Software Requirement Specification Document for EasyPark: Parkinson's Disease Detection

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Table 1: Document version history

Version	Date	Reason for Change
1.0	21-Dec-2022	SRS First version's specifications are defined.

GitHub: https://github.com/sajasaadoun/EasyPark

Contents

Abstract

Parkinson's disease is a degenerative neurological disease that affects the nervous system and nerve-controlled areas of the body. It has now become such a severe worry that it affects the majority of elderly individuals. In other words, people who have it have insufficient dopamine in their brains as a result of the death of some of the nerve cells that create it. The condition can be diagnosed in three ways in this project: (1) by drawing a spiral wave or a regular wave that will be identified using hand-drawn images, (2) by recording a voice record, and (3) by using face images to execute a specific facial emotion.The handwriting sketch and voice recording databases were discovered in academic articles, while the face photos dataset will be produced by photographing people with and without the condition. All of these datasets will be combined into a single file, and multiple machine-learning approaches will be used to identify whether or not these individuals have the condition. Following a positive result, the patient's severity level will be determined by answering the questionnaire and applying machine learning algorithms to the data. The questionnaire is included in order to obtain more accurate results, and the doctor can alter its questions. Patients can also contact doctors to learn more about the treatment.

1 Introduction

1.1 Purpose of this document

Software Requirements Specification is a document that outlines what the project will accomplish and how it should perform. It also outlines the functionality required by the product to meet the needs of all stakeholders. In this case, it is created for patients and doctors to help them detect Parkinson's disease easier and with the least effort. In this document, the implementation will be discussed including methods and algorithms.

1.2 Scope of this document

This document's purpose is to make the system's fundamentals clear so that it can be understood. It includes the fundamental class diagram for the application, design constraints, data design, and functional and non-functional needs. The objectives of the mobile application and potential user characteristics are covered in this document, which also compares systems to EasyPark and illustrates the overview, scope, and context of the EasyPark system design. Finally, a timeline for the application is provided, along with an analysis of the operational situation.

1.3 Business Context

Parkinson's disease is one of the most challenging diseases to deal with. To begin, patients who want to take the test to determine whether they have Parkinson's Disease will save a lot of time, they can easily know whether they have the disease or not, detect its severity level, and contact doctors. Second, there are doctors who would like to use this application in the detection process, like adding questions to the questionnaire and contacting patients. The application will provide both tests and a contact system with doctors to assist them in curing the disease.

2 Similar Systems

2.1 Academic

- **R. Arefi Shirvan and E. Tahami** [1] A central nervous system is Parkinson's disease. 90% of Parkinson's disease patients reportedly experience speech and vocal issues. Typically, this illness impairs the vocal folds, giving the patient's speech an unnatural voice. KNN classification method was used to achieve data classification. Prior to feature extraction, recorded signals underwent digital normalization. The K-nearest neighbor (KNN) algorithm in pattern recognition is a technique for categorizing objects based on nearby training examples in the feature space. A fundamentally easy method for pattern recognition is the KNN. This approach consists of two steps: a) identifying K close neighbors, and b) using these close neighbors to identify the class type. The data set includes 192 voice signal recordings from 32 male and female subjects. Each subject has had 6 voice signal recordings. 23 subjects suffer from Parkinson's disease, and the rest are healthy people. Subjects were about 46–85 years old. The findings of this study demonstrate that Parkinson's disease has a significant impact on human voice. A classification accuracy of 98.2% or more was achieved when at least nine optimized characteristics were present. While this paper only uses machine learning classifiers, deep learning could improve accuracy.

- **Ferdib-Al-Islam and Laboni Akter**[2] One of the most severe neurodegenerative issues affecting the essential nervous system of humans is Parkinson's disease. In order to prevent the worst stages of the disease, it is essential to detect Parkinson's disease in its early stages. This study primarily focuses on using hand-drawn spirals and waves to identify Parkinson's disease. It has been suggested to use machine learning approaches to identify the disease. Decision Tree, Gradient Boosting, K-Nearest Neighbor, and Random Forest were the four most often used machine learning algorithms. The Gradient Boosting and the K-Nearest Neighbor performed more accurately, scoring 86.67% and 89.33%, respectively. The images for the spiral and wave drawings are included in the dataset from Zham et al that was used in this study, the dataset contains 102 images for the spiral and 102 images for the waves and is divided into training and testing sets. There were no deep-learning methods used in this paper. Therefore, EasyPark's method detects drawings using a capsule neural network, which is more accurate at detecting objects.

- **Shunan Zhao et al.**[3] Parkinson's disease (PD) is a neurological disorder that most commonly affects people in their advanced years. Akinesia (inability to initiate movement), tremors, rigidity, and postural imbalance are some of its hallmark symptoms. It is, after Alzheimer's disease, the most prevalent neurological condition. In this paper, the categorization of PD speech and the classification of emotional speech in PD patients are both examined. According to the study's findings, SLPs successfully distinguished PD (or its absence) from a patient's voice alone between 70.7 and 73.7 percent of the time, which is not statistically different from the best-automated methods (73.3% on average). Participants recorded short speaking statements with different emotional prosody, They were categorized using 209 distinct auditory variables utilizing three techniques (nave Bayes, random forests, and support vector machines).

2.2 Business Applications

- **PARK:** [4] Park is a website that requires people to record a video of themselves saying multiple sentences and performing a cretin movement in order to complete a disease study, as shown in the figure [1] that depicts the user interface of the PARK website.

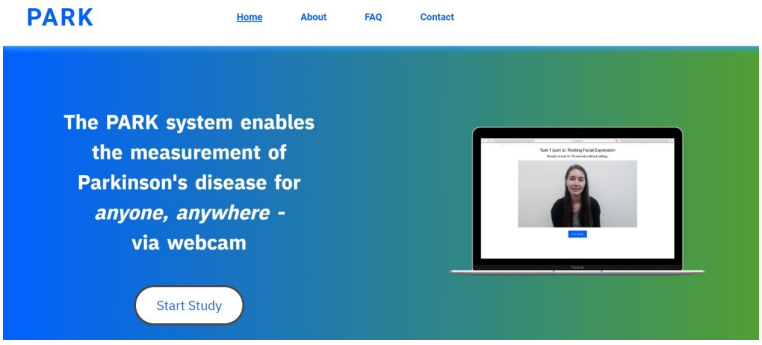


Figure 1: Park Website

- **iPrognosis:** [5] A mobile application called iPrognosis aims to collect data that might be connected to early signs of Parkinson's disease. When individuals hold their devices steadily while talking on the phone, the app can detect steadiness. It can also measure how people type on the app's keyboard.

- **Patana AI:** [6] Patana AI employs artificial intelligence (AI) and machine learning to assist in the earlier detection of Parkinson's disease. In order to evaluate if someone is most likely displaying symptoms of Parkinson's Disease, Patana AI examines their posture, movement, and presence of tremors as shown in figure[2].

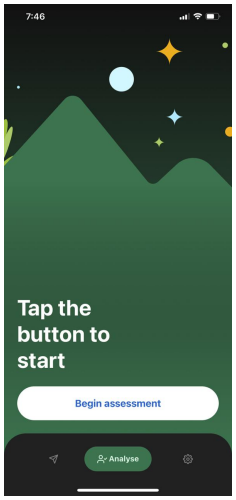


Figure 2: Patana AI Mobile Application

3 System Description

3.1 Problem Statement

This particular disease is very rare which results in detecting and curing it very hard. Aging up makes the person's body weaker and weaker which makes it much easier to get all kinds of diseases, one of which is Parkinson's. It produces unintentional or uncontrollable movements such as shaking, and stiffness, including balance and coordination difficulties. Symptoms normally appear gradually and progress over time. People may have trouble walking and talking as the condition advances [7]. One of the main reasons why it takes time to diagnose is how the diagnosis happens, the traditional ways include checking the patient family's medical history, making tests, and waiting for results, or the disease is so spread out it can be seen so easily which makes curing it very difficult.

