Thal-IT is an App for the Android phones that is the brain child of Dr. Suhaib Ahmed. It can analyze the electrophoresis images of haemoglobin, serum proteins and a wide variety of PCR amplified products. The images are captured through the mobile camera and the App creates color histograms of the samples in an image.

The name “Thal-IT” is derived from the most significant application of the App i.e. diagnosis of “Thalassaemia through Information Technology”. Hemoglobin, being a colored compound, can be analyzed without staining that eliminates the artifacts due to uneven staining of the electrophoresis strips. This gives Thal-IT a distinct advantage over the traditional densitometry.

Thal-IT is primarily meant for the quantitative estimation of the normal and abnormal haemoglobin variants. The combination of GTI-Haemoglobin Apparatus and the Thal-IT App can play a pivotal role in the population based screening of thalassaemia carriers in the countries with resource constraints.

**Download and Installation**

You can download and install the App on your android phone from Google Play Store. On first installation you are required to sign-up. Use of the App requires a license that can be obtained by contacting info@thal-it.com.

For more information and instruction video you may visit our website [www.thal-it.com](http://www.thal-it.com).
The App may be operated by touch screen but for accuracy a screen stylus is recommended (http://draz.com).

Home Screen

The general information about Thal-IT may be accessed by touching the menu icon in the left upper corner of the Home screen.

Image Capture

The images of electrophoresis are captured through the mobile camera. For best results GTI-Image Capture Device is recommended because it can ensure uniformity and clarity of the images.
Image Cropping

The captured images must be rotated and cropped uniformly so that the origin/mobility of the samples is from above downwards and the image measures approximately 25 x 50 mm.

Capture  Rotate  Crop

Use the cropped image in the Thal-IT App

Uploading an Image

Touch the “Select Image” button to open the most recently accessed image directory.
Touch the selected image to upload it. You may browse between different directories by touching the icon in the left upper corner of the screen.

Cropping a sample in an image

Once the image is selected touch the “Crop Image” button to proceed to the sample cropping screen.
The individual samples in the selected image are read from left to right (1-6).

The margins of the image window can be moved by dragging. Move the right and the left margins to the sample to be analyzed taking care not to include any portion of the adjacent sample. The window should have at least half of the total sample width preferably the middle portion. The top and the bottom margins of the cropped window must remain the same for all of the samples in an image. The cropping is completed by touching the “CROP” button in the right upper corner of the screen.
**Creating Color Histogram (Line Graph)**

The cropped image is displayed in a separate window. Touch the “Next” button to display the colour histogram.

The colour histogram is displayed as a line graph. The X-axis shows the position of the peaks from left to right and height of the peaks are shown on the Y-axis.

**Drawing the Baseline**

The baseline is drawn to eliminate the background noise in an image. It is the most critical part of the analysis. A baseline that is too high or too low can give erroneous results especially for the
minor components like Hb-A₂. The baseline is drawn by touching the line graph at an appropriate level. An ideal baseline should be slightly above the line between the two or more peaks. Once the baseline is drawn a top menu showing the current level of baseline and other buttons is displayed. The level of the baseline can be increased or decreased by touching the “+” or the “-” and the “apply” buttons. The effect of the selected baseline is applied by touching the “finish” button.

The baseline selection results in clearing of the graph below the baseline. The hemoglobin fractions in a sample are represented by peaks in the color histogram (graph). In this sample the first peak (Peak 1) is of Hb-A₂ and the second (Peak 2) is of Hb-A.
**Reading the Peaks**

The peaks are read from left to right. The App will not respond if the peaks are read in the reverse order. Each peak is selected by touching the graph line at the start and the end of the peak. The App responds at each step by a message. Depending on the speed of the device processor the App may take a few seconds in selection of the peak. During this period the App does not respond to any command. On completion of the process the area under the selected peak turns gray. The next peak selection can be initiated only when the last peak area has turned gray. The App can read up to 20 peaks in one sample.

When two peaks are very close to each other the lowest point between the two should be selected even if the point is above the baseline.
**Calculation of Results**

When all of the peaks have been selected the results can be displayed by touching the “calculator” button at the top right of the screen. This displays the percent values of the selected peaks. The results are displayed as Peak 1, Peak 2, Peak 3 etc. in the descending order. Peak 1 represents the first peak and Peak 2 represents the second peak from left to right. The result screen can show the results of up to six peaks at a time. The results of more than six peaks can be seen by scrolling up and down the result window.
**Peak Positions**

The position of each peak on the X-axis is shown in brackets after the peak number. For example Peak 1 (232), Peak 2 (312) Peak 3 (413) etc. It is important to note that the relative position of a particular hemoglobin fraction (peak) in an image is dependent on the electrophoresis conditions and the way the image was cropped. Therefore the peak positions are relevant only to a particular image. The position of a particular hemoglobin fraction (peak) may be different in different images. If the peak positions are to be used for identification of hemoglobin fractions then a known hemoglobin control must be run with each batch of samples in an image.

**Storing the Results**

The final result of each analysis can be saved by taking a screenshot. The stored screenshots can be identified by date and time of the analysis that is displayed in the top red bar of the result screen.

**Reading other Electrophoretic runs**

Thal-IT is primarily meant for the diagnosis of thalassemia and abnormal hemoglobins. However, the App may also be used to analyze appropriately stained electrophoresis images of serum proteins and PCR amplified DNA.
**Serum Protein Electrophoresis:**

Quantitative analysis of serum proteins fractions after electrophoresis can provide valuable diagnostic information about a large number of diseases for example immunological disorders, liver diseases, and inflammatory conditions etc. Thal-IT may be used to read any appropriately stained image of serum protein electrophoresis. The images are selected and cropped in the same way as described earlier.
Analysis of PCR amplified DNA (Quantitative PCR)

Electrophoresis of amplified DNA for example quantitative Short Tandem Repeat (STR) analysis for donor chimerism, trisomy screening, maternal contamination in fetal samples and Quantitative PCRs like tumour specific gene expression (bcr-abl, JAK2 mutation etc.), and viral PCR with internal controls are other areas where Thal-IT App can be used.