

Chapter 5

Classification and Predicting Abundance of Anopheles Mosquitoes in Zimbabwe Using Machine Learning

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ABSTRACT

This study seeks to utilize Machine Learning techniques on entomology data available in Zimbabwe. Much of the data is just lying around so it end up being of no use. By applying machine learning models to analyze the data in a time series manner and data mining techniques in Entomological research is a key approach to utilizing large volumes of available mosquito-related data for extracting knowledge. The objectives of the research are to (1) design a model to classify mosquito species from images; (2) use data mining to identify presence/absence of malaria vectors in an area; and (3) find out which months when malaria vectors are in abundance. The study clearly pointed out that ML can be used come up with solution in solving

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complex problems found in fighting Malaria. I particular coming up with models that can classify mosquito species from images which is the primary objective. Even though the images used were not from Zimbabwe, but the mere fact that it worked well means that it can used by images of species found in Zimbabwe.

1.1 BACKGROUND

The Malaria epidemic has led to many deaths in Zimbabwe and world over. It is estimated that in 2018 there were 405 000 deaths from malaria globally (World Health Organization, 2019). Since it is a vector borne disease, this has led to development of different intervention methods to fight it. One such method that has proved to be effective is Indoor Residual Spraying (IRS), but this method relies heavily on entomological data. In Zimbabwe data coming from entomological surveys is available and the analysis is just the usual simple analysis, which might leave out important information, which can be used by the country in fighting the malaria disease.

In the turn of the century, ML has gained traction in health. Particularly, ML helps to perform predictive analysis or pattern recognition on large data. Also, it offers a range of alerting and risk management decision support tools, targeted at improving patients' safety and healthcare quality.

This study seeks to utilize Machine Learning techniques on entomology data available in Zimbabwe. In addition to having data available, being able to classify the malaria vectors is also important. In Zimbabwe there are two main vectors (Raghavendra, Barik, Reddy, Sharma, & Dash, 2011) the *Anopheles gambiae* complex (*An. gambiae* s.l.) and *Anopheles funestus* group (*An. funestus* s.l.). Usually the classification termed morphological identification is a laborious task and is a high specialty area.

1.2 PROBLEM STATEMENT

Malaria disease is a huge problem in some areas in Zimbabwe. To eliminate it there is need to understand the behavior of the vector that transmit it. Much of the data is just lying around so it end up being of no use. By applying machine learning models to analyze the data in a time series manner and data mining techniques in Entomological research is a key approach to utilizing large volumes of available mosquito-related data for extracting knowledge.

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