3.2 System Overview

Figure 15 shows how the sequence will be in this system. As mentioned before, there will be three ways to detect besides the added Questionnaire which are (1) by hand-drawn sketches, (2) by voice records, and (3) by face images. First, the user will choose how he/she would like to detect, then the data enters the system to go through multiple operations. Assuming that the user draws a sketch of a spiral or a regular wave, the image is taken to apply some data pre-processing operation. When a user decides to capture a voice recording, the data is used to perform data sampling, which involves three operations: over, under, and random sampling. The data is then subjected to feature scaling and normalization. Finally, various machine learning algorithms and deep learning are used, with the one with the highest accuracy being the best. If the user selects the diagnosis by sketching a spiral or a normal wave, the image is collected and data preprocessing is done to adjust the image. Following feature extraction, the process concludes with classifiers being applied to the data and the highest accuracy being checked. As for face detection the user uploads images that show his/her face, the system applies data preprocessing operations, determines the regions of interest on the face then apply some feature extraction operation and classifiers. If the patient has Parkinsonism, the severity [8] level will be determined, and the results will be displayed on the mobile application and the patient could contact the doctor easily for help.

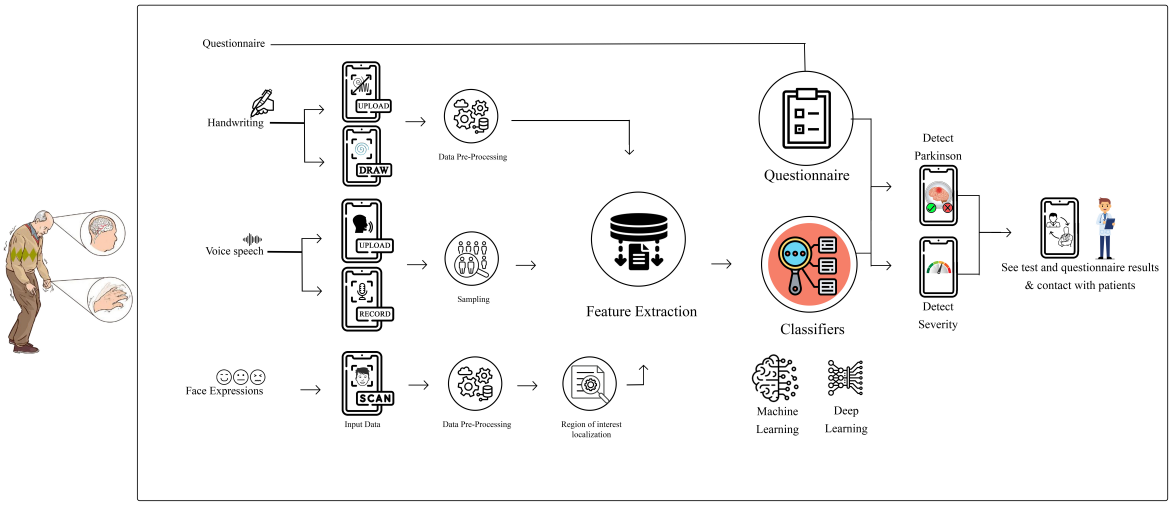


Figure 3: system overview

3.3 System Scope

EasyPark is a program that overcomes a workload of examinations and testing to diagnose a person. The system contains multiple datasets that were in various research papers, but as for the face images dataset it had to be collected due to not finding any. It offers a very easy way to detect it, one of which is by sketching a spiral wave or a normal one and then submitting it, it can be drawn using the phone itself or on paper and then uploading it. Also recording a voice record saying anything can also detect it. Last but not least by simply taking a picture of the face while being disgusted, happy, and surprised. In the end, all these images and records are taken to apply some machine learning method that detects whether a person has Parkinson's or not. After detecting the disease, the patient will be able to determine the severity level of the disease, contact doctors to know how to cure it and some physical exercise will be available too. Another thing that the system provides is a questionnaire that the patient answers and the doctors check to get more accurate results.

3.4 System Context

The system will receive four sorts of input: a facial picture or video, voice recordings, spiral or wave sketches, and questionnaire responses. The user can select any of these inputs to determine whether or not he or she has Parkinson's disease. When the results are positive, the severity level is also identified. The patient can contact doctors to check on them, contact them, and provide them with further information on how to cure it. Doctors contact patients and review their test results. The application has a third side, which is the admin side, which has control over the application.

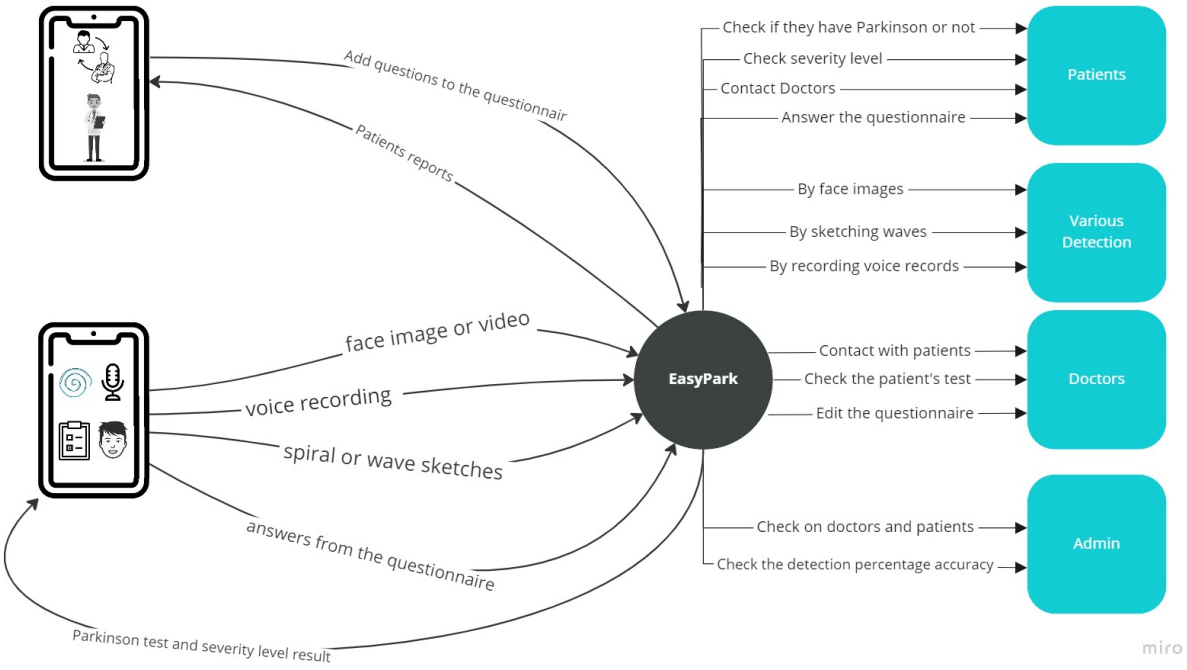


Figure 4: system context

3.5 Objectives

Since the proposed system is intended to replace some tasks performed by doctors and to do them more quickly and effectively.

