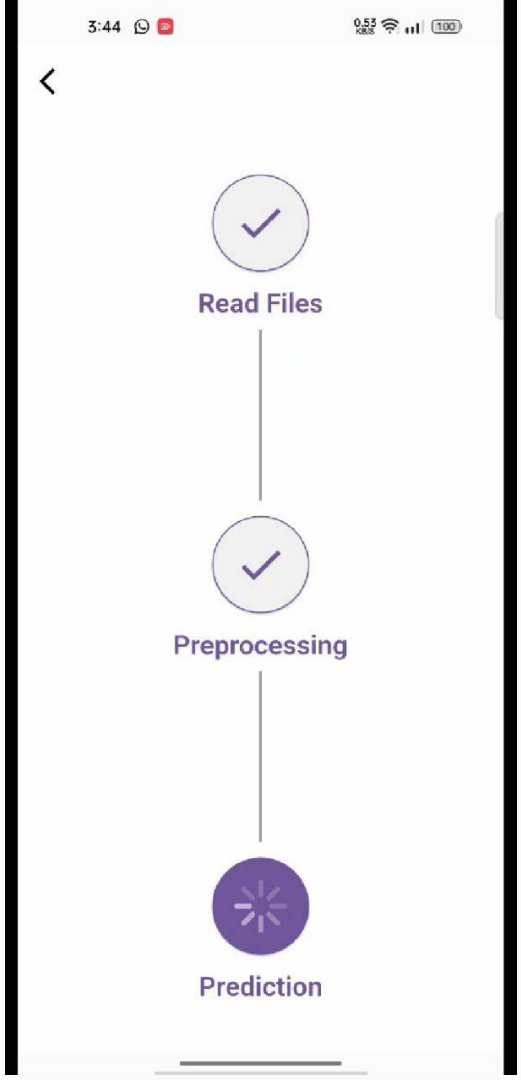
Read Files
Preprocessing
3
Prediction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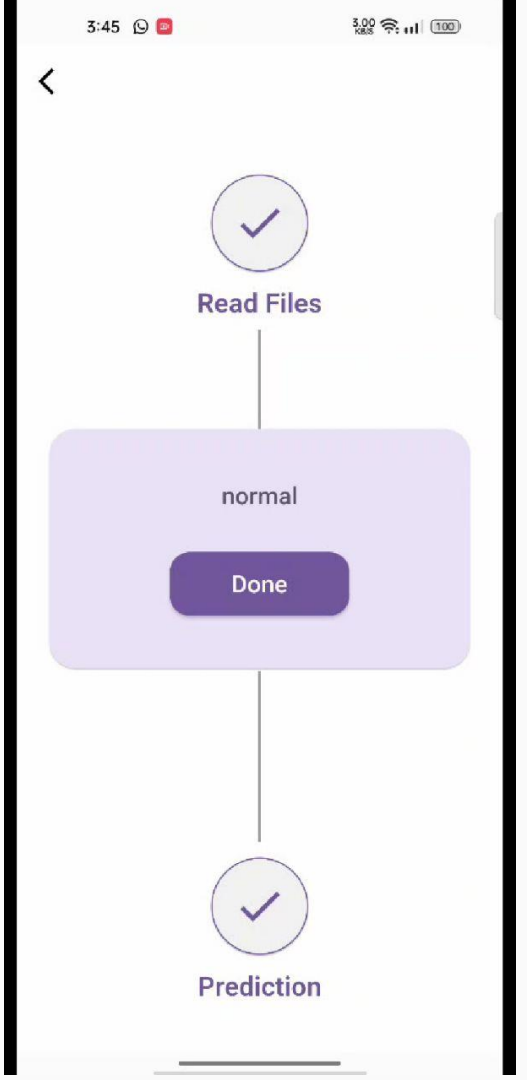
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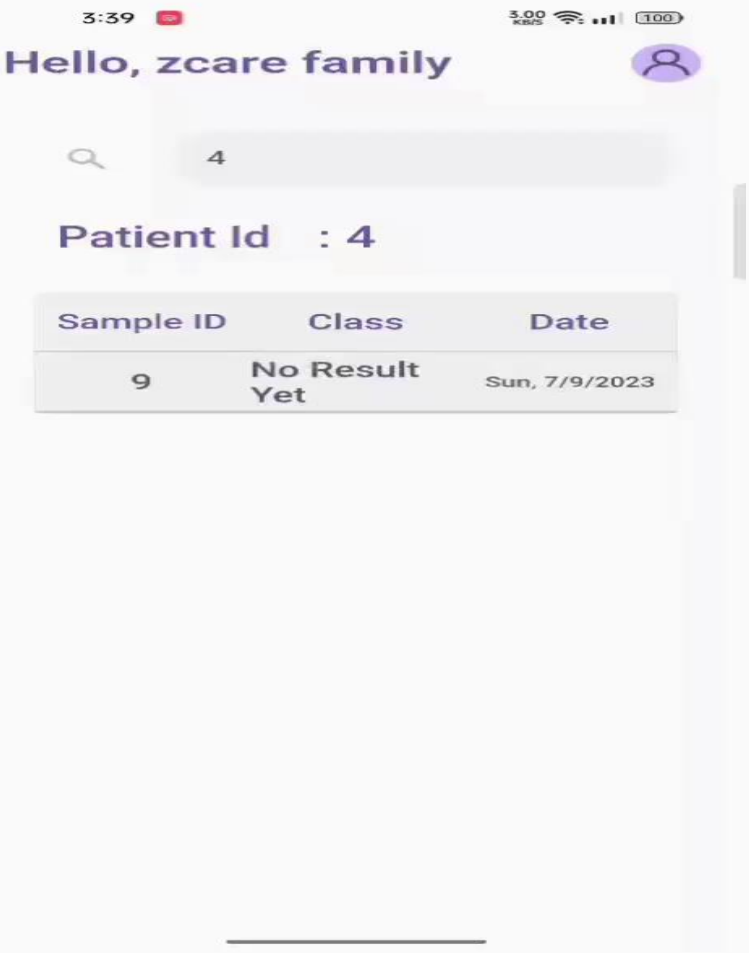
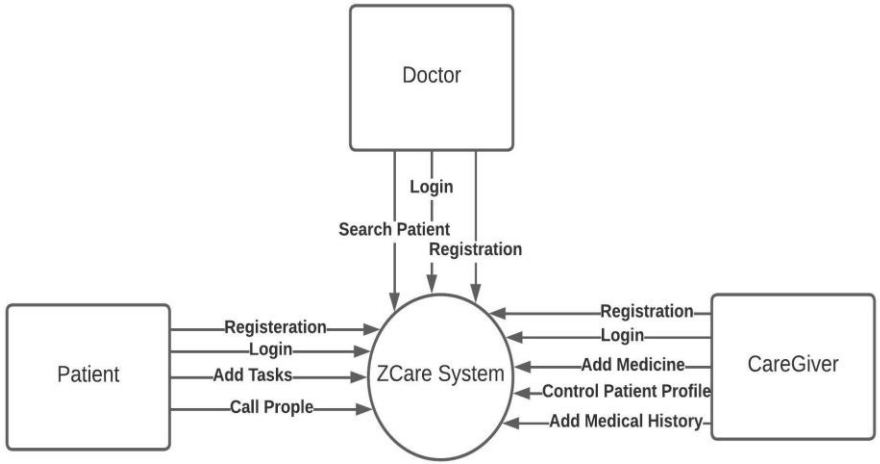
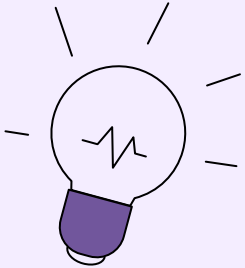
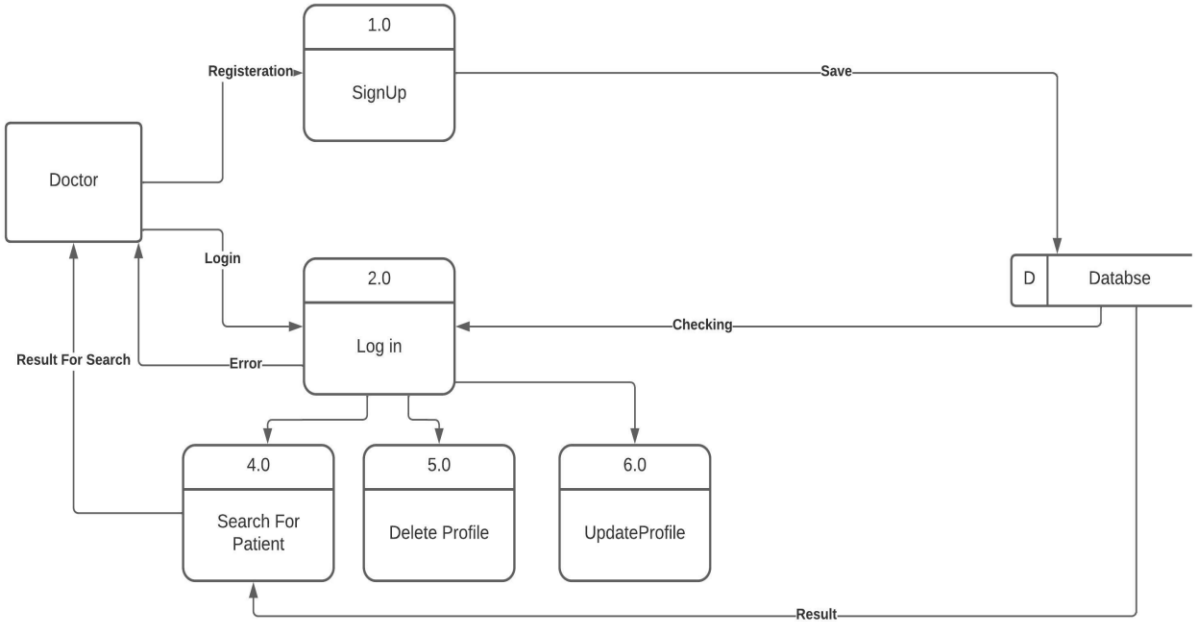
Read Files
normal
Done
Prediction


3:39
Hello, zcare family
4
Patient Id : 4
Sample ID
Class
Date
9
No Result Yet
Sun, 7/9/2023

