Literature review

Malaria is listed by the World Health Organisation (WHO) as a life-threatening disease with children under the age of 5 classified as the most susceptible, Malaria is caused by plasmodium parasites spread by female Anopheles mosquitoes [1]. Parasite identification is mainly done by a medical expert examining typically giemsa stain blood smears under a microscope, this process can take up 20 minutes and is reliant on the parasitologists’ expertise [2]. There has been extensive effort to reduce the time taken for diagnosis and reduce the chance of human error; attempting to reduce the variability and artifacts in images by segmenting Red Blood Cells (RBC) and parasites using a scheme based on HSV colour space [1], using Computer Vision to detect Malaria on a microscopic image of patient blood sample [3]. Plentiful work has been done to use Computer Vision and Deep Learning for clinical use in all areas of medicine, a Convolutional Neural Network AlexNet took huge strides in increasing the performance of CNN’s in categorizing natural images [4], the use of CNN’s was specified to identify the most common plasmodium’s causing Malaria, falciparum [5] and most deadly vivax [5] the research produced a scheme that obtained an accuracy of 93.4% and sensitivity of 95.2% for malaria detection [6]. The African region carries a disproportionately high share of malaria deaths at 90% [5], this along with the huge importance of mobile phones in the African continent [7] has pushed the research into trying to use mobile phone cameras to automatically detect malaria in blood smears [8] if successful and widely adopted, this would allow areas with low access to the high quality expensive medical equipment, or personnel typically needed to diagnose malaria the ability to quickly and reliably diagnose a disease that plagues them.

The attractiveness of using a mobile phone app with a trained CNN to diagnose malaria is multifaceted. CNN’s can quickly, and consistently give with a high degree of accuracy a diagnosis, requiring little resource or medical training. CNN’s can over timed be trained to improve, the mainly open-sourced nature of a lot of the CNN’s in the medical field allows for the improvement and expansions of the work done by a predecessor. With these in mind there have been mobile apps that have done exactly what I propose to do, a mobile app that attaches to a microscope and using the phone camera take a picture of a blood smear and with a good degree of accuracy, diagnose malaria. In 2017 an app [9] running on android, the leading mobile platform in the African continent with an 83.6% [9] market share was able to diagnose malaria with a 91% accuracy, although not yet available to the public is very promising. In 2020 a publicly available app called Malaria Screener [11] was able to give malaria diagnosis with 95% accuracy, the app unlike the 2017 attempt can detect malaria in both thin and thick blood smears specifying the type of plasmodium parasite and number of parasites in the smear. This specificity and increased accuracy give increased confidence in diagnosis and treatment. I aim to go in a slightly different direction by allowing diagnosis to be shared quickly and fast to the patient so treatment can start immediately.