- The system's purpose is to detect Parkinson's disease using deep learning instead of the traditional way.
- Detecting the disease early makes it much easier to cure it and less painful.
- Sketch, voice records and face images is the way of detecting which is one of the easiest things anyone can do it.
- Offering an easy system for anyone, anywhere with an internet connection to detect with simple steps.
- This system will eliminate the time and effort spent in detecting the disease.
- After having a positive result in the test , the severity of the disease will be detected
- The system will have a questionnaire that will be answered by patients to get more accurate results
- Patients and doctors can contact each other to cure the disease

3.6 User Characteristics

The users that are expected to use this application are both doctors who have knowledge of parkinson disease and patients that doubt they have parkinson or already have it and want to know the severity of it .

- Users must have a basic understanding of how to use a mobile phone.
- The system should be accessible to users of all ages, so the user can be young or old.
- User can add their face image , record or their sketch image to test whether they have parkinson or not
- The system will offer a relation between the doctor and the patient to check up the patient's medical health
- Doctors must have enough knowledge of Parkinson disease to take good care of the patients

4 Functional Requirements

4.1 System Functions

- **ID:01** The patient/doctor/admin shall be able to sign Up to create a new account.
- **ID:02** The patient/doctor/admin shall be able to login into their account.
- **ID:03** The patient shall be able to take/ upload photos of the face in different positions.
- **ID:04** The patient shall be able to upload or record a voice message.
- **ID:05** The patient shall be able to draw the given image on the screen of mobile.
- **ID:06** The patient shall be able to upload a picture of the images required for the test.
- **ID:07** The patient shall be able to access all the previous tests taken.
- **ID:08** The patient shall be able to search for a specific doctor.
- **ID:09** The patient shall be able to retake any test at any time.
- **ID:10** The patient shall be able to fill out all the forms required.
- **ID:11** The patient shall be able to see the results of the tests done.
- **ID:12** The patient shall be able to contact his/her own doctor.
- **ID:13** The patient/doctor/admin shall be able to edit their account.
- **ID:14** The patient/doctor/admin shall be able to log out of their account.
- **ID:15** The patient/doctor/admin shall be able to delete their account.
- **ID:16** The doctor shall be able to view the patient's test.
- **ID:17** The doctor shall be able to contact the patients.
- **ID:18** The doctor shall be able to view the patient's medical history.
- **ID:19** The doctor shall be able to create a questionnaire for the patients.
- **ID:20** The doctor shall be able to give the patient physical exercises.
- **ID:21** The doctor shall be able to edit or delete the questionnaire provided to the patients.
- **ID:22** The doctor shall be able to give the patients some form to fill out.
- **ID:23** The doctor shall be able to give comments to the patients about what to do based on the severity of the tests done.
- **ID:24** The admin shall be able to view all the available doctors.

- **ID:25** The admin shall be able to view all the available patients.
- **ID:26** The admin shall be able to delete doctors or patients.
- **ID:27** The system shall be able to detect the severity of Parkinson's Disease.
- **ID:28** The system shall be able to detect whether the patient has Parkinson's Disease or not based on the test and the doctor's review.
- **ID:29** The system shall be able to help the doctor to view all the details about its patients.
- **ID:30** The system shall be able to provide the patients with different types of tests.