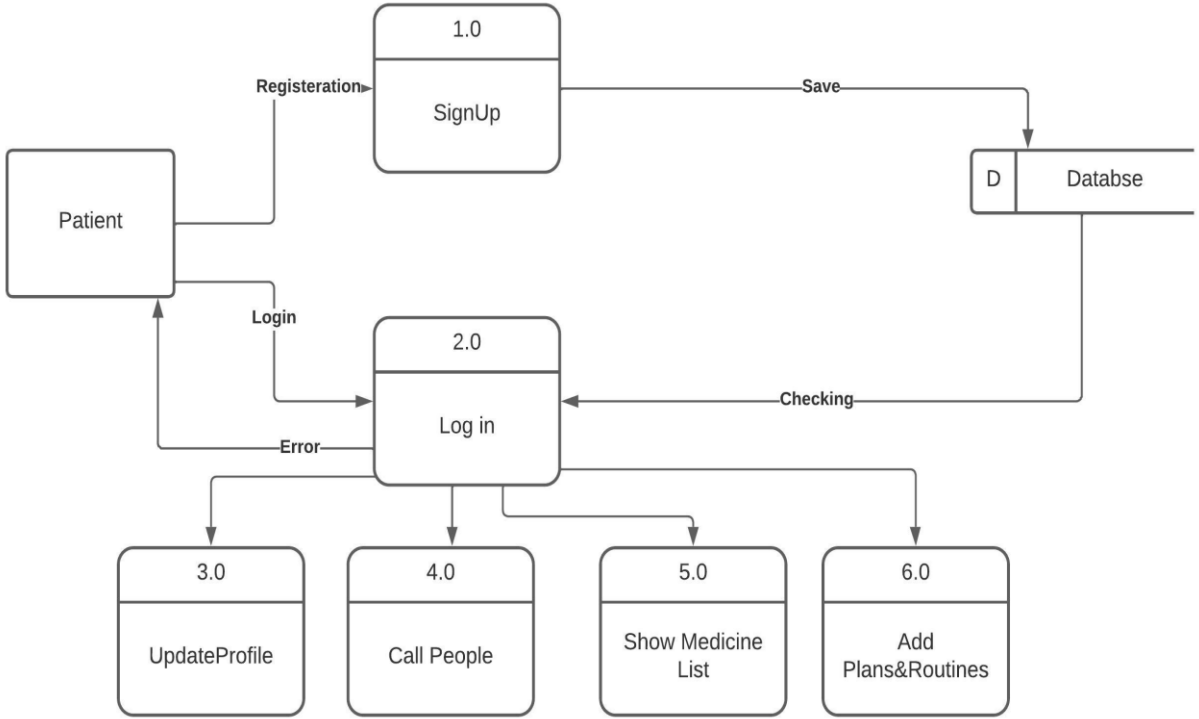


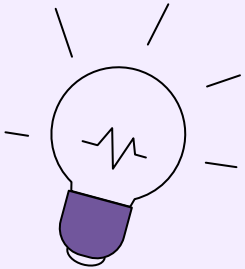


–Context Diagram

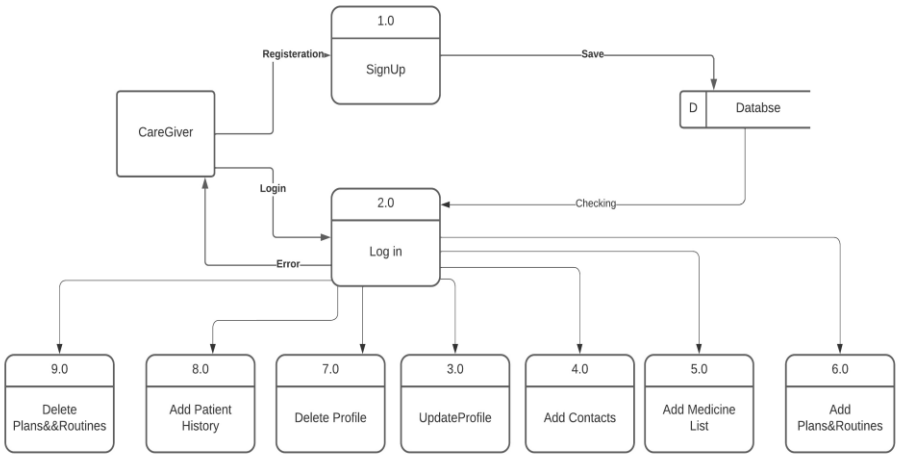

1.0
SignUp
Registeration
Save
Doctor
Login
2.0
Log in
D
Databse
Checking
Result For Search
Error
4.0
Search For Patient
5.0
Delete Profile
6.0
UpdateProfile
Result

—Doctor DFD

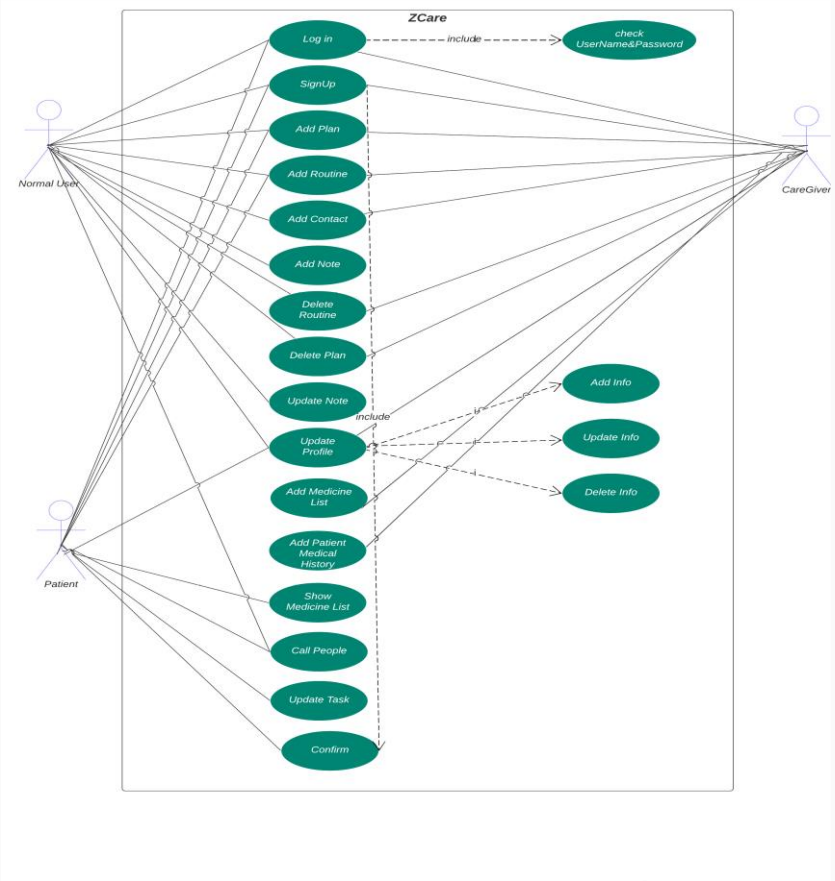

1.0
SignUp
Registeration
Save
D
Databse
Patient
Login
2.0
Log in
Checking
Error
3.0
UpdateProfile
4.0
Call People
5.0
Show Medicine List
6.0
Add Plans&Routines

