Spring 2020

SW551 - Capstone II

Implementation Phase

System Requirements Specification for Autism Screening Application

Group 2

Chris Carter

Indigo Guerra

Thomas Marrinan

Emre Ozbalta

Hung Nguyen

April 21st, 2020

Table of Contents

Executive Summary

This system requirements specification document describes the requirements for version 1.0 of a mobile application utilizing Tensorflow to assess the potential for a child to have Autism Spectrum Disorder (ASD).

The Group will refer to this document to plan, develop, and test these components of this system. If requirements change during development, this document should be modified to reflect those changes.

Introduction

A dataset has been provided to us with data from the AQ10 child survey and the diagnosis from the doctor. Our system will use this data to train a neural network through Tensorflow to create a model used by a mobile application to determine if a patient may have autism.

The software for this consists of three steps:

1) A model pre trained by Tensorflow on a PC, deployed to the mobile application
2) A mobile application that requests data inputs from the user via UI
3) Tensorflow light framework which will run the inputs through the pretrained model to determine the probability of the patient having ASD

Application Context

This project will utilize provided data from the child AQ10 survey to train a Neural Network. The model generated by this network will then be used to determine if a patient has autism. The data for this consists of 21 attributes. Of these attributes the following will be useful for our neural network:

- AQ10 scores
- Age
- Gender
- Ethnicity
- Language
- Jundice
- Country of Residence
- Autism Diagnosis

The mobile application must be easy to use and will ask the same 10 questions on the existing AQ10 Child survey. The answer provided must recommend a doctors visit based on the outcome rather than blatantly saying they have autism since the goal of this application is not to take the responsibility away from the doctor, merely to recommend that a patent bring their child in for evaluation.

Functional Requirements

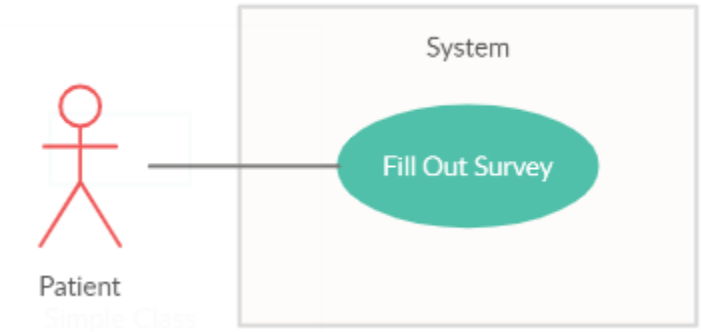
The requirements of our system are as follows:

1. User shall be able to enter personal information into the application
2. User shall be able to answer 10 questions based on the AQ10 survey
3. Application will run Tensorflow lite against a pretrained model to determine if a patient may have autism

Functional Modeling

Use Case Diagram

Since the only user is the patient and their interactions are minimal so the use case diagram for this contains a single actor using a single function of the software. Future versions of this application may include other Autism surveys and would add different surveys for the patient to choose from.



Use Case Name: **Fill Out Survey**	ID:1	Importance Level: High
Primary Actor: Customer	Use Case Type: Essential	
Stakeholders and Interests: - Patient wants user-friendly interface to fill out the survey - Patient wants to know if their child has autism		
Brief Description: This use case describes how a new customer fills out the AQ10 survey and receives the results		
Trigger: Customer enters an AQ10 survey Type: External		
Normal Flow of Events: 1. Customer clicks on 'AQ10 Child Survey' 2. Customer is at the beginning of the AQ10 survey screen 3. Customer fills out the survey 4. System runs survey results against the model using Tensorflow Lite 5. System notifies user with results		

Environmental Requirements

Since the software runs on mobile devices and has no real-world interactions there are no environmental requirements to note.

Software Qualities

- Functionality:
  - Our software will present the AQ10 child survey to patients
  - Our software will recommend whether or not their child should undergo evaluation based on the results of the model
- Security
  - Our software will **not** store results of surveys due to the laws and regulations surrounding Patient Health Information (PHI)

Time Schedule

This schedule reflects the time allotted by the university to research and develop this application. This project should be done much sooner than this so this provides us with ample time to fix any mistakes found during development.

