Project Plan Proposal

VIP Intestinal Worms Team, Spring 2022

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Our project aims to develop a diagnostic system which can improve the ability for public health professionals to know the areas with high rates of soil transmitted helminth. Our system will need to reliably quantify the severity of infection by roundworms, hookworms, threadworms, and whipworms. Currently, the Kato-Katz system is done manually and counted by pathologists in the field, a time and labor intensive process which limits the ability to reach communities and provide deworming medication. By creating an automated, low-cost, and easy to use system that conforms to World Health Organization sensitivity and specificity criteria, we will enable public health officials to reach communities more effectively, even when trained pathologists are not available on-site (Children Without Worms, 2021a; Children Without Worms, 2021b).

Our team has two specific problems to focus on. First, we wish to analyze the code from the paper, "Affordable artificial intelligence-based digital pathology for neglected tropical diseases: A proof-of-concept for the detection of soil-transmitted helminths and *Schistosoma mansoni* eggs in Kato-Katz stool thick smears" and adapt the code to fit the needs of the Children Without Worms team (Ward 2022). We will need this code to have sufficient sensitivity and specificity to meet clinical standards as well as be compatible with the scanning hardware that we produce. Our second problem to focus on is creating hardware to scan the slides. This work was last worked on by team AutoSTHetics (Do 2022). We aim to continue this work so that it produces high quality, consistent images which can feed into our machine learning algorithm to quantify the number and species of worm egg.

Our goals for this semester are:

* Have running machine learning algorithm for detection of STH eggs
* Adjust machine learning algorithm to meet our needs
* Integrate machine learning algorithm with hardware (stretch goal)
* Improve hardware to automatically rotate images

Our intermediate goals for this semester are

* Create Kaggle accounts
* Understand neural networks and convolutional neural networks
* Make copy of research paper code and be able to run ourselves on test dataset
* Be able to run research paper code on the STH egg dataset
* Learn how to fine tune and adjust hyperparameters on machine learning model
* Understand Autodesk and CAD
* Brainstorm ways to automatically rotate images
* Print CAD improvements and test

Works Cited

Do, Jennifer, Girardot Michelle, et. al. (2022). "AutoSTHetics Final Report."

https://gatech.instructure.com/courses/279466/files/34232513?module\_item\_id=27

3424

Children Without Worms (27 May 2021). "Innovative Technology to Address the Elimination of Morbidity of Soil Transmitted Hemelinth."<https://gatech.instructure.com/courses/214292/files/24538503?module_item_id=1970154>

Children Without Worms (2021). "Welcome Georgia Tech BME Students!" <https://gatech.instructure.com/courses/214292/files/24797641?module_item_id=1982086>

Ward P, Dahlberg P, Lagatie O, Larsson J, Tynong A, et al. (2022) Affordable artificial intelligence-based digital pathology for neglected tropical diseases: A proof-of-concept for the detection of soil-transmitted helminths and *Schistosoma mansoni* eggs in Kato-Katz stool thick smears. PLOS Neglected Tropical Diseases 16(6): e0010500. <https://doi.org/10.1371/journal.pntd.0010500>