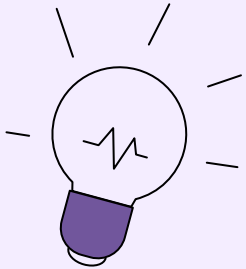


-Patient DFD

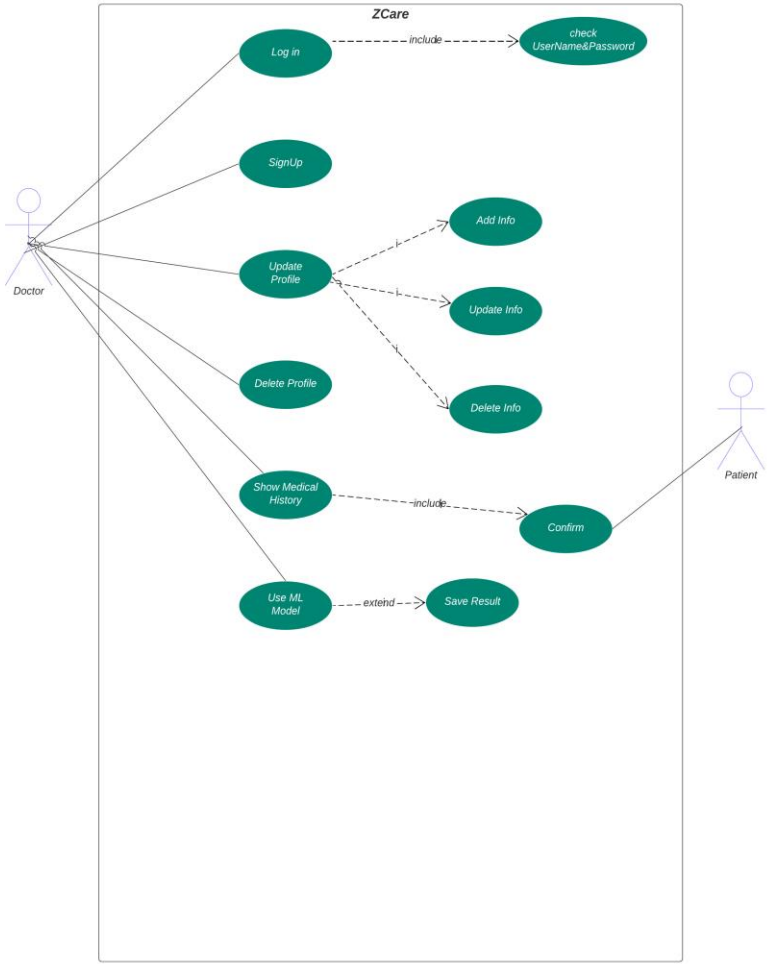


–CareGiver DFD

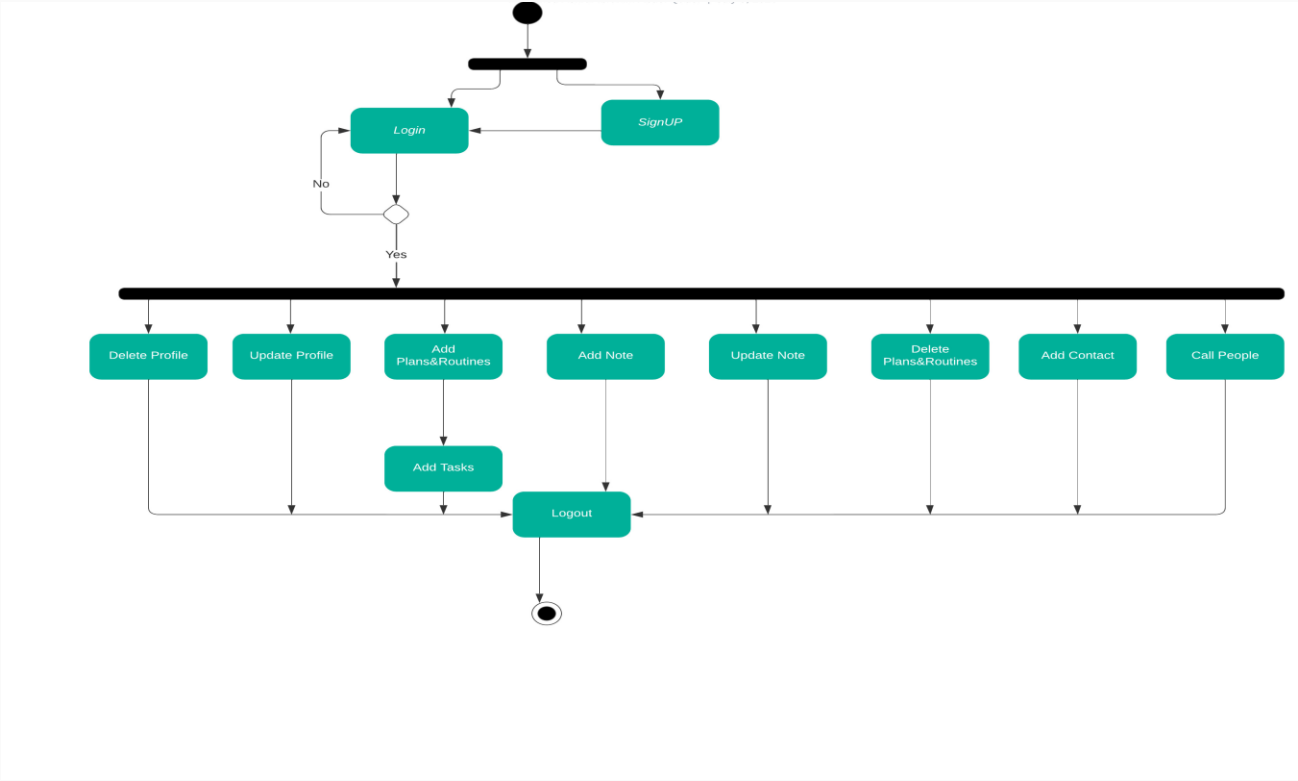




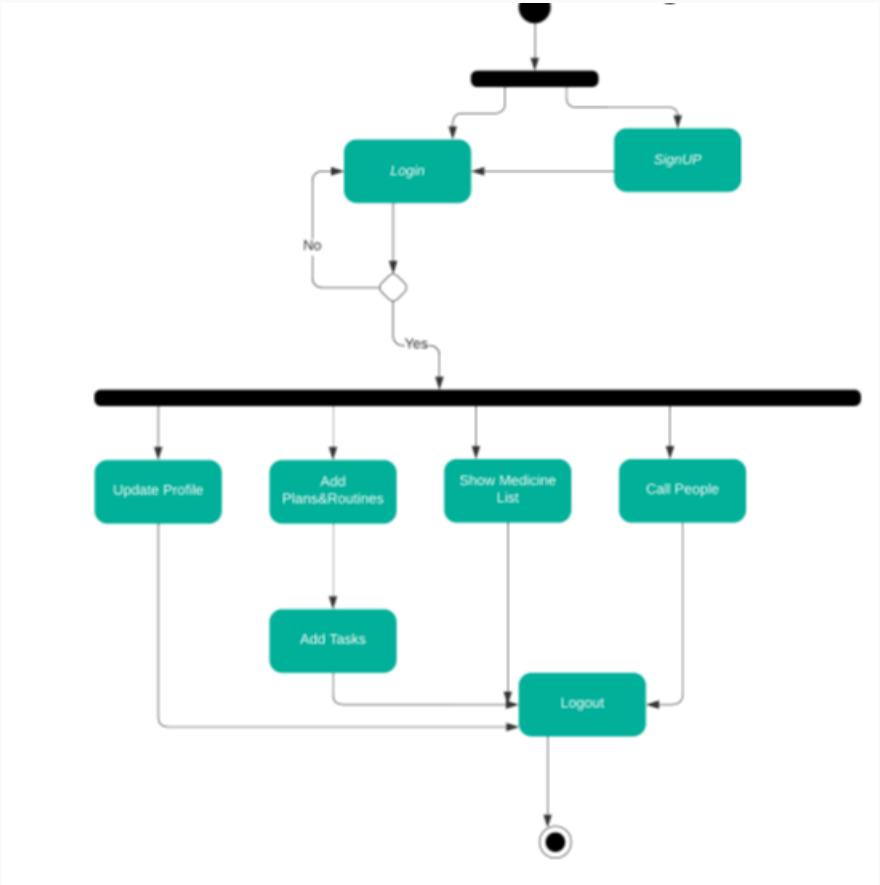
—Patient, NormalUser, CareGiver Use case