Guardrails	**Start Date**	**End Date**	**Days**
Research (Capstone I)	9/2/2019	12/9/2019	98
Design	1/15/2020	1/30/2020	15
Coding	2/1/2020	3/31/2020	59
QA Test Execute	4/1/2020	4/30/2020	29
Release Stabilization	5/1/2020	5/4/2020	4
Total Days			**205**

Training

Patients who use this product should not need any special training as the application will instruct them on how to proceed through the survey.

Potential Risks

1. Patients may be given an incorrect result
2. Patients may consider the results as absolute truth; never going to see a doctor for evaluation

Future Changes

Future improvements to this program would include:

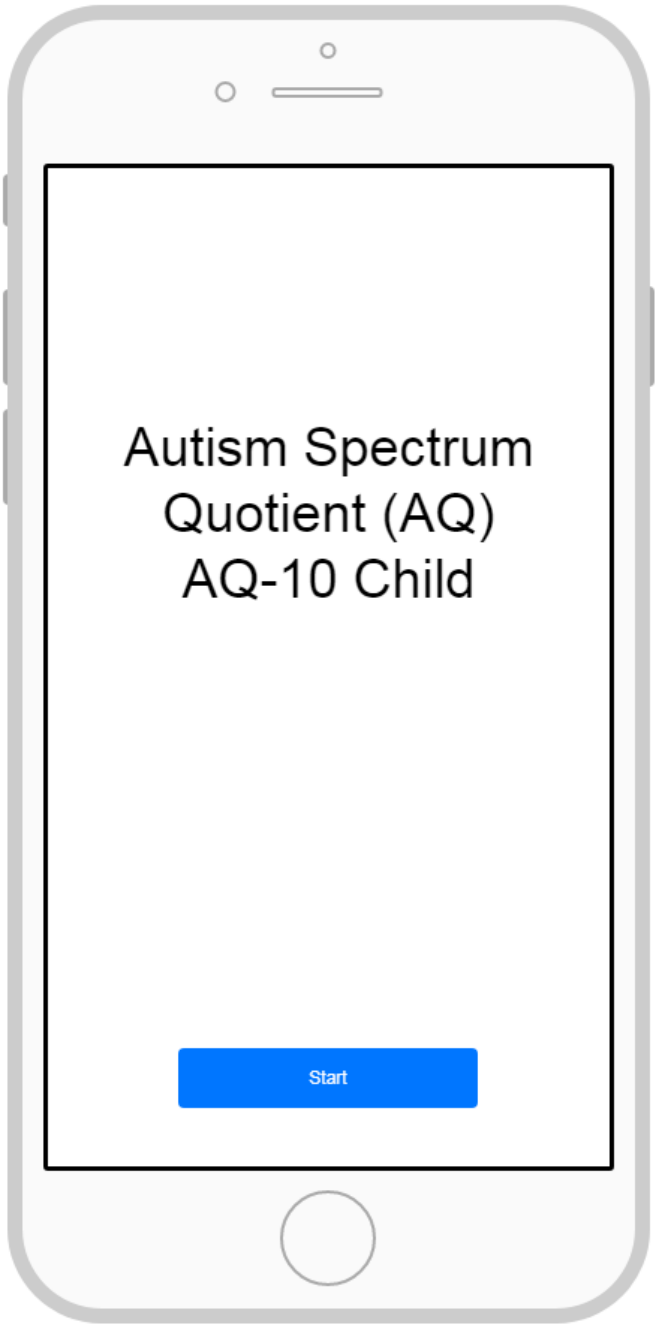
1) Addition of further AQ10 surveys
    a) Training of new models for these surveys
    b) New questionnaires for these models
2) Addition of a help section that outlines resources for the user to learn more about Autism Spectrum Disorder