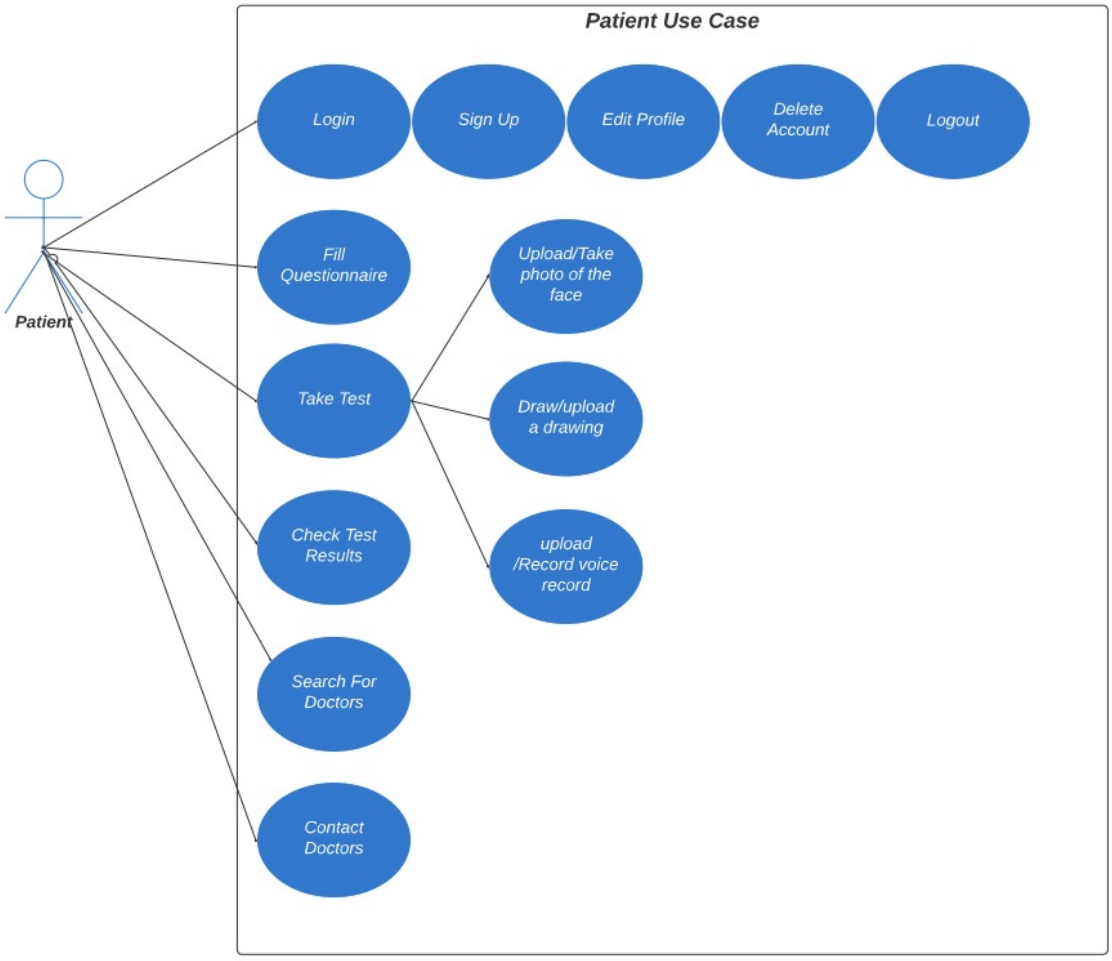


Figure 5: Patient Use Case

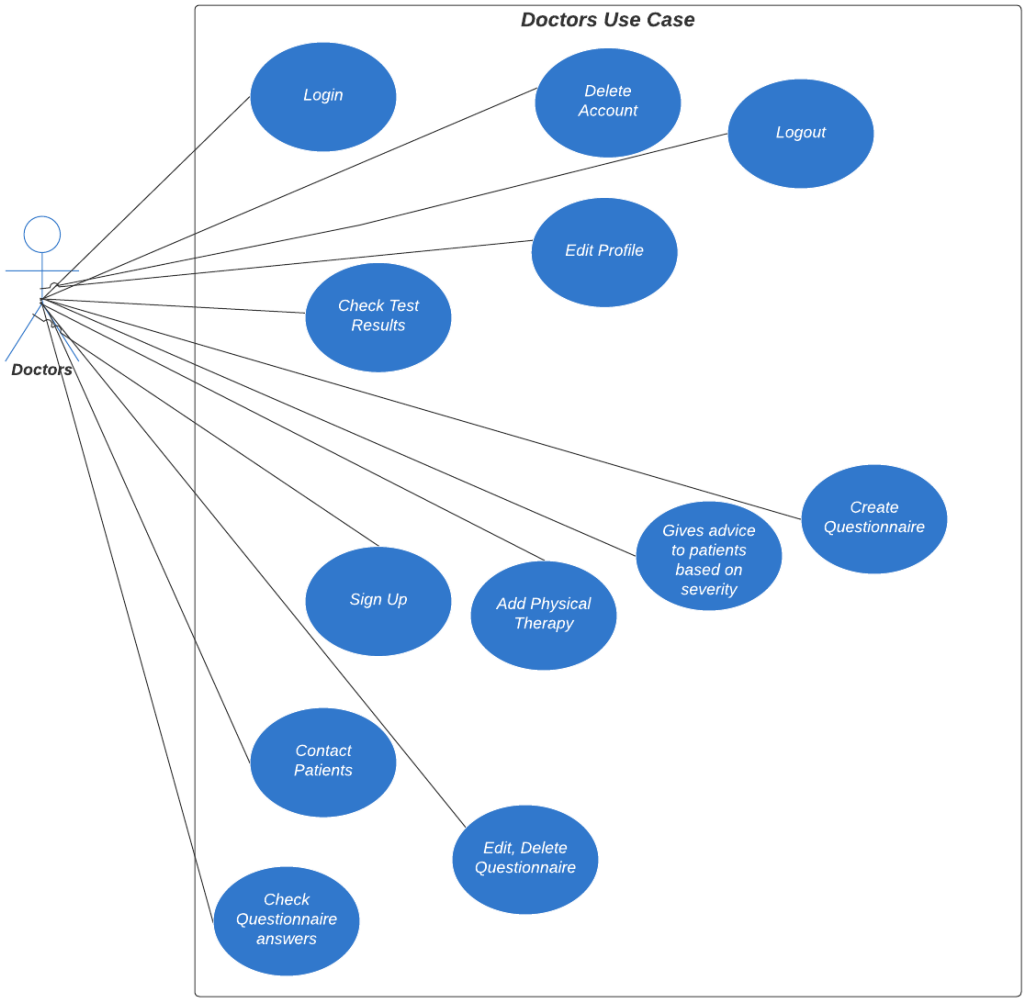


Figure 6: Doctors Use Case

Figure 7: Admin Use Case

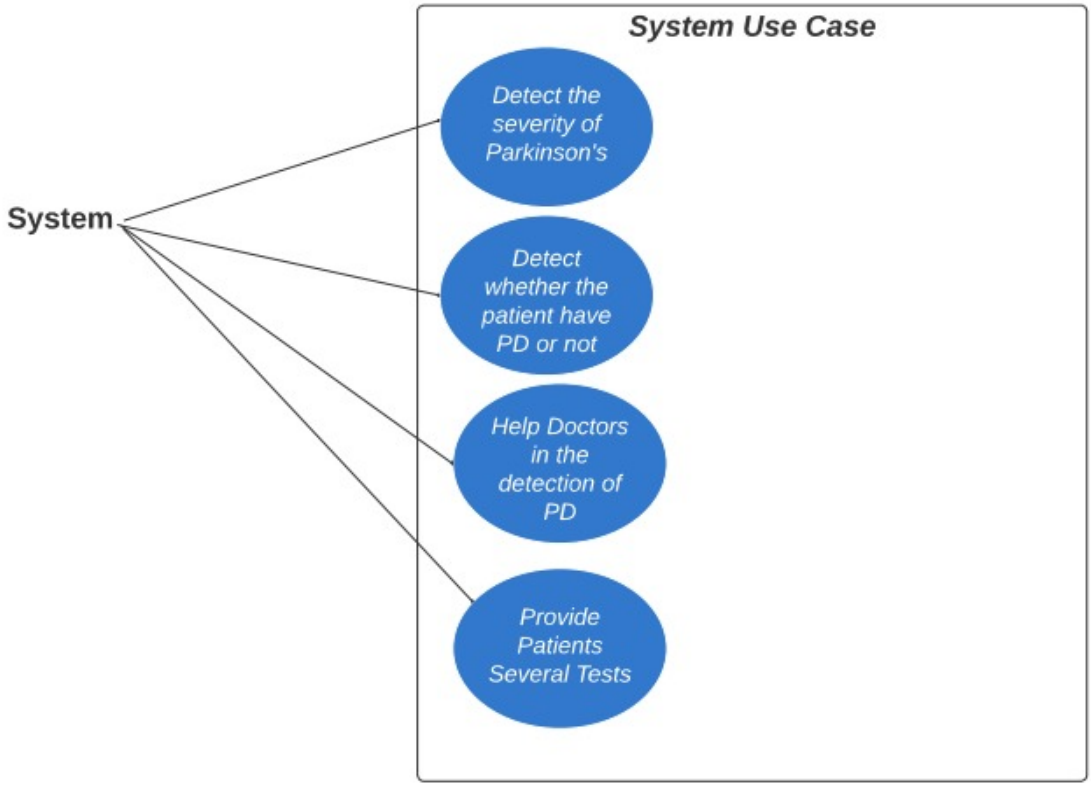


Figure 8: System Use Case

4.2 Detailed Functional Specification

Name	Recording voice
Code	FR04
Priority	High
Critical	-
Description	After the patient installs the application he uses the phone's microphone to record his voice.
Input	Recording the patient voice.
Output	Print message the recording is accepted or not and Parkinsonism severity
Pre-Condition	Must have a smartphone and install the application.
Post-Condition	-
Dependency	-
Risk	Patient record external noise beside his voice.

Table 2: Recording Voice

Name	Search for Doctors
Code	FR08
Priority	medium
Critical	The patient must view doctors first to choose from them.
Description	Before or after the patient signing he will able to view all doctors.
Input	Enter the name of the doctor he wants to search for.
Output	View the searched doctors.
Pre-Condition	Doctor's name is required.
Post-Condition	Redirect the information of the searched doctor.
Dependency	-
Risk	Doctor's name does not exist.

Table 3: Search For Doctors

Name	Upload an image.
Code	FR06
Priority	High
Critical	Provide the application with data to process and classify.
Description	Responsible for uploading an image to the application to detect Parkinson's.
Input	Image of the patient.
Output	The image is accepted or not.
Pre-Condition	Must have a smartphone and install the application.
Post-Condition	-
Dependency	depends on having an already saved image to upload.
Risk	No image uploaded.

Table 4: Upload An Image

Name	Add Questionnaire.
Code	FR19
Priority	medium
Critical	Need to add the question to Questionnaire.
Description	Before or after the patient signing he will able to view all doctors.
Input	A Question.
Output	Added question.
Pre-Condition	Press add question button.
Post-Condition	Doctors get asked the question.
Dependency	-
Risk	-

Table 5: Add Questions

Name	Draw on screen
Code	FR05
Priority	High
Critical	Need to take input from the patient.
Description	Used to help in the determination of patient state.
Input	Circular spirals.
Output	Message about whether the input is accepted or not.
Pre-Condition	Must have a smartphone and install the application.
Post-Condition	-
Dependency	-
Risk	Noncircular spirals.

Table 6: Draw on screen

5 Design Constraints

5.1 Standards Compliance

The easy park application for Parkinson's disease detection only runs on Android or IOS operating systems, the app will be downloaded through the App store or Play Store. So, the mobile should be a smartphone to connect to the internet.

5.2 Hardware Limitations

The user must have a smartphone connected to the internet, with a working camera to be able to take pictures of themselves to upload them to the system. Additionally, a mobile device with a working microphone and speakers so can record the patient's voice.