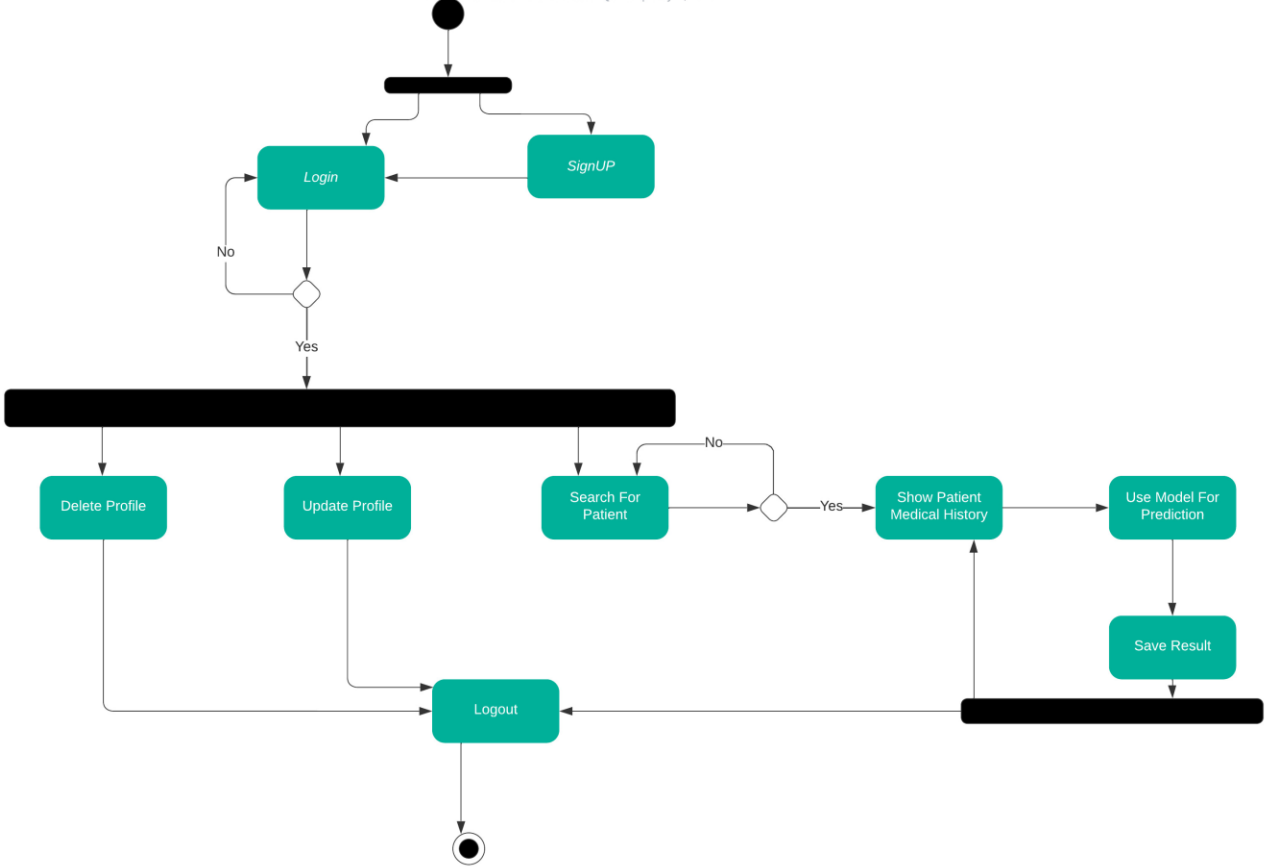
-Doctor UseCase



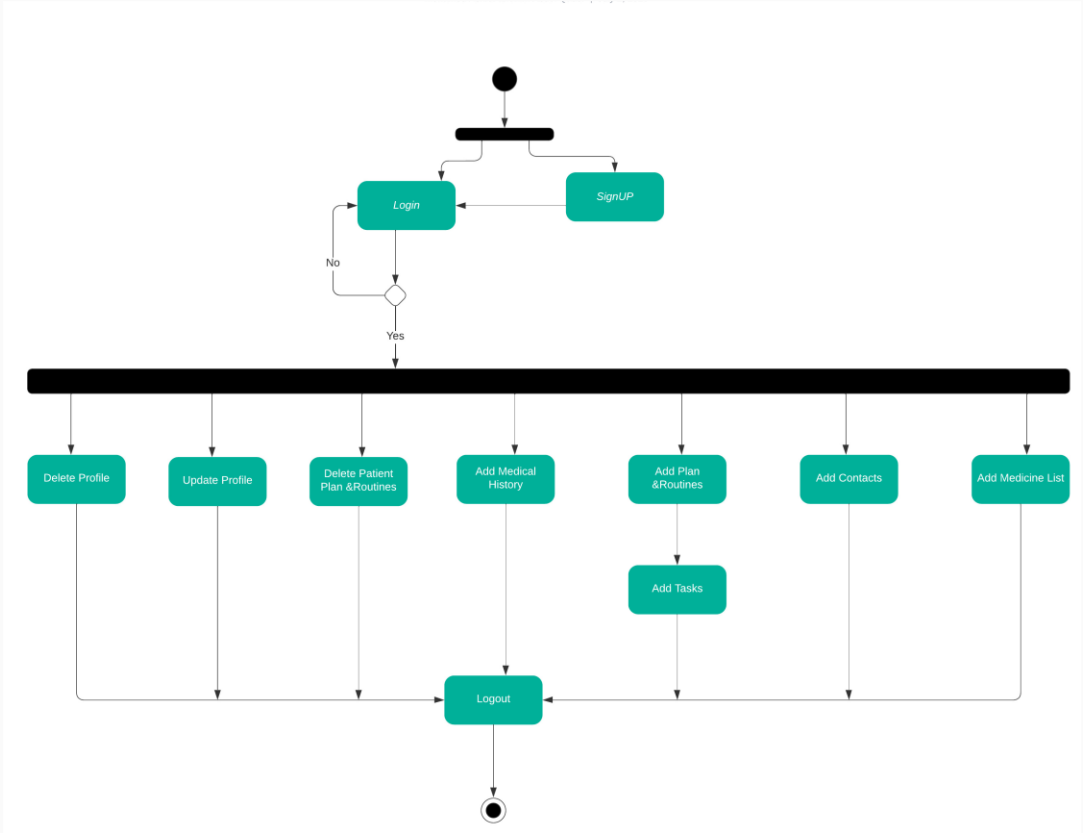
Normal User Activity Diagram



-Patient Activity diagram

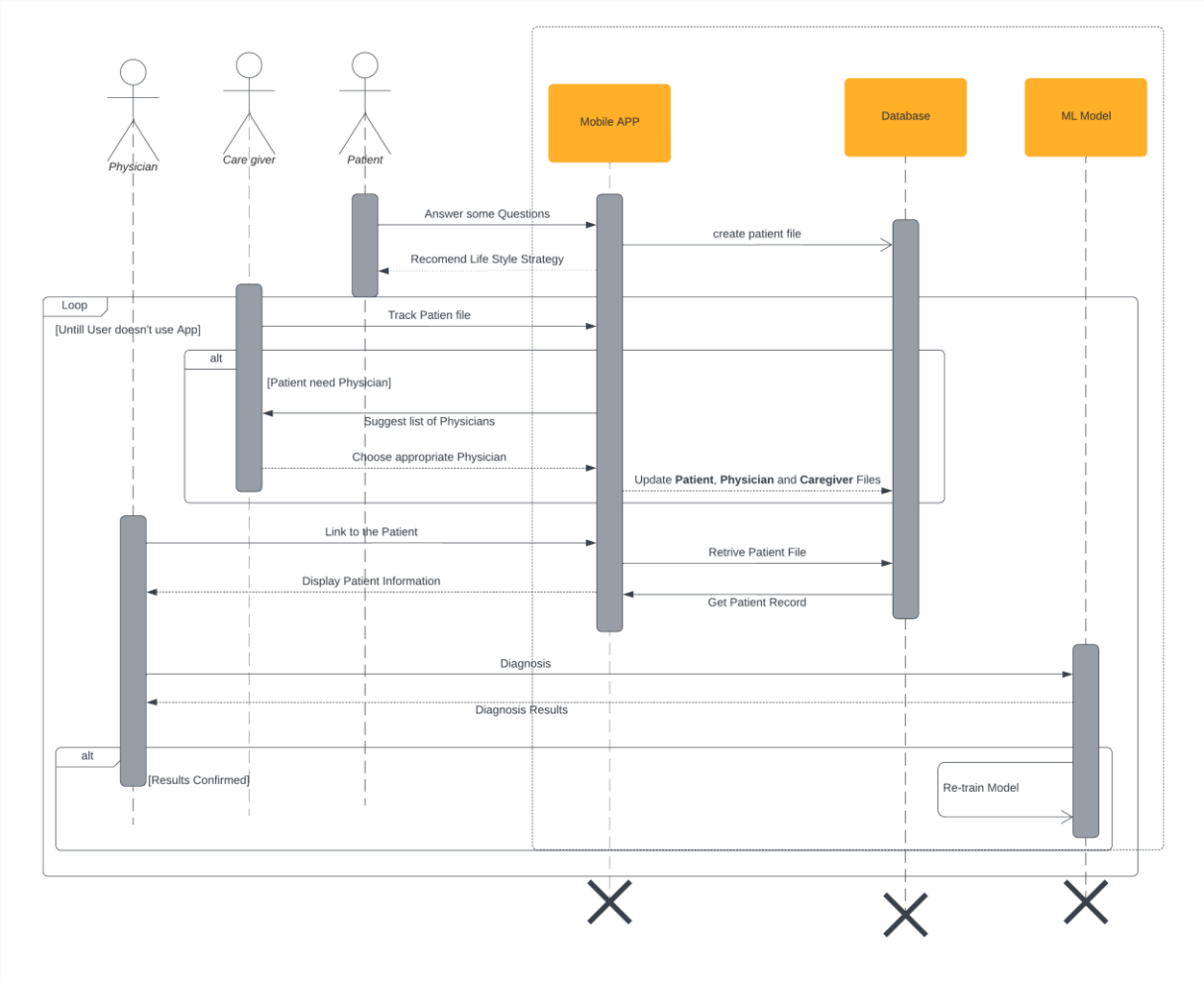


-Doctor Activity diagram

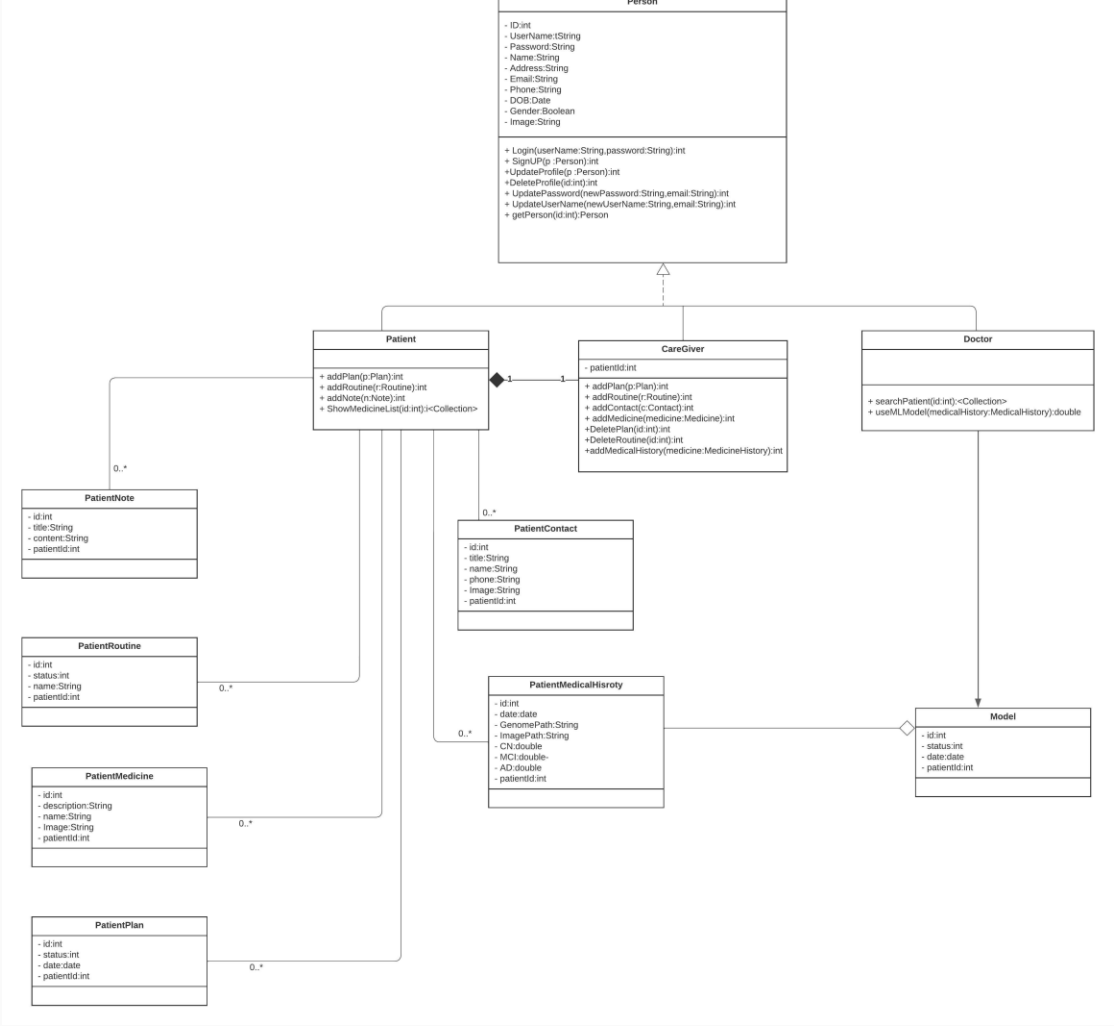


-CareGiver Activity diagram

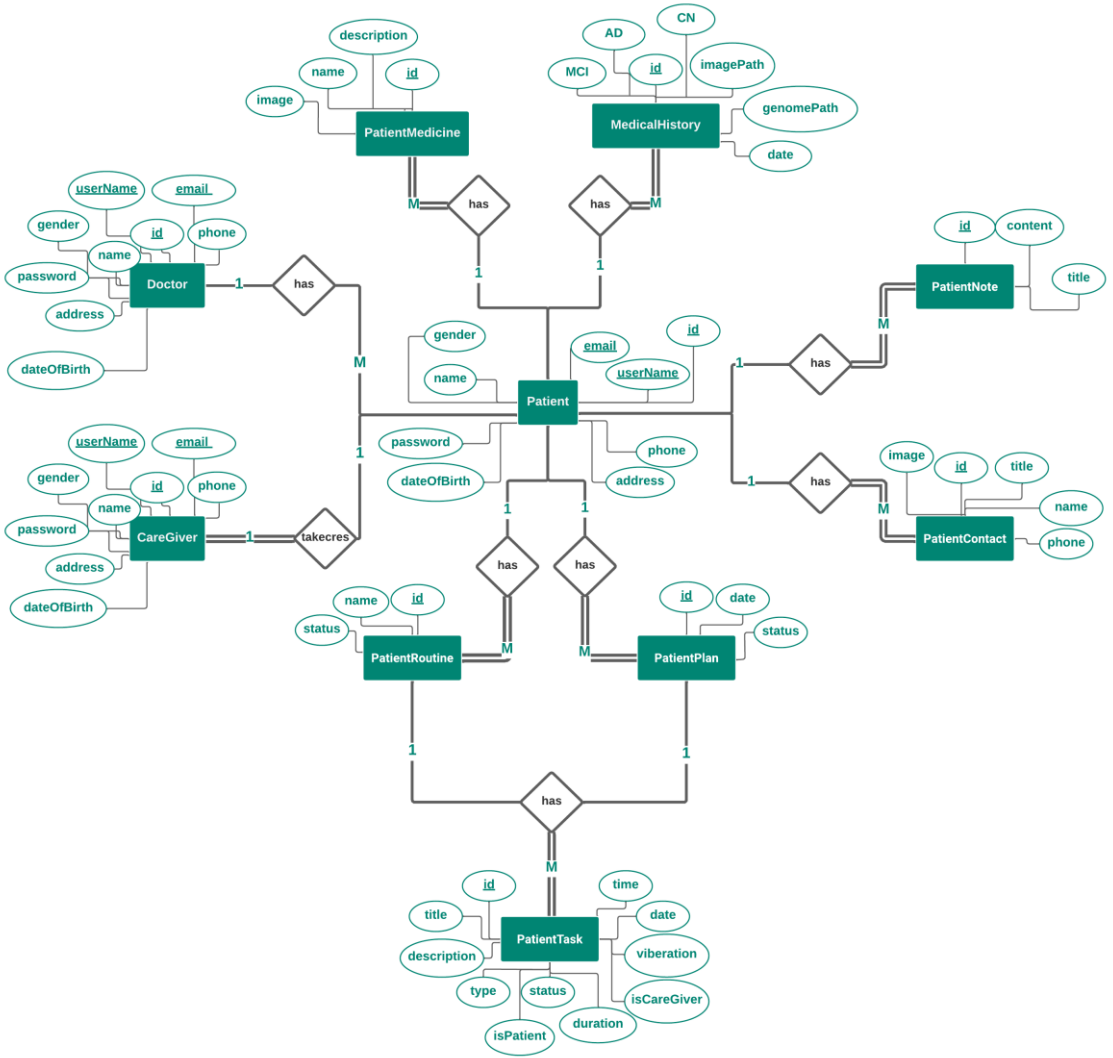
-Sequence diagram



Class diagram



-ERD Diagram


description
name
id
image
PatientMedicine
AD
CN
MCI
id
imagePath
genomePath
date
MedicalHistory
has
has
M
M
1
1
userName
email
gender
id
phone
name
password
address
dateOfBirth
Doctor
1
has
M
id
content
title
PatientNote
M
1
has
gender
email
id
name
userName
Patient
password
phone
dateOfBirth
address
1
has
M
image
id
title
name
phone
PatientContact
userName
email
gender
id
phone
name
password
address
dateOfBirth
CareGiver
1
takecres
1
1
has
has
name
id
status
PatientRoutine
M
M
id
date
status
PatientPlan
1
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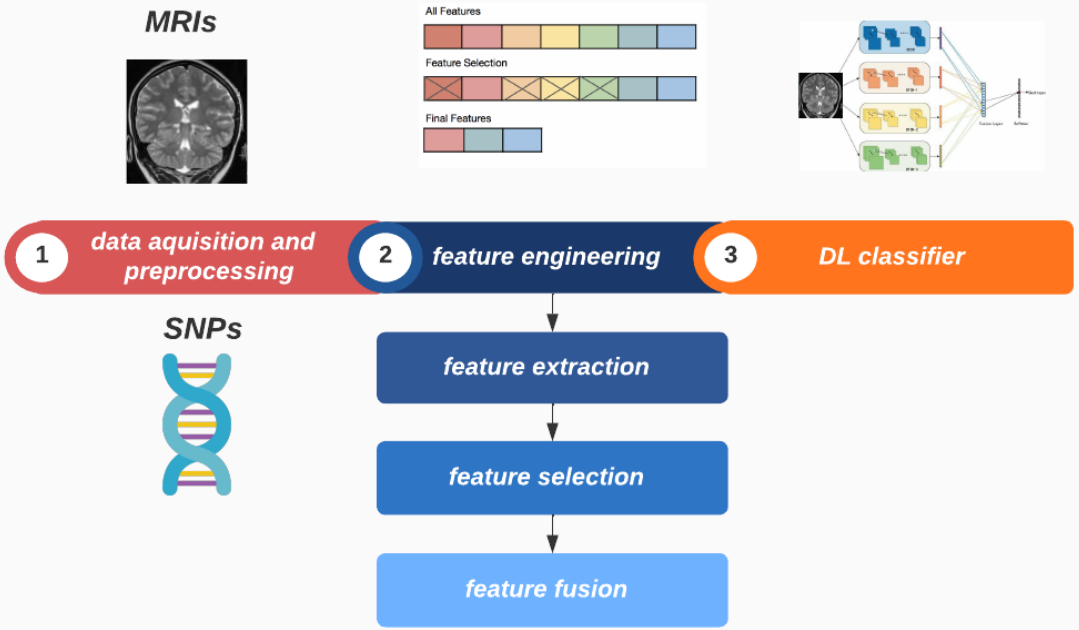
has
M
id
time
title
date
description
viberation
type
status
isCareGiver
duration
isPatient
PatientTask