Acceptance Test Plan

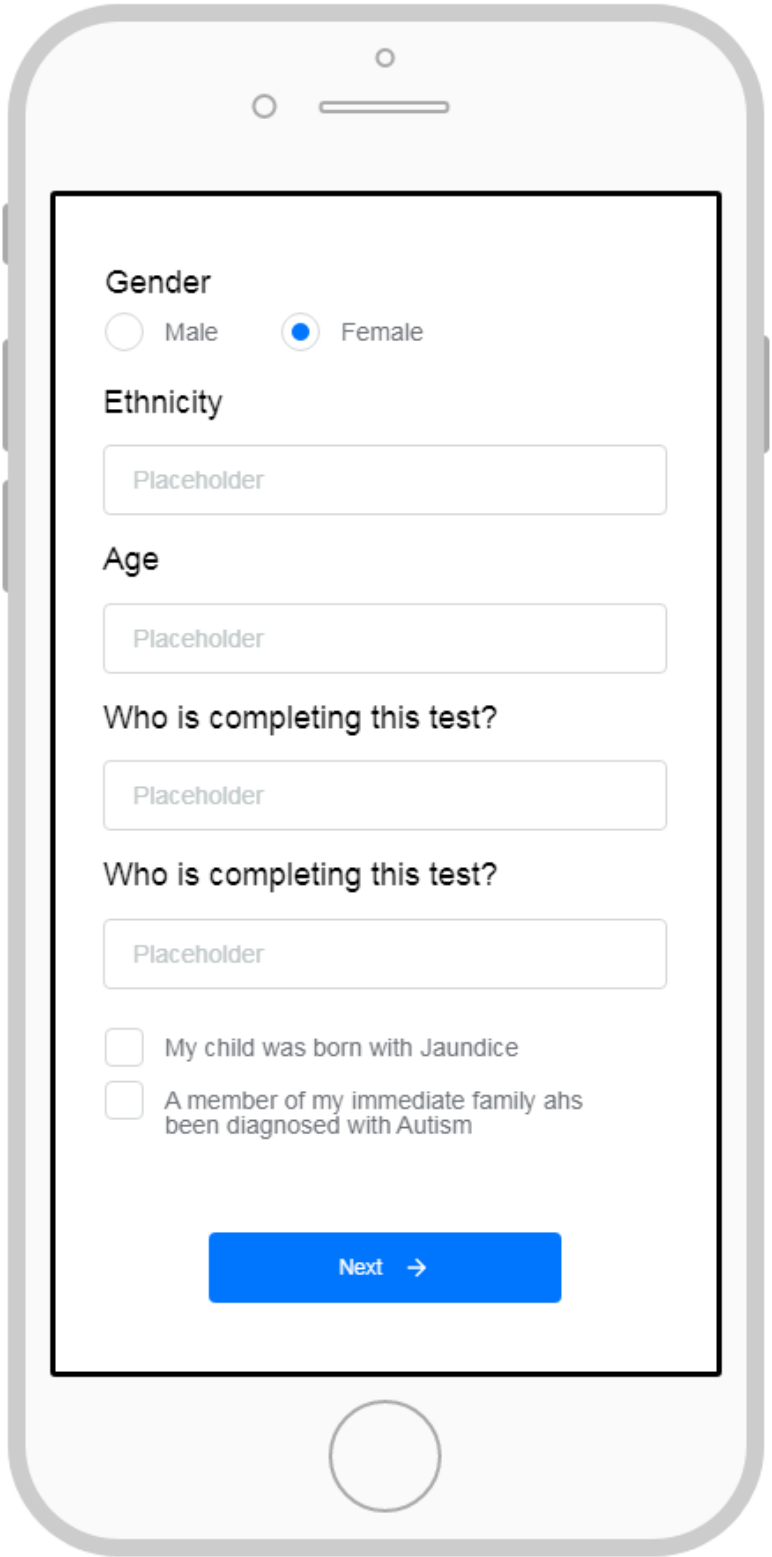
1. **Scope**
    - Regression testing
    - Functional testing
    - Model Testing
    - Front end testing
2. **Schedules**
    - Development
        i. Testing of the model should be done within one month
        ii. Testing of integration should be done in one weeks
    - Shipping code to production
        i. Test using a validation set
3. **Roles and Responsibilities**
    - Functional testers
        i. Front end: This process ensures all product requirements/design are properly implemented.
4. **Deliverables**
    - All critical defects should be found and reported during testing before releasing code to production
5. **Environment**
    - Production
    - Development
    - Testing
6. **Risk and Risk Management**
    - Security issue
    - System malfunction
    - Performance issue