6 Non-functional Requirements

6.1 Security

• All users passwords will be hashed or encrypted.
• Each user type must have access to specific vital data records.
• The software must ensure the integrity of the stakeholders account information.
• The server must not return a restricted mobile page to a user who is not authorized to access it.

6.2 Accessibility

• All designs shall be fully responsive.
• all mobile pages shall be keyboard friendly & easy to use.

6.3 Usability

• The system should be developed in a user-friendly.
• The system should be offered in two languages English & Arabic.
• The system should be fully automated as much as possible for patients and doctors.
• The system should be simple and easy to understand for patients.
• The system should be easy for patients to get in touch with their doctors.

6.4 Maintainability

• The system should be simple to update and expand.
• The system should be simple to maintain the amount of code changes.

6.5 Portability

• The system will be made available on play store.
• It is accessible from any android connected device.

6.6 Availability

• Users can access the system 99 percent of the time without failure during working days.
• Users can depend on the system to be up as the application will be running on API.

7 Data Design

The dataset that has been used in this project was collected from multiple research papers. There are 2 types of datasets numerical and images due to having multiple detection ways which are by voice, sketches, and face images. As shown in figure [7] and figure [7], the detection by sketches includes hand-drawn spiral and wave shapes from Parkinson's patients along with healthy individuals. The spiral-Wave analysis detected irregular patterns and distortions in handwriting and classified images as Parkinson's or healthy. This dataset's photo examples were divided into two groups: training and testing.