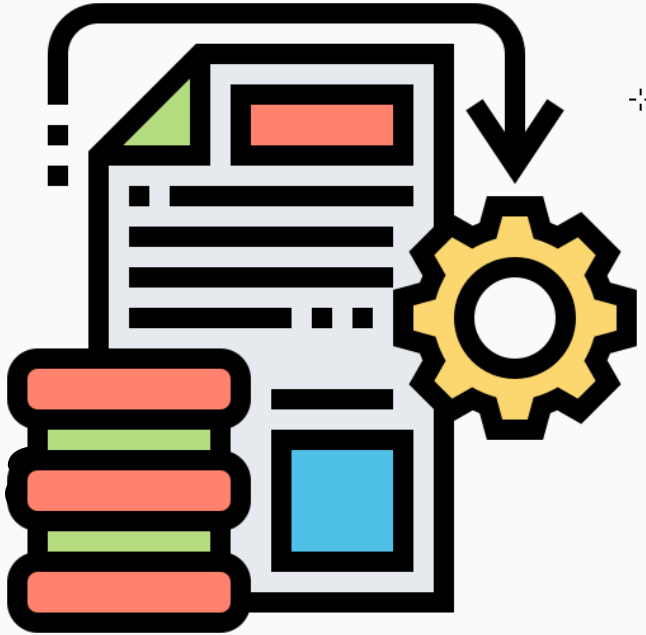
06.

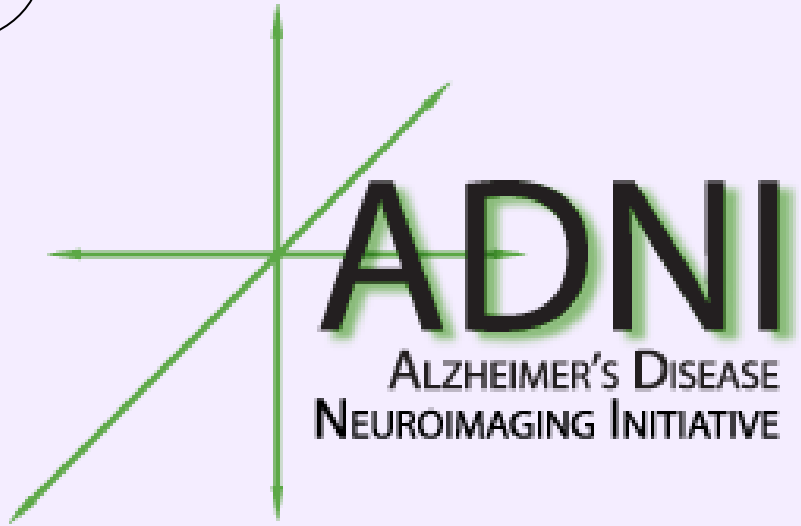
Discussion & Experimental Results


MRIs
All Features
Feature Selection
Final Features
1
data aquisition and preprocessing
2
feature engineering
3
DL classifier
SNPs
feature extraction
feature selection
feature fusion

Framework

Data acquisition preprocessing





Data acquisition

Data preprocessing

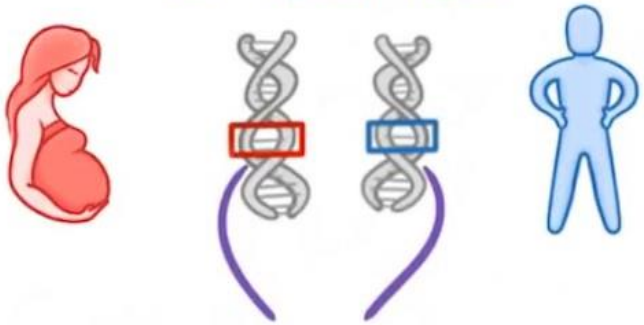
GENOTYPE VS PHENOTYPE

GENOTYPE

PHENOTYPE

Difference Between Gene And Allele

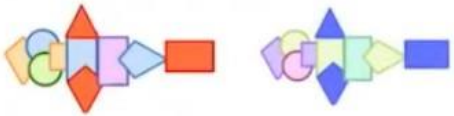
2 COPIES

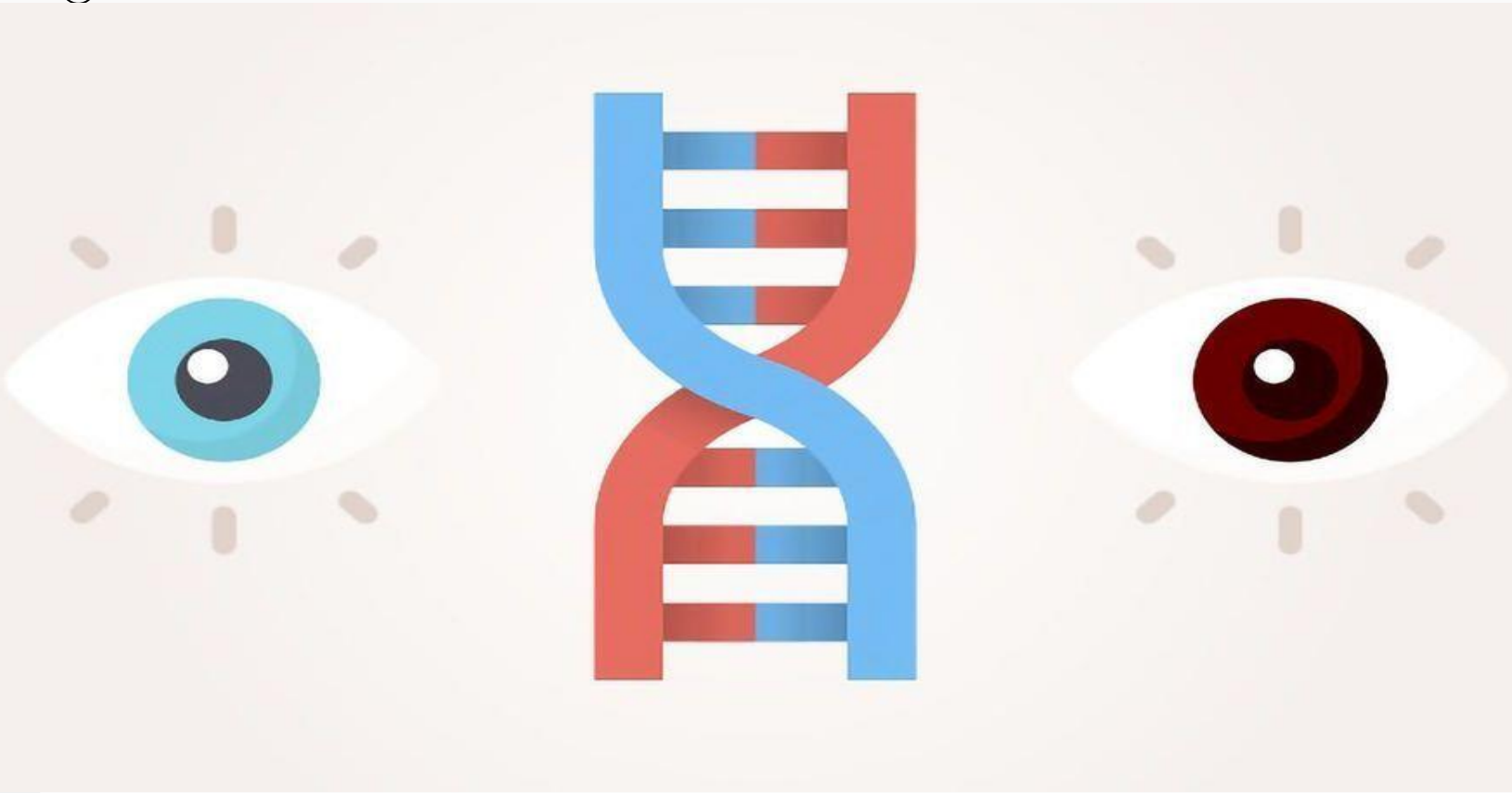


2 ALLELES

- CAN BE THE SAME ALLELE

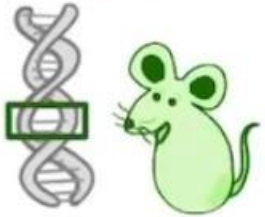
- 2 DIFF ALLELES





PURPLE

GREEN



GENE

DOMINANT

HETEROZYGOUS

RECESSIVE

ALWAYS

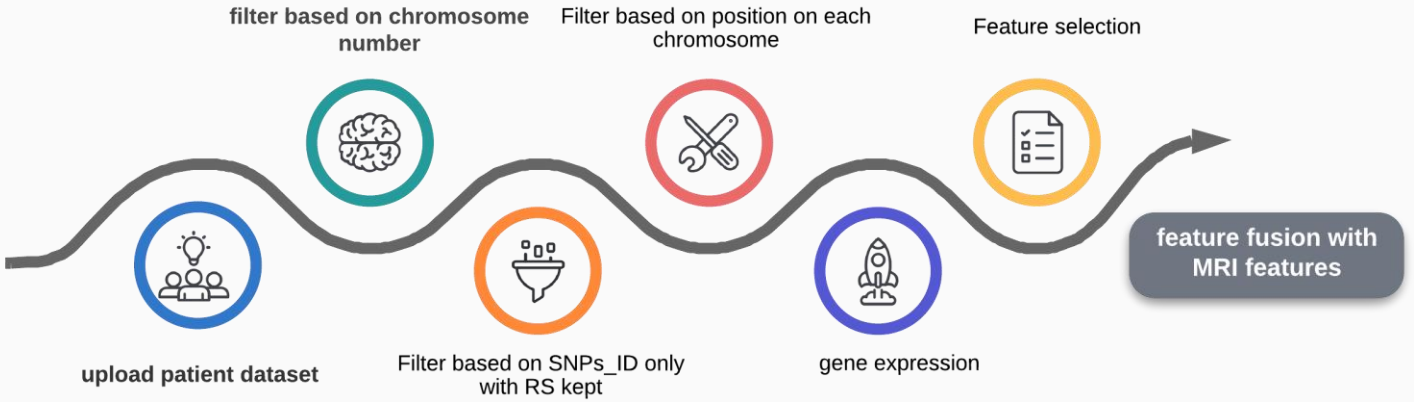
EXPRESSED

└ FUR COLOUR

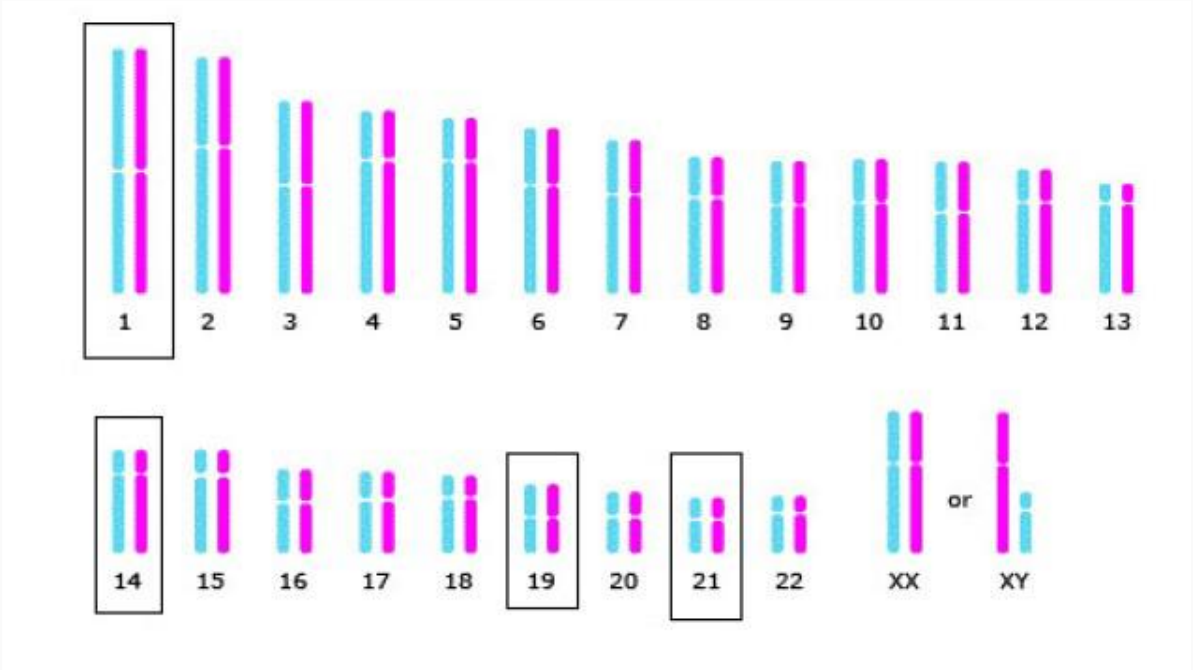
└ ONE ALLELE WILL BE DOMINANT)

