Segmentation of malaria parasites in peripheral blood smear images - <https://ieeexplore.ieee.org/abstract/document/4959845>

* 2009
* Malaria identification is mainly done in person by experts and can be time consuming
* Malaria infects hundreds of millions of people a year killing hundreds of thousands
* P. falciparum, P. vivax, P. ovale, and P. malariae (P. for plasmodium) are the four species of malaria that infect humans
* Paper is mainly about the different way of developing the images to distinguish the plasmodium from the red blood cells
* Segment Parasite from RBC’s using a colour- based model

The Malaria System MicroApp: A New, Mobile Device-Based Tool for Malaria Diagnosis

<https://www.researchprotocols.org/2017/4/e70>

* 2017
* World health organisation estimates that around 3.2 billion people are at risk of becoming infected with malaria
* Weak healthcare in some high-burden countries is causing slower than average decline in malaria incidences and a high mortality rate
* Misdiagnosis can increase morbidity and mortality
* 2 methods for malaria diagnosis- stained slides (thick blood films or blood smear) or by rapid diagnostic test (RDTs). Slide staining is the most common and cheaper, the RDT methods are effective as they allow malaria diagnosis technicians to identify the type of plasmodium
* Minimum requirements for the app, Android 4.2 or higher with minimum 5 megapixel camera.
* Heuristic facial recognition method proposed by Viola and Jones which was used to develop a mew method for integral image representation
* Haar-like features for real time recognition
* Specifically identifies Plasmodium falciparum in the trophozoite ring stage
* Image Acquisition, Image pre-processing, training and validation, Mobile prototype development

Machine learning-based in-line holographic sensing of unstained malaria-infected red blood cells <https://onlinelibrary.wiley.com/doi/full/10.1002/jbio.201800101>

* 2018
* a new automatic sensing method using digital in-line holographic microscopy (DIHM) combined with machine learning algorithms
* Testing 6 machine learning algorithms to separate RBC and infected RBC
* The model trained by the support vector machine (SVM) was the most accurate 96% accuracy
* This DIHM-based artificial intelligence methodology is simple and does not require blood staining
* “After malaria parasites invade red blood cells (RBCs), they destroy the host RBCs and consume the hemoglobin (Hb) of the malaria-infected RBCs (iRBCs). Therefore, the morphological, biochemical and mechanical properties of the host RBC are altered”
* staining a blood slide takes more than 45 minutes
* Rapid Diagnosis tests (RDT) only give qualitative information
* detect iRBCs without blood staining

Malaria Parasite Detection Using Deep Learning : (Beneficial to humankind) <https://ieeexplore.ieee.org/abstract/document/9121073>

* 2020
* Using a custom convolutional neural network to distinguish between healthy and infected blood sample
* Proposed network consist of three fully connected layers
  + First layer has 32 filters
  + Second layer has 64 filters
  + Third layer has 128 filters
* 95% accuracy
* 2019 228 million occurrences of malaria with around 405 000 people dying from it
* Most fatalities ae children from sub-Saharan Africa (Personal connection)
* “*Deep learning models use sequences of nonlinear processing unit layers to discover structural characteristics in the raw data.*”
* “*There are various layers in the Convolutional Neural Network (CNN) wherein each layer of the CNN provides an activation function for the given image. The initial layers of CNN extract the primitive features like blobs, edges, and colors that are abstracted by the deep inner layers of CNN to create high-level features that give a more affluent image representation*.”
* Many research projects around the world using CNN for clinical uses
  + Some of the first was Alexnet by Alex Krizhevsky
  + “*In 2016, Huang [12] proposed a model wherein each layer of the model is connected to the entire next layer by using network architecture and was named as Densely Connected Convolutional Networks (DenseNet) which is a variant of CNN.*”
* DL models are being used around the world in a variety of medical image analyses
* DL models with SVM provide accuracy in the range of 90-95%
* The models built in Python 3.7.x and JupyterLab IDE
* Overall detection accuracy of the model was around 95%

Detection of malaria parasite in giemsa blood sample using image processing <https://aircconline.com/ijcsit/V10N1/10118ijcsit05.pdf>