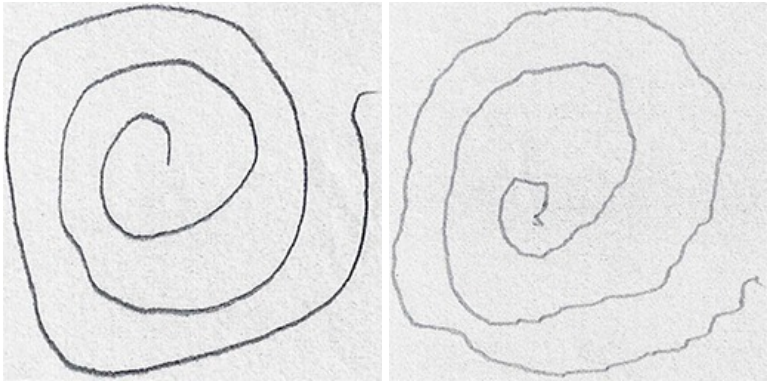


Figure 9: Healthy And Parkinson Spiral

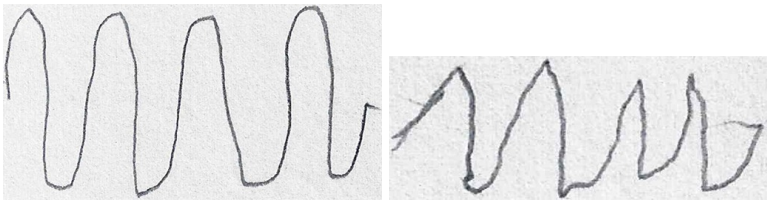


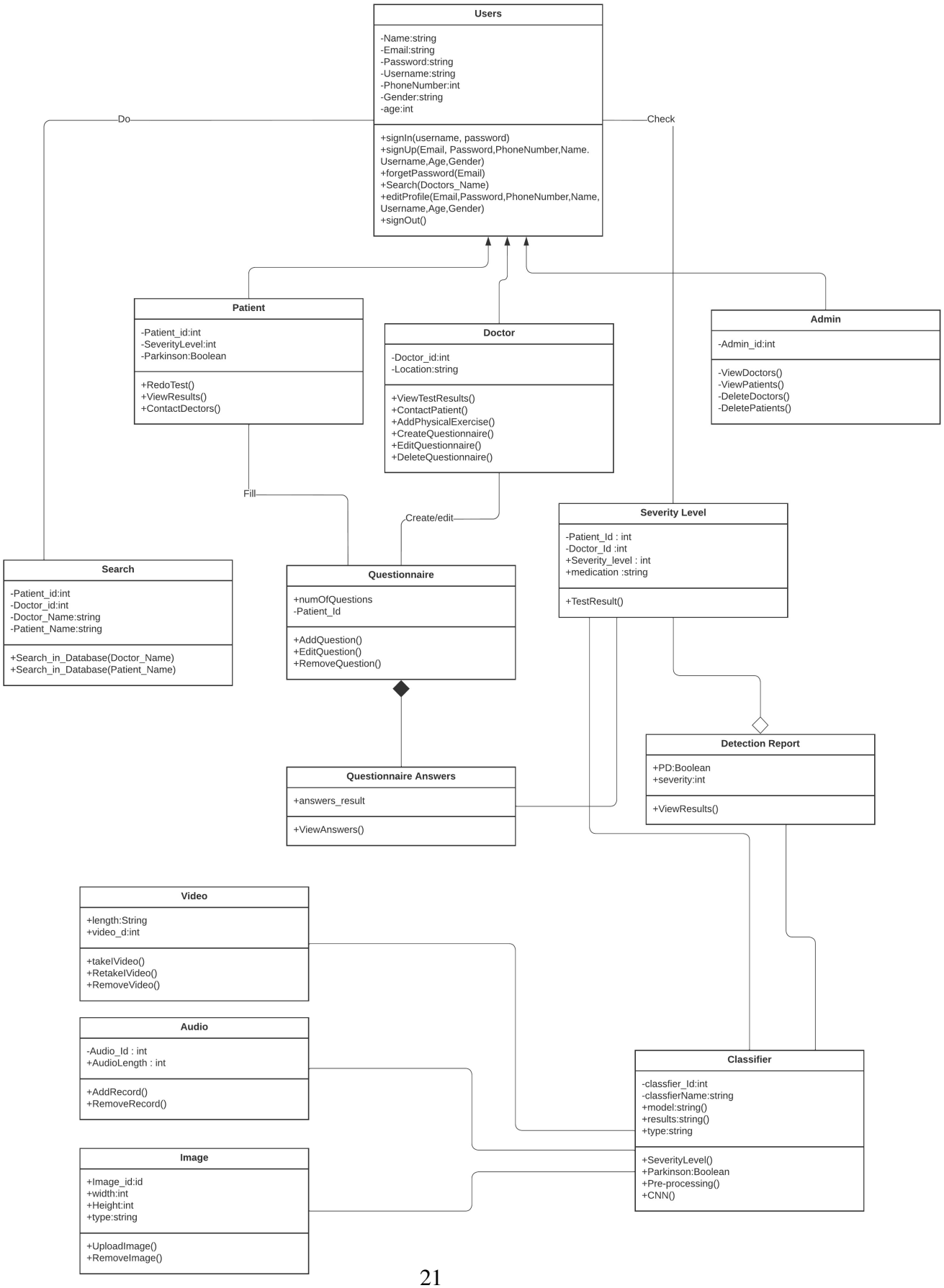
Figure 10: Healthy And Parkinson Wave

The second approach is to detect Parkinson's disease using voice recordings, which include recordings from both Parkinson's patients and healthy people as shown in figure [7]. Voice recordings are used to diagnose vocal problems [9]. This data set's inputs are -Fo (Hz): Mean fundamental frequency. -Fhi (Hz): the highest fundamental frequency. -Flo (HZ): fundamental frequency minimum. -Jitter (%): The average absolute difference, Shimmer, and -HNR: the harmonics to noise ratio. As for face detection, the dataset will be collected by taking pictures of people who have Parkinson's and people who don't.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
name	MDVP:Fo(I	MDVP:Fhi(	MDVP:Flo(	MDVP:Jitt	MDVP:Jitt	MDVP:RAF	MDVP:PPC	Jitter:DDP	MDVP:Shir	MDVP:Shir	Shimmer:A	Shimmer:A	MDVP:APC	Shimmer:D	NHR	HNR	status	RPDE	DFA	spread1	spread2	D2
phon_R01	119.992	157.302	74.997	0.00784	0.00007	0.0037	0.00554	0.01109	0.04374	0.426	0.02182	0.0313	0.02971	0.06545	0.02211	21.033	1	0.414783	0.815285	-4.81303	0.266482	2.301442
phon_R01	122.4	148.65	113.819	0.00968	0.00008	0.00465	0.00696	0.01394	0.06134	0.626	0.03134	0.04518	0.04368	0.09403	0.01929	19.085	1	0.458359	0.819521	-4.07519	0.33559	2.486855
phon_R01	116.682	131.111	111.555	0.0105	0.00009	0.00544	0.00781	0.01633	0.05233	0.482	0.02757	0.03858	0.0359	0.0827	0.01309	20.651	1	0.429895	0.825288	-4.44318	0.311173	2.342259
phon_R01	116.676	137.871	111.366	0.00997	0.00009	0.00502	0.00698	0.01505	0.05492	0.517	0.02924	0.04005	0.03772	0.08771	0.01353	20.644	1	0.434969	0.819235	-4.1175	0.334147	2.405554
phon_R01	116.014	141.781	110.655	0.01284	0.00011	0.00655	0.00908	0.01966	0.06425	0.584	0.0349	0.04825	0.04465	0.1047	0.01767	19.649	1	0.417356	0.823484	-3.74779	0.234513	2.33218
phon_R01	120.552	131.162	113.787	0.00968	0.00008	0.00463	0.0075	0.01388	0.04701	0.456	0.02328	0.03526	0.03243	0.06985	0.01222	21.378	1	0.415564	0.825069	-4.24287	0.299111	2.18756
phon_R01	120.267	137.244	114.82	0.00333	0.00003	0.00155	0.00202	0.00466	0.01608	0.14	0.00779	0.00937	0.01351	0.02337	0.00607	24.886	1	0.59604	0.764112	-5.63432	0.257682	1.854785
phon_R01	107.332	113.84	104.315	0.0029	0.00003	0.00144	0.00182	0.00431	0.01567	0.134	0.00829	0.00946	0.01256	0.02487	0.00344	26.892	1	0.63742	0.763262	-6.1676	0.183721	2.064693
phon_R01	95.73	132.068	91.754	0.00551	0.00006	0.00293	0.00332	0.0088	0.02093	0.191	0.01073	0.01277	0.01717	0.03218	0.0107	21.812	1	0.615551	0.773587	-5.49868	0.327769	2.322511
phon_R01	95.056	120.103	91.226	0.00532	0.00006	0.00268	0.00332	0.00803	0.02838	0.255	0.01441	0.01725	0.02444	0.04324	0.01022	21.862	1	0.547037	0.798463	-5.01188	0.325996	2.432792
phon_R01	88.333	112.24	84.072	0.00505	0.00006	0.00254	0.0033	0.00763	0.02143	0.197	0.01079	0.01342	0.01892	0.03237	0.01166	21.118	1	0.611137	0.776156	-5.24977	0.391002	2.407313
phon_R01	91.904	115.871	86.292	0.0054	0.00006	0.00281	0.00336	0.00844	0.02752	0.249	0.01424	0.01641	0.02214	0.04272	0.01141	21.414	1	0.58339	0.79252	-4.96023	0.363566	2.642476
phon_R01	136.926	159.866	131.276	0.00293	0.00002	0.00118	0.00153	0.00355	0.01259	0.112	0.00656	0.00717	0.0114	0.01968	0.00581	25.703	1	0.4606	0.646846	-6.54715	0.152813	2.041277
phon_R01	139.173	179.139	76.556	0.0039	0.00003	0.00165	0.00208	0.00496	0.01642	0.154	0.00728	0.00932	0.01797	0.02184	0.01041	24.889	1	0.430166	0.665833	-5.66022	0.254989	2.519422
phon_R01	152.845	163.305	75.836	0.00294	0.00002	0.00121	0.00149	0.00364	0.01828	0.158	0.01064	0.00972	0.01246	0.03191	0.00609	24.922	1	0.474791	0.654027	-6.1051	0.203653	2.125618
phon_R01	142.167	217.455	83.159	0.00369	0.00003	0.00157	0.00203	0.00471	0.01503	0.126	0.00772	0.00888	0.01359	0.02316	0.00839	25.175	1	0.565924	0.658245	-5.34012	0.210185	2.205546
phon_R01	144.188	349.259	82.764	0.00544	0.00004	0.00211	0.00292	0.00632	0.02047	0.192	0.00969	0.012	0.02074	0.02908	0.01859	22.333	1	0.56738	0.644692	-5.44004	0.239764	2.264501
phon_R01	168.778	232.181	75.603	0.00718	0.00004	0.00284	0.00387	0.00853	0.03327	0.348	0.01441	0.01893	0.0343	0.04322	0.02919	20.376	1	0.631099	0.605417	-2.93107	0.434326	3.007463
phon_R01	153.046	175.829	68.623	0.00742	0.00005	0.00364	0.00432	0.01092	0.05517	0.542	0.02471	0.03572	0.05767	0.07413	0.0316	17.28	1	0.665318	0.719467	-3.94908	0.35787	3.10901
phon_R01	156.405	189.398	142.822	0.00768	0.00005	0.00372	0.00399	0.01116	0.03995	0.348	0.01721	0.02374	0.0431	0.05164	0.03365	17.153	1	0.649554	0.68608	-4.55447	0.340176	2.856676
phon_R01	153.848	165.738	65.782	0.0084	0.00005	0.00428	0.0045	0.01285	0.0381	0.328	0.01667	0.02383	0.04055	0.05	0.03871	17.536	1	0.660125	0.704087	-4.09544	0.262564	2.73971
phon_R01	153.88	172.86	78.128	0.0048	0.00003	0.00232	0.00267	0.00696	0.04137	0.37	0.02021	0.02591	0.04525	0.06062	0.01849	19.493	1	0.629017	0.698951	-5.18696	0.237622	2.557536
phon_R01	167.93	193.221	79.068	0.00442	0.00003	0.0022	0.00247	0.00661	0.04351	0.377	0.02228	0.0254	0.04246	0.06685	0.0128	22.468	1	0.61906	0.679834	-4.33096	0.262384	2.916777
phon_R01	173.917	192.735	86.18	0.00476	0.00003	0.00221	0.00258	0.00663	0.04192	0.364	0.02187	0.0247	0.03772	0.06562	0.0184	20.422	1	0.537264	0.686894	-5.24878	0.210279	2.547508
phon_R01	163.656	200.841	76.779	0.00742	0.00005	0.0038	0.0039	0.0114	0.01659	0.164	0.00738	0.00948	0.01497	0.02214	0.01778	23.831	1	0.397937	0.732479	-5.55745	0.22089	2.692176
phon_R01	104.4	206.002	77.968	0.00633	0.00006	0.00316	0.00375	0.00948	0.03767	0.381	0.01732	0.02245	0.0378	0.05197	0.02887	22.066	1	0.522746	0.737948	-5.57184	0.236853	2.846369
phon_R01	171.041	208.313	75.501	0.00455	0.00003	0.0025	0.00234	0.0075	0.01966	0.186	0.00889	0.01169	0.01872	0.02666	0.01095	25.908	1	0.418622	0.720916	-6.18359	0.226278	2.589702
phon_R01	146.845	208.701	81.737	0.00496	0.00003	0.0025	0.00275	0.00749	0.01919	0.198	0.00883	0.01144	0.01826	0.0265	0.01328	25.119	1	0.358773	0.726652	-6.27169	0.196102	2.314209