Prototype Images

Home screen

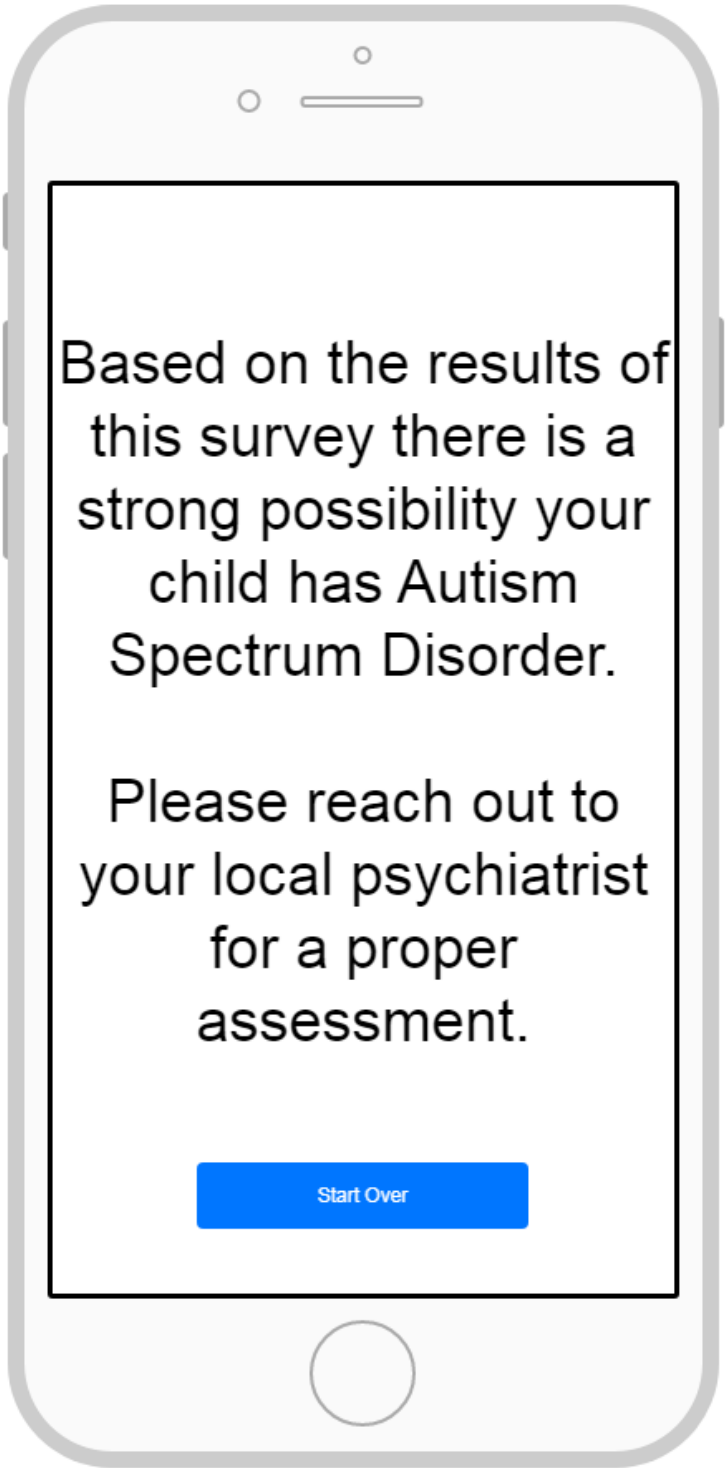


First screen asks for some personal information which we plan to use next semester if we can obtain more data to improve our accuracy and reduce error rates.



One of these is shown for each of the ten questions. First question shown for effect. Each of the 10 questions in the AQ10 offer options for definitely agree, slightly agree, slightly disagree, and definitely disagree.

Final screen indicates results of prediction from neural network based on the user's answers. Will suggest a proper assessment from a psychiatrist since we (nor the app) will take responsibility for a medical diagnosis, we should merely tell the user the possibility of their child having ASD and recommending that they seek out a proper assessment from a psychiatrist.



Glossary

Term	Definition
Tensorflow	Machine learning library used to create the model for this application using a basic Neural Network
Tensorflow Lite	Lightweight framework used to interact with a previously trained Tensorflow model on a mobile device
ASD	Autism Spectrum Disorder
Stakeholders	A person with an interest or concern in the business of robot vacuuming
User Interface	A display of the AQ10 survey and the user's experience