Congo Red Dot Urine Test Web Application

Background:

Preeclampsia is a complication that a pregnant woman might develop during her pregnancy. It is characterized by high blood pressure in women who had not previously experienced high blood pressure before. If left untreated, preeclampsia can lead to eclampsia, a serious condition that can put a mother and her baby at risk. [1]

Two recently discovered molecular signatures of preeclampsia are protein misfolding and aggregation. Congo Red dye adheres to misfolded urinary proteins of preeclamptic women. As such, this has led to the development of the Congo Red Dot Test (CRD) Quantkit. [2] Below are two examples of Congo Red Dot Tests. The left is not preeclamptic and the right is highly preeclamptic.
Mobile Application

Professor Hemant Tagare’s Lab has been developing both an iPhone and Android application to enable quantitative point of care assessment of urine congophilia in women at risk as it carries the potential of a major breakthrough in obstetrics. [2]

These applications apply optimal specimen renditions such as alignment, cropping, and perspective correction were applied to images. An algorithm was used to eliminate illumination gradients, segment the red and blue channels and calculate the area ratio of the test result. [2]

Proposal

Database Design: As of now, all of the data processing and storing is done on the physical mobile phones. We will create a database to store Congo Red Dot Test images, results, and other data that might be useful to researchers and health professionals studying preeclampsia.

Web Application/Server:
In addition to the database, the project will also include building a web interface and server so that processing the image can be done online and viewing the database can be more readable to those studying preeclampsia and the Congo Red Dot Test. People will be able to upload Congo Red Dot Test images, test different versions of algorithms, and evaluate results.

New Congo Red Dot Tests and Testing:
There has been little to no testing of the android application so far. For this project, we will continue working on this android application and test it for accuracy and ease of use. We will do the same for the web application. In addition, we will be improving the
algorithms used in each and try a few different algorithms for analyzing the Congo Red Dot Test images. The database will be particularly useful in this case so that researchers can apply any of the provided algorithms and compare results. Furthermore there will be a new generation of Congo Red Dot Tests coming in March that will need to be tested on the apps.

**Deliverables**

**Database (backend) Design:**
- Determine schema

**Web Application (frontend):**
- Design user interface
- Receiving and processing http requests Email Processing Application (as an extension, if time allows)
- To retrieve and process requests sent through email

**Testing**
- Ease of use
- Accuracy:
  - of different algorithms
  - of processing images submitted from different platforms
- New generation of Congo Red Dot Tests
References