└ OTHER WILL BE RECESSIVE

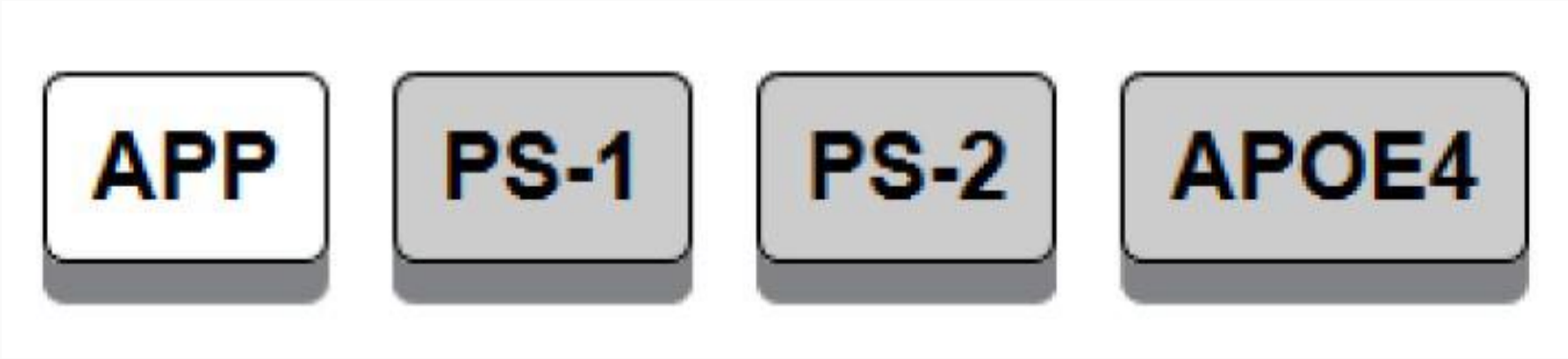
Gene	Chromosome	Start	End
PSEN2	1	225,114,896	225,160,427
PSEN1	14	72,662,932	72,766,862
APOE	19	50,090,879	50,114,490
APP	21	26,164,732	26,475,003



SNPs



Chromosomes responsible for AD



4 AD genes in the 4 mentioned chromosomes

Certain genes can increase the risk of developing dementia, including Alzheimer's disease

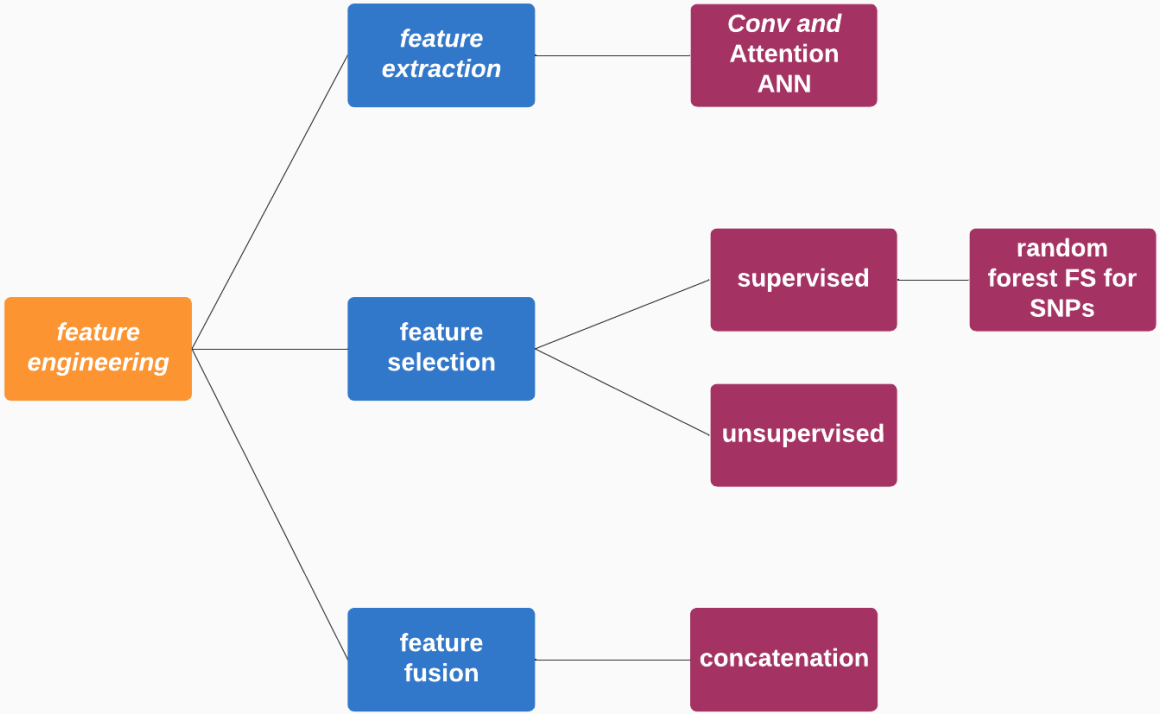
1. The **APP gene** provides instructions for making a protein called amyloid

2. The **PSEN1 gene** provides instructions for making a protein called presenilin 1

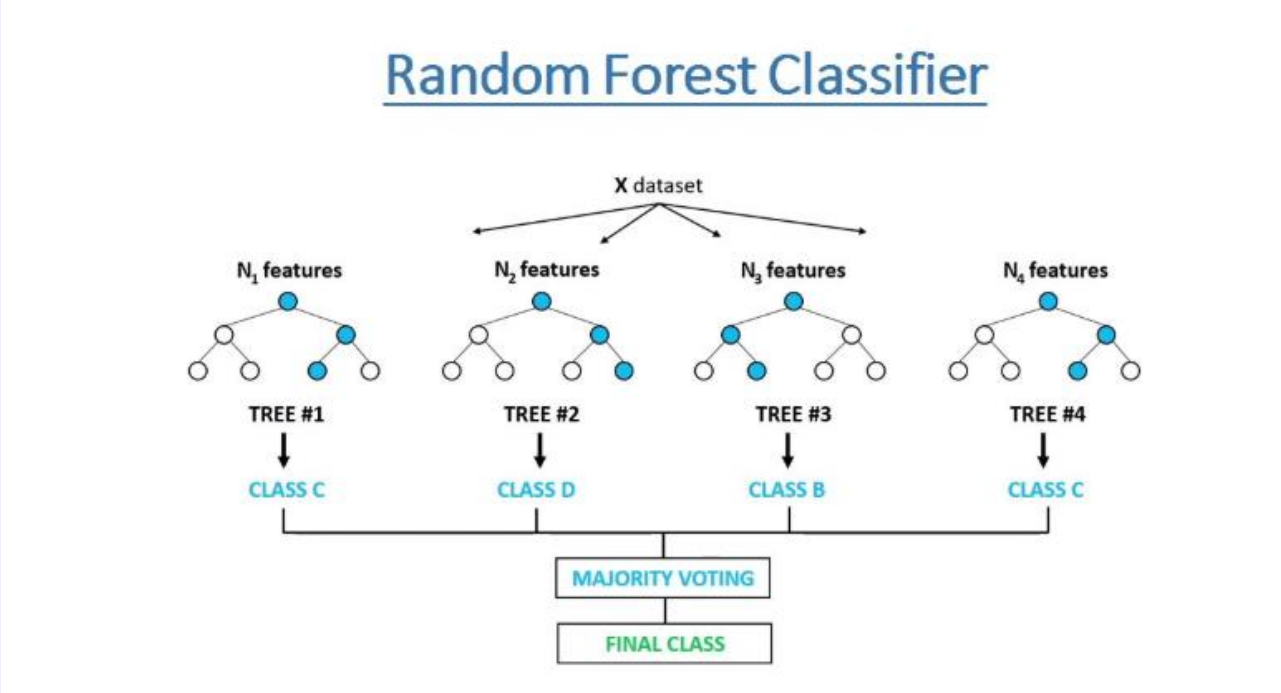
3. The **PSEN2 gene** provides instructions for making a protein called presenilin 2. Presenilin 2

PSEN2,1 helps process proteins that transmit chemical signals from the cell membrane into the nucleus. Once in the nucleus, these signals turn on (activate) genes that are important for cell growth and maturation

4. **APOE ε4** increases risk for Alzheimer's and is associated with an earlier age of disease onset in certain populations. About 15% to 25% of people have this allele, and 2% to 5% carry two copies **APOE4 is the strongest risk factor gene for Alzheimer's disease** apolipoprotein E gene called APOE4



Feature engineering



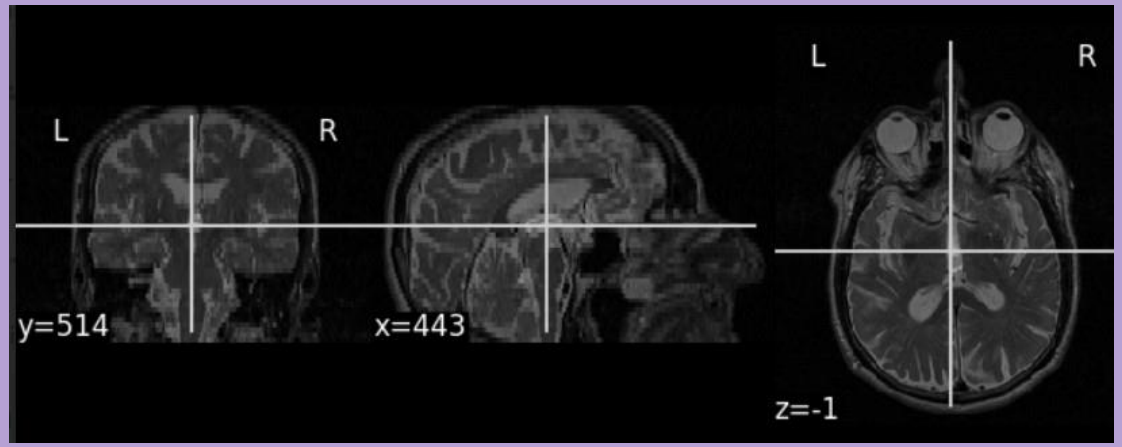
Feature selection using random forest for SNPs