* 2018
* Using different image processing to detect malaria

Malaria parasite detection and species identification on thin blood smears using a convolutional neural network

<https://dl.acm.org/doi/10.5555/3204094.3204095>

* 2017
* “obtained an accuracy of 92.4% and sensitivity of 95.2% for malaria parasite detection, and an accuracy of 87.9% for identifying the two species Plasmodium falciparum and Plasmodium vivax.”
* Malaria is the 9th leading cause of morbidity

Application Of Malaria Detection Of Drawing Blood Cells Using Microscopic Opencv

<https://www.lens.org/lens/scholar/article/171-649-539-707-286/main>

* 2011
* Detecting malaria on a microscopic digital image of patient blood sample using OpenCV
* The paper goes into detail about how malaria occurs, symptoms and modern day malaria diagnosis
* Malaria detection can be done by examining thin or thick blood smears
* The ways to distinguish between the different types of malaria cells
* In depth information on computer vision and how to use it to identify iRbc
* The application can detect malaria in thin and thick blood smears
* Issues where red blood cell shape vary or blend into each other

Automated Detection of Malaria Parasites on Thick Blood Smears via Mobile Devices

<https://www.sciencedirect.com/science/article/pii/S1877050916312029>

* 2016
* presence of P.falciparum trophozoites and white blood cells in Giemsa stained thick blood smears
* using a Support Vector Machine (SVM) classifier
* the mobile phone is currently Africa's most important digital technology(<https://ieeexplore.ieee.org/document/6995631>)
* African telecommunications largely skipped over landline infrastructure and went straight to mobile phones, some experts say African medicine can skip over centralized labs
* thin smear consists in a single layer of red blood cells, the thick smear is 6-20 times thicker, allowing for a greater volume of blood to be examined
* hick smears are firstly used to check the presence of malaria parasites (MP),while thin smears are subsequently analyzed for the identification of MP species.
* Uses a Optical Magnification Prototype , a mobile phone attachment to capture images at 1000x magnification, has a automated system for moving blood samples around to capture multiple images
* he great majority of the proposed methodologies to date are based on images acquired under well controlled conditions and with proper microscopic equipment, the main differential factor of this work is the usage of microscopic images exclusively acquired with smartphones

Image segmentation techniques for red blood cell : on overview <https://www.lens.org/lens/scholar/article/114-533-619-202-673/main>

* 2015
* RBC Segmentation

Malaria Screener: a smartphone application for automated malaria screening

<https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-020-05453-1>

* 2020
* Microscopic examination of stained blood smears allows for characterisation of parasite species, density and assess effectiveness of treatment
* presents a smartphone-based semi-automated system that provides analysis of blood smear images for malaria screening
* phone application combines multiple functions, including image acquisition, image screening, and management of the acquired data
* smartphone is used in combination with a microscope adapter
* OOP of design
* Front end UI is based on Android API
* Back end is OpenCV4 Android, TensorFlow Lite, SQLite, Box API
* This does Exactly what I’ve been asked to do
* Can examine both thick and thin Smears
* Pre-trained Convolutional Neural Network (CNN) models
* classifications: infected vs uninfected RBC in the case of a thin smear, or parasite vs background in the case of a thick smear
* Deployed to app using TensorFlow lite
* first smartphone-based system that can screen thin and thick smears

Deep Learning for Smartphone-Based Malaria Parasite Detection in Thick Blood Smears <https://ieeexplore.ieee.org/abstract/document/8846750>

* 2020
* Using a customized CNN
* Automatic Parasite detection on a mobile phone
* 93.46% accuracy vs pre trained CNN Alexnet 92.21%
* Human error in Microscopy examination especially in resource limited environments
* Misdiagnosis can lead to inappropriate treatment
* Thick blood smears allows more efficient detection of parasites than a thin blood smear
* Camera is attached to the eyepiece of the microscope
* TensorFlow Mobile
* Accuracy to detect a true parasite 97.28% vs a pre trained network Alexnet 96.33%
* Second paper to develop a smartphone application for thick blood smears