Figure 11: voice dataset

8 Preliminary Object-Oriented Domain Analysis


Users
-Name:string
-Email:string
-Password:string
-Username:string
-PhoneNumber:int
-Gender:string
-age:int
+signIn(username, password)
+signUp(Email, Password,PhoneNumber,Name.
Username,Age,Gender)
+forgetPassword(Email)
+Search(Doctors_Name)
+editProfile(Email,Password,PhoneNumber,Name,
Username,Age,Gender)
+signOut()
Do
Check
Patient
-Patient_id:int
-SeverityLevel:int
-Parkinson:Boolean
+RedoTest()
+ViewResults()
+ContactDectors()
Doctor
-Doctor_id:int
-Location:string
+ViewTestResults()
+ContactPatient()
+AddPhysicalExercise()
+CreateQuestionnaire()
+EditQuestionnaire()
+DeleteQuestionnaire()
Admin
-Admin_id:int
-ViewDoctors()
-ViewPatients()
-DeleteDoctors()
-DeletePatients()
Fill
Create/edit
Severity Level
-Patient_Id : int
-Doctor_Id :int
+Severity_level : int
+medication :string
+TestResult()
Search
-Patient_id:int
-Doctor_id:int
-Doctor_Name:string
-Patient_Name:string
+Search_in_Database(Doctor_Name)
+Search_in_Database(Patient_Name)
Questionnaire
+numOfQuestions
-Patient_Id
+AddQuestion()
+EditQuestion()
+RemoveQuestion()
Detection Report
+PD:Boolean
+severity:int
+ViewResults()
Questionnaire Answers
+answers_result
+ViewAnswers()
Video
+length:String
+video_d:int
+takeIVideo()
+RetakeIVideo()
+RemoveVideo()
Audio
-Audio_Id : int
+AudioLength : int
+AddRecord()
+RemoveRecord()
Image
+Image_id:id
+width:int
+Height:int
+type:string
+UploadImage()
+RemoveImage()
Classifier
-classfier_Id:int
-classfierName:string
+model:string()
+results:string()
+type:string
+SeverityLevel()
+Parkinson:Boolean
+Pre-processing()
+CNN()

9 Operational Scenarios

9.1 Patient Scenario

Initial Assumption : patients have the option of registering/signing in or remaining a guest, then finding multiple ways to find out whether they have Parkinson's or not and the severity level of the disease.
Normal flow of events : after detecting the disease, the patient will have the ability to contact doctors to learn more about the disease and know the ways to cure it. Solving a questionnaire will be part of the process and contacting doctors for medical devices
What can go wrong: the patient might enter a wrong sketch image or an unclear face image while uploading which may lead to not knowing how to detect the disease.

9.2 Doctor Scenario

Initial Assumption : the doctor will find multiple patients that have been diagnosed with Parkinson's disease using the application.
Normal flow of events : doctors can check up with patients to help them cure it also gain access to the system to add, edit, and delete any question in the questionnaire provided to patients.
What can go wrong: the doctor might enter a wrong questing or delete a question when editing the questionnaire or might contact a wrong patient

9.3 Admin Scenario

Initial Assumption : admin will log in by entering the username and password and then, find all application users and how active each user is.
Normal flow of events : the admin can follow up with doctors and patients, can delete unhelpful doctors, and check on the detection accuracy.
What can go wrong: the admin may enter the wrong username or password while signing in, which will lead to renting the data, or you may not enter them at all due to not having an account.

10 Project Plan

Task	Start Date	End Date	Duration (days
Deciding the idea and start working on	8/18/2022	9/18/2022	31
Information collection and researches	9/18/2022	10/15/2022	27
survey and propsal Preparation	9/20/2022	10/15/2022	25
The Implementation that has been done	10/1/2022	10/18/2022	17
Proposal Presentation with 10% Implementation	10/1/2022	10/23/2022	22
Build UI for the mobile application	10/31/2022	12/18/2022	48
Trying deep learning algorithms for handwriting method	10/31/2022	12/18/2022	48
Searching and build dataset for face approach	10/31/2022	12/18/2022	48
Reasearch to detect parkinson's disease from smart phone sensors	10/31/2022	12/18/2022	48
find dataset and imlement smart phone sensors to detect	10/31/2022	12/18/2022	48
Call Doctors and know how to overcome the disease	10/31/2022	12/18/2022	48
SRS Preparation	10/31/2022	12/18/2022	48
SRS Presentation with 35% Implementation	10/31/2022	12/1/2022	31
link deep/machine learning classifiers with mobile application	12/25/2022	2/1/2023	38
build a dataset for face expression approach	12/25/2022	2/1/2023	38
academic/ medical research to detect severity	12/25/2022	2/1/2023	38
Meeting doctors for more severity levels information	12/25/2022	2/1/2023	38
submitting forms for the face videos & pictures dataset	12/25/2022	2/1/2023	38
implementation for doctor side in the application	12/25/2022	2/1/2023	38
SDD Preparation	12/5/2022	2/1/2023	58
SDD Presentation with 65% Implementation	12/5/2022	2/1/2023	58
Technical Working Implementation	3/1/2023	4/20/2023	50
System Prototype submission with 80% Implementation	3/1/2023	4/20/2023	50
Test and Validate	4/20/2023	5/7/2023	17
Technical Evaluation with 90% Implementation	4/20/2023	5/7/2023	17
Final thesis 100%	5/7/2023	6/14/2023	38

Figure 13: Time plan for EasyPark

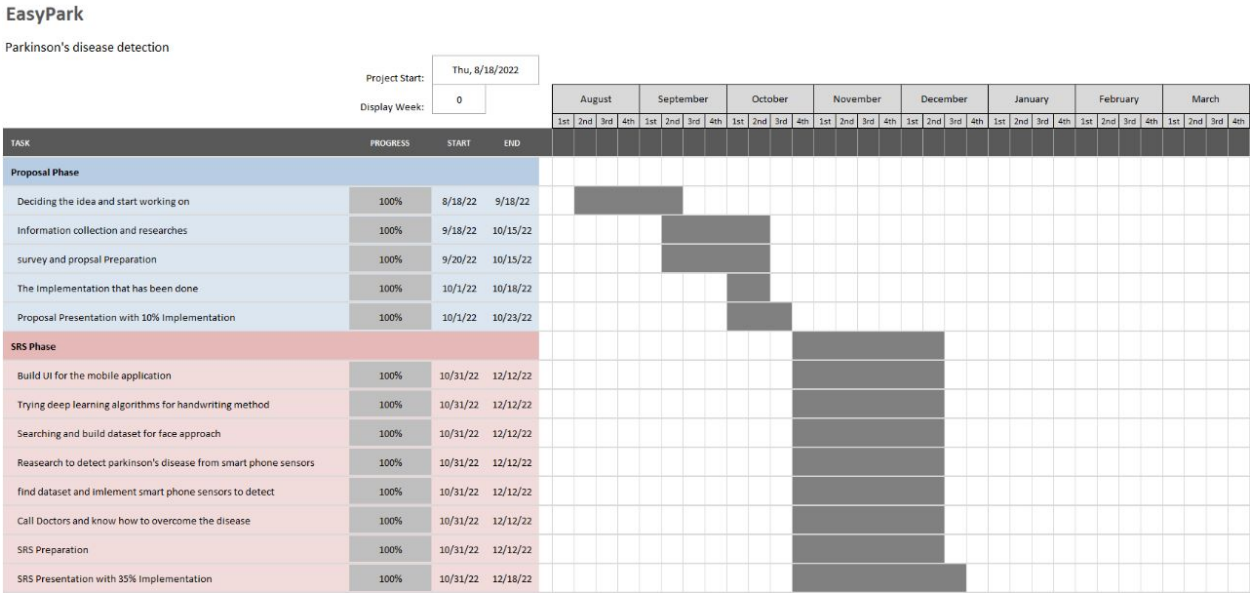


Figure 14: Gantt chart of time plan for EasyPark

11 Appendices

11.1 Definitions, Acronyms, Abbreviations

Terms	Stands For
PD	Parkinson's Disease
K-NN	K-Nearest Neighbor
RF	Random Forest
SLP	Single Layer Perceptron
SVM	Support vector machine