['rs1150895', 'rs12126925', 'rs12405469', 'rs1295640',
'rs16846644', 'rs1783016',
'rs1783025', 'rs2014146', 'rs2073489', 'rs2156079', 'rs216762',
'rs2234983', 'rs2256331',
'rs2313007', 'rs2802268', 'rs2829973', 'rs2829997',
'rs2830000', 'rs2830008', 'rs2830012',
'rs2830028', 'rs2830033', 'rs2830036', 'rs2830038',
'rs2830044', 'rs2830052', 'rs2830088',
'rs362350', 'rs362393', 'rs373521', 'rs3787620', 'rs380417',
'rs439401', 'rs440666',
'rs452987', 'rs466448', 'rs466609', 'rs7276036', 'rs7278838',
'rs8006497', 'rs8106922',
'Sex', 'Age']

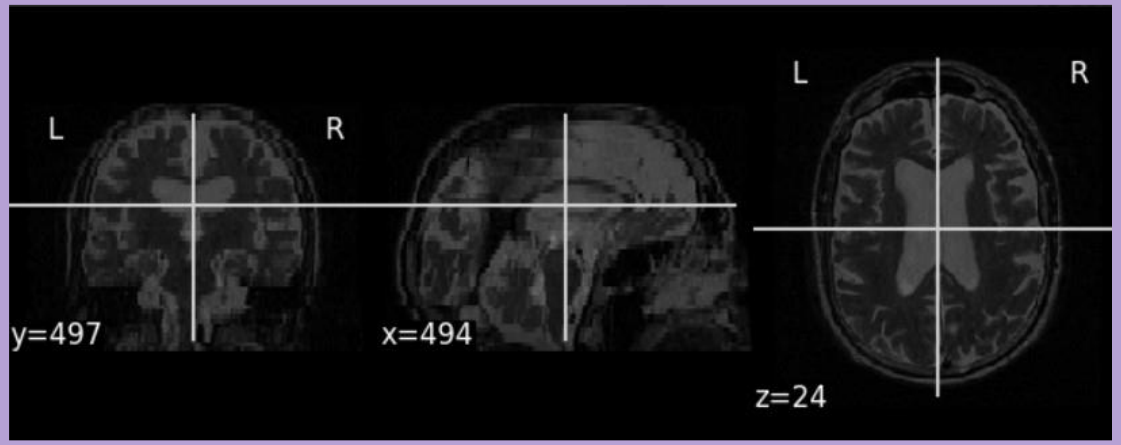
Produce 41 feature

MRIs

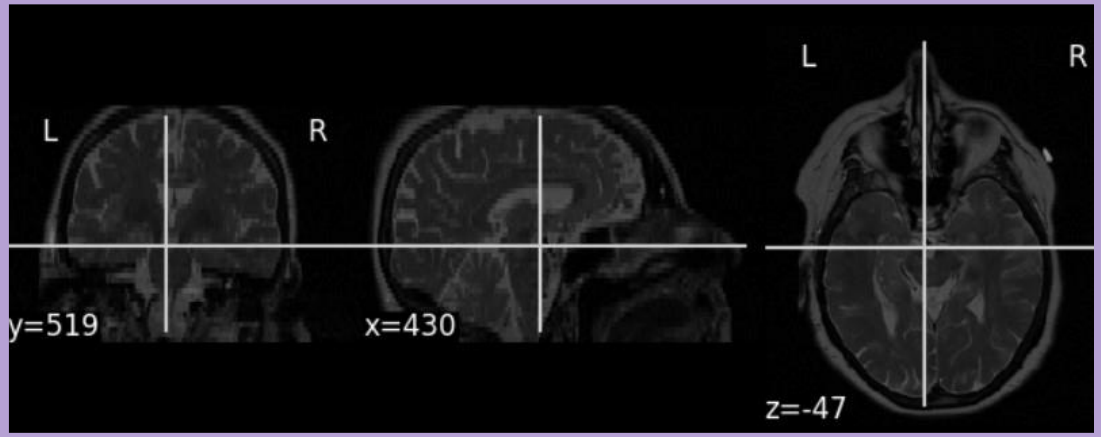
preprocessing



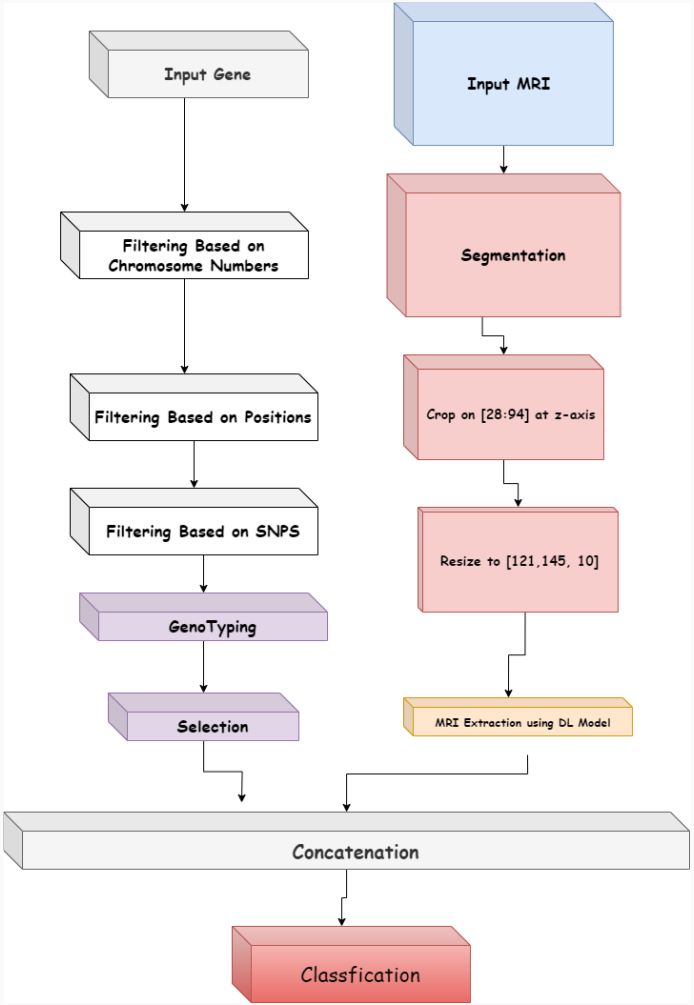
CN

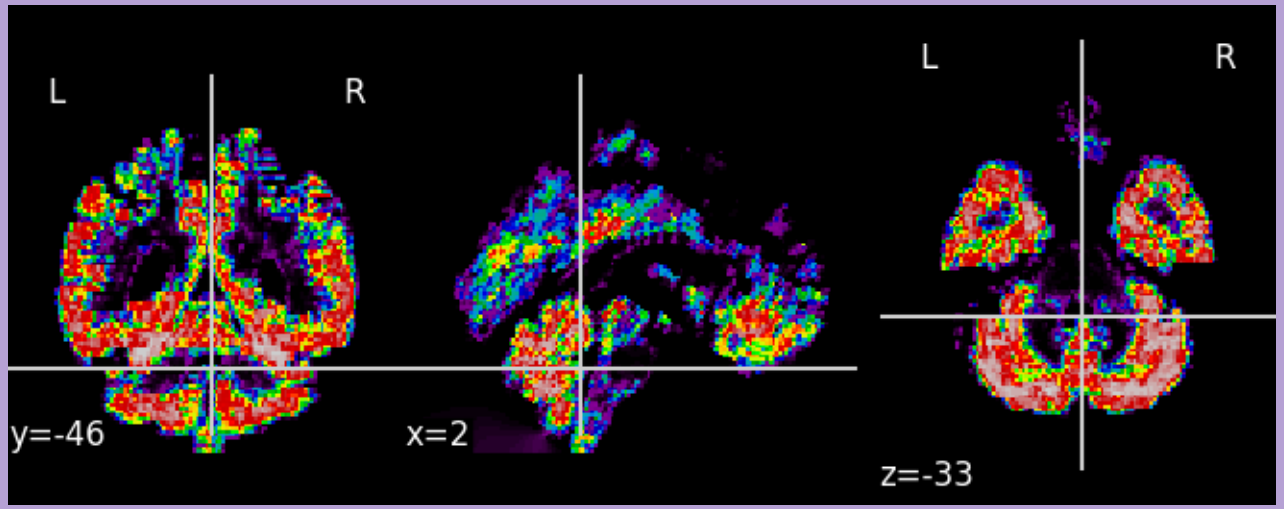


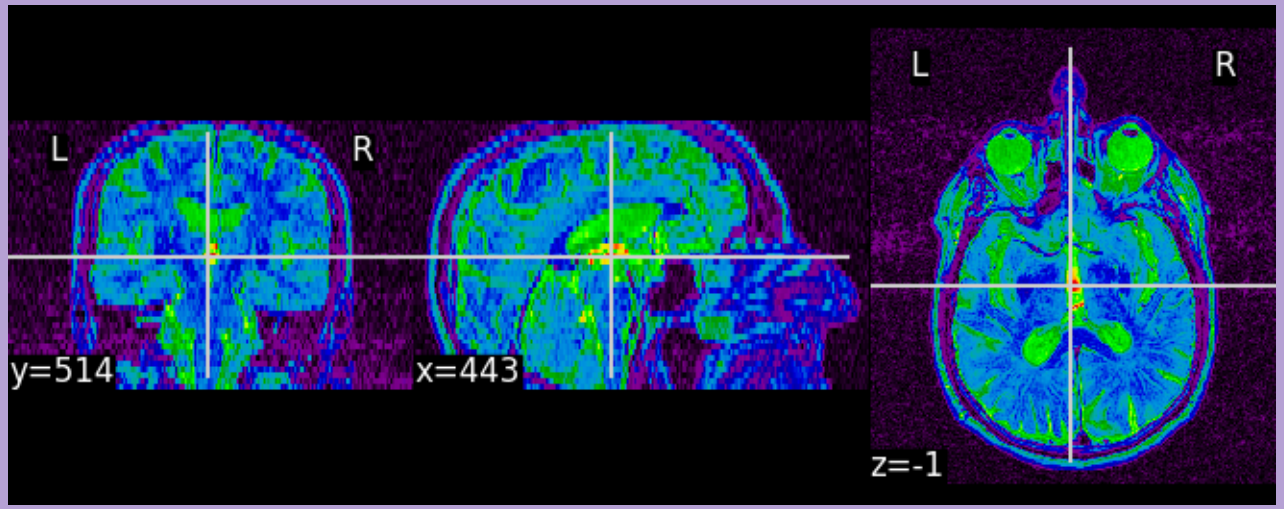
AD



MCI


Input Gene
Input MRI
Filtering Based on Chromosome Numbers
Segmentation
Filtering Based on Positions
Crop on [28:94] at z-axis
Filtering Based on SNPS
Resize to [121,145, 10]
GenoTyping
Selection
MRI Extraction using DL Model
Concatenation
Classfication