Table 7: Abbreviations Table

11.2 Supportive Documents

- A researcher was contacted due to the lack of a face dataset. Mr. Kulkarni and his research team wrote a paper on detecting neurological disease from patients' faces as shown in figure [15]. Therefore, the team thought it would be very useful to use this dataset in this project. [10]

- In order to collect a dataset of patient faces, we first approached a doctor from the Ain Shams Demerdash Hospital about the idea [11]. She offered to assist us by providing us with numerous forms to complete and submit to the hospital on our behalf as shown in fig[16]. In order to better assist patients during the subsequent stages of treatment, the doctor will explain to us in the second portion of the conference how the severity of Parkinson's disease will be determined.

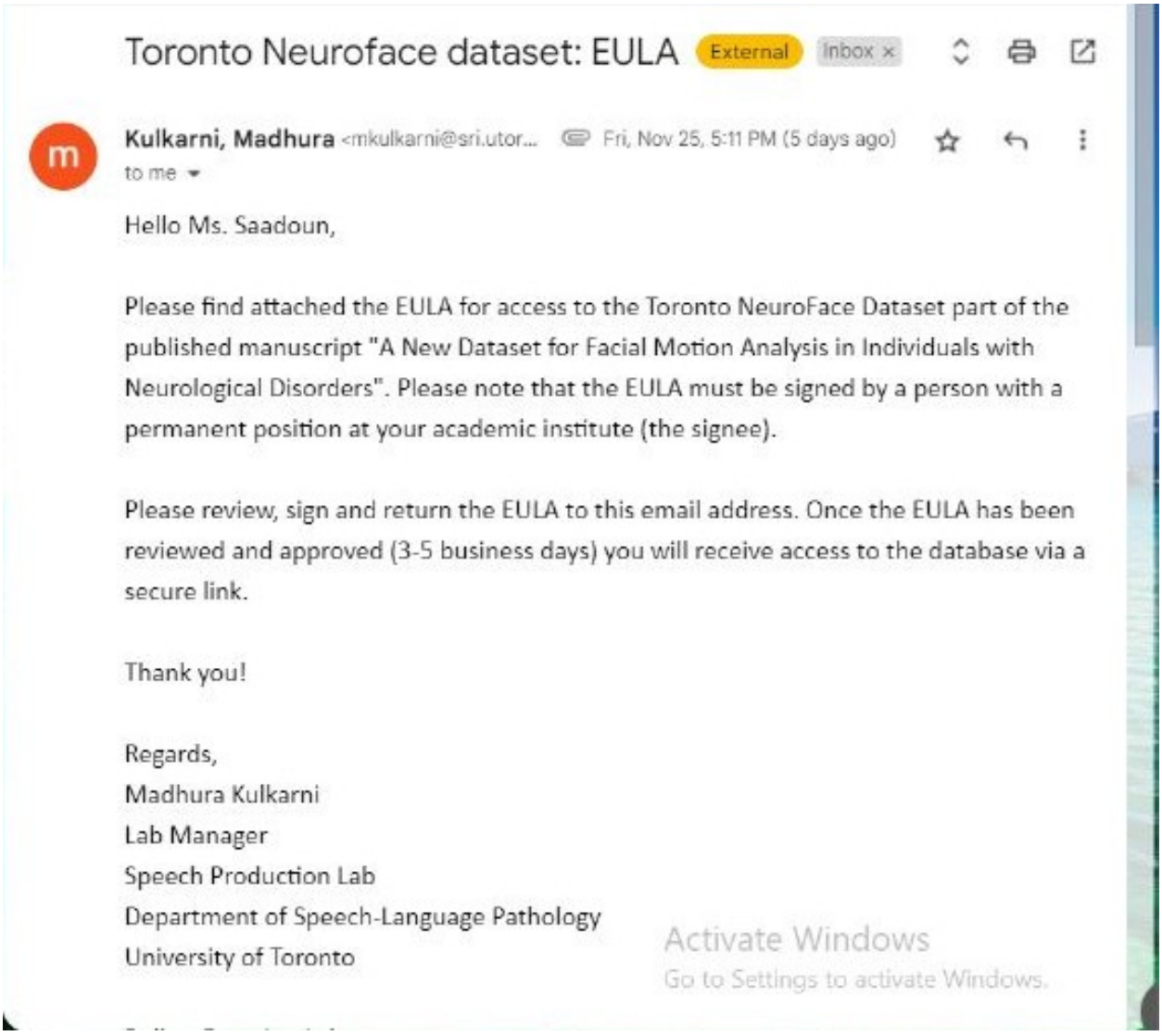


Figure 15: Email Snapshot

جامعة عين شمس
كلية الطب
لجنة أخلاقيات البحث العلمي

المستندات المطلوبة للتقديم

(ماجستير – دكتوراه – دراسه)

1- البروتوكول باللغه الانجليزيه والعربيه

2- الموافقة المستنيرة باللغه الانجليزيه والعربيه word وتكتب كمبيوتر (تستوفي بمعرفة الباحث طبقا لموضوع الرساله وتبعا للنموذج المرسل)

3- فى حالة استخدام استبيان يقدم باللغة االعربيه وفي حالة بحث مشترك مع جهات أجنبيه يقدم باللغتين العربية والانجليزيه

4- الإحصاء الطبي في وحدة الاحصاء الطبي بقسم طب المجتمع ويضاف في البروتوكل ما هو مكتوب بال Statistics Checklist

5- المراجعه في اللجنه تستغرق بالنسبه للدراسات التداخليه وال Randomized Clinical Trials

حد ادنى شهر من تاريخ التقديم والدراسات الملاحظيه حد ادنى ١٥ يوم

5- أى موافقات سابقة من لجان اخلاقيات البحث العلمى بالداخل او الخارج.

6- في حاله إجراء الرساله خارج مستشفيات جامعة عين شمس (مستشفيات – مراكز طبيه معتمده) يتم إحضار موافقة اداريه من الجهه التي سيتم فيها أجراء الرساله .

7 - خطاب احاطه من القسم

8- ال Investigator Application Form (يستوفي بمعرفة الباحث) ويكتب كمبيوتر word

9- ال protocol review checklist (يتم طباعته فارغ والتاكد من عد الصفحات من 1-9 ويستوفي بمعرفة الاستاذ مراجع اللجنه فى القسم علي الا يكون من ضمن الاساتذه المشرفين) مع مراعاه بأن الاستاذ المراجع قد أعطي موافقه نهائيه في الصفحه الاخيره

10- خطاب مركز الابحاث الطبيه من خلال تسجيل الرسالة بمركز الأبحاث الطبية بالكلية (امام مستشفي النساء)

Figure 16: Form Snapshot

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