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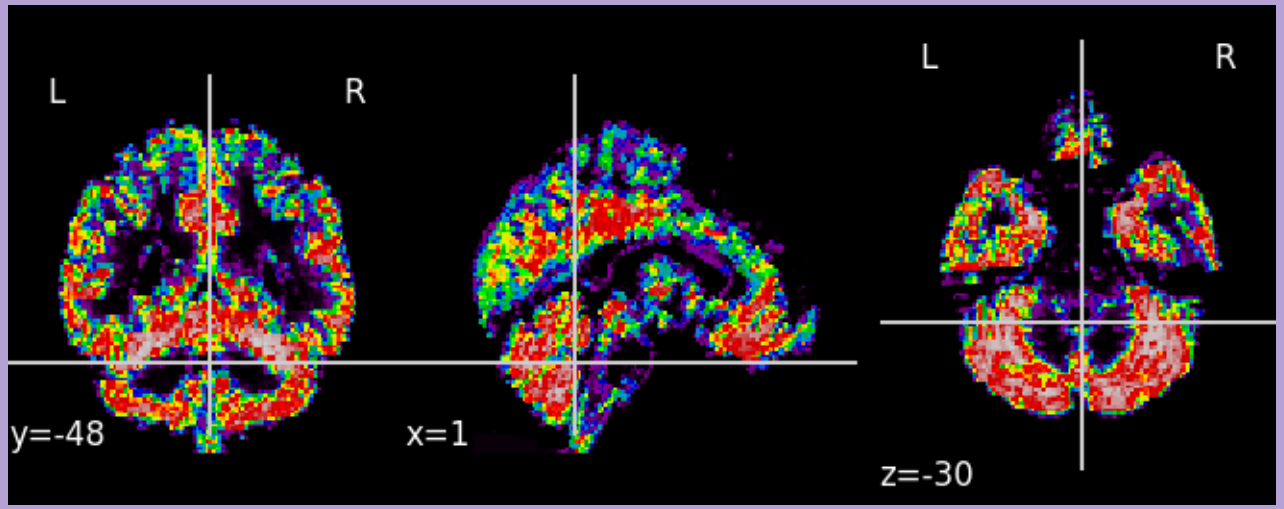
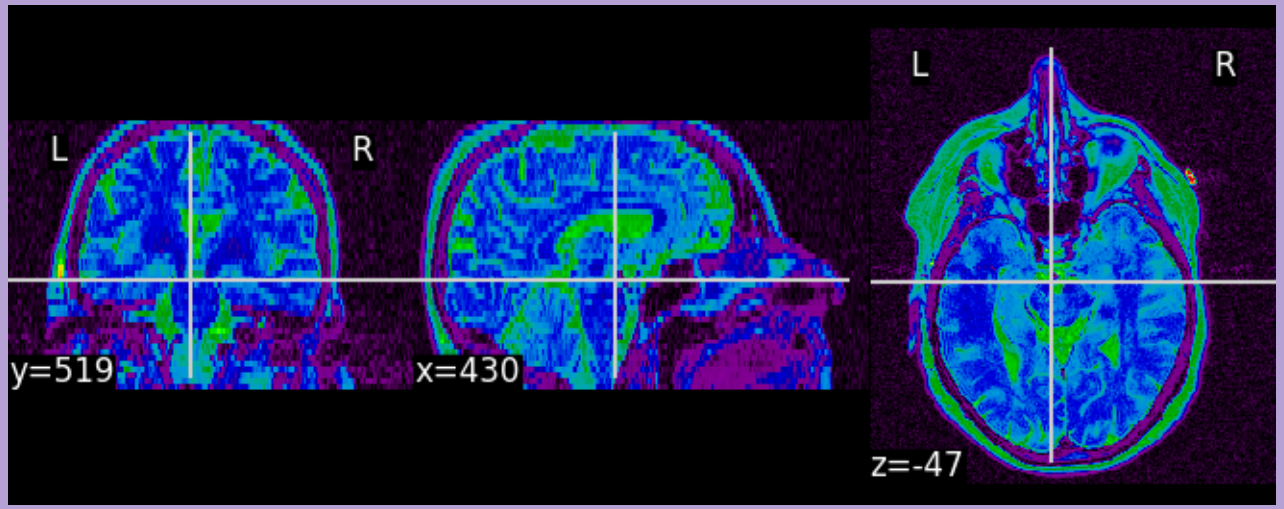
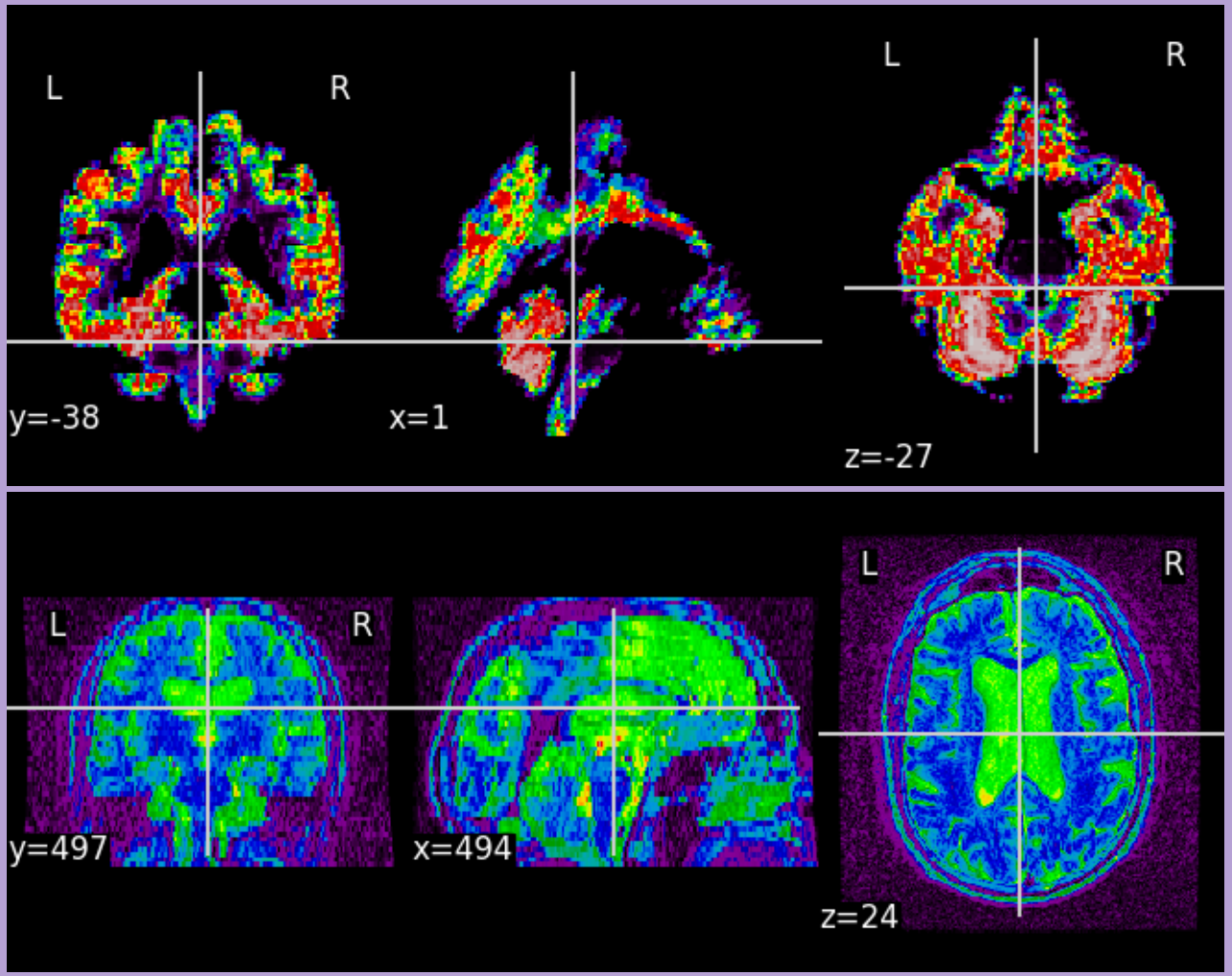




MCI

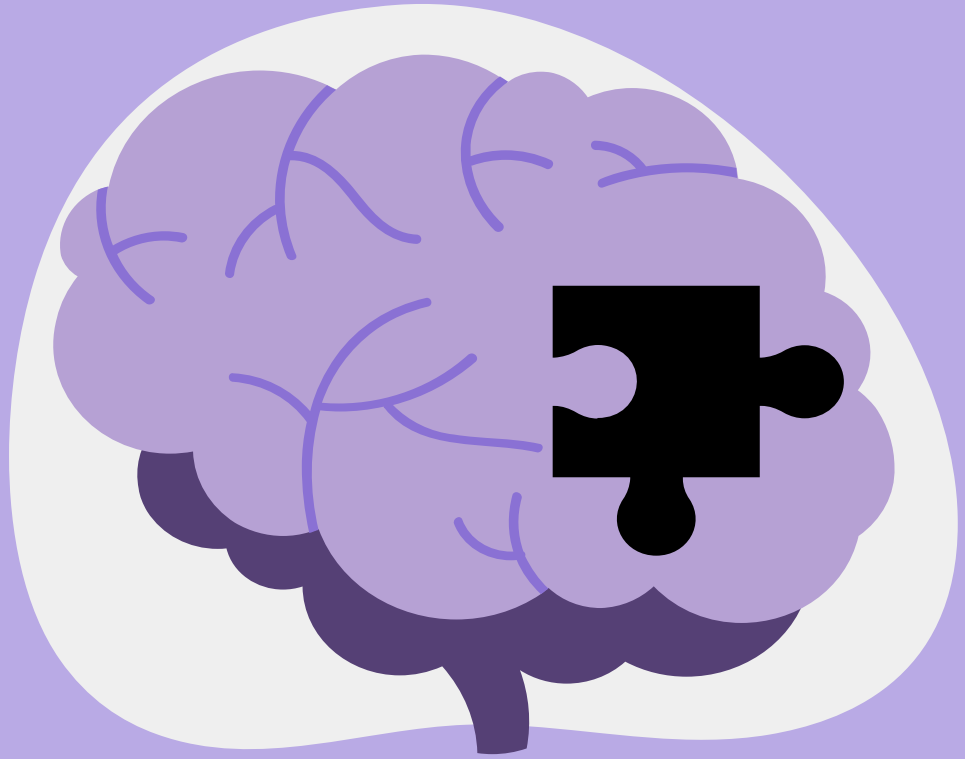


AD

Model	Accuracy		AUC		Loss	
	Train	Test	Train	Test	Train	Test
CNN 1	0.9661	0.9298	0.9938	0.9810	0.1083	0.2655
CNN Reduced	0.9511	0.9298	0.9912	0.9834	0.1400	0.2014
CNN with Attention	**0.9984**	**0.9561**	**1.0000**	**0.9897**	**0.0101**	**0.1348**

ZCARE Implementation, Used Technologies and Techniques

07. Conclusions & Future Work



Conclusion

1. Use multimodal data SNPs and MRIs

2. binary classification CNN achieved an accuracy of 89.47% and 91.55% for NC vs. AD and MCI vs. AD, respectively. Finally, for multimodality, ZCARE achieved an accuracy of 79.17 %. Which is high compared to other studies

3. Gives more time for the family and loved ones to understand the disease and plan for their future.

Future work

1. Increase SNPs samples
2. Insert personalized medicine with our study.
3. In addition to MRIs and SNPs we intend to use clinical data to improve accuracy
4. Suggesting suitable medicine for each person depending on personalized medicine.
5. Follow the stages of disease development.
6. Add an expert user to manage data and model.
7. Apply Time Series Analysis to understanding the progression of AD for the Patient

08. OUR Team

Z CARE

- Yasmeen Saad
- Mohamed Ashraf
- Shrouk Nasser
- Sameul Adel
- Mohamed Yasser

THANKS!