Blood cell sorter

Problem statement

In a medical setting a blood sample is taken and analyzed by medical professionals. One task that could be automated is a test called manual differential. In this test a trained medical technologist uses a microscope to analyze blood slides. The blood slide analysis looks for white blood cells and determines what kind of white blood cell it is and if it is normal or abnormal. This kind of test is common and can be time intensive for the medical technologist.

Context

Like any business, medical facilities are looking for a way to bring accurate, cheaper, and quicker test results back to the doctor and the patient. The test manual differential for blood slides is a time intensive test. In order for a medical facility to expand its operations, time and care is placed in how to expand in a responsible way that benefits the patients without burning out the medical professionals performing the tests. To expand and meet the needs of the business, the medical facility could consider hiring more workers or buying more machines to run the test. Having an intelligent program that can help expand the productivity of existing workers would be lucrative in meeting the expanding needs of patients and the medical facility.

Criteria for success

The criteria of success of this project is to create a program that accurately sorts cells into the various types of white blood cells. Accurately sorting cells is a difficult task that a medical technologist with many years of experience can take time. Allowing this test to be performed in parallel to a medical technologist improves the efficiency of each worker.

Scope of solution space

By using a training set of images of normal and abnormal cells an algorithm should be able to correctly identify each white blood cell. This can be achieved by having a program to analyze each item in the image and then have a program that can interpret the image items as the different kinds of white blood cells.

Constraints

The FDA approval for medical devices will be necessary for the program to be used on patients. After the program is approved, working with each medical facility's staff to create a new workflow that benefits the medical worker. This will be key in order to better utilize each medical worker's abilities for other tasks.

Stakeholders

FDA regulators will be needed to gain approval to use on patients.
Once the program is approved by the FDA the medical facility CEO and laboratory directors will be needed to show how accurate and cost effective this can be for the medical facility. To further reach medical facilities partnering with existing manufactures of medical devices can help reach the necessary key people to expose the program to. By showing the value of the program to the medical worker as a time saver by tailoring the workflow around this program will help encourage the worker to use the program.

Data sources

Kaggle database of images of normal and abnormal cells. Medical institutions may also have saved images of patient data stored on site. As each system is set up at a medical institution the program can be further tuned on the local patient population in order to further tailor the program for each client.

Normal cell data base-
https://www.kaggle.com/datasets/unclesamulus/blood-cells-image-dataset

Blood cell detection
https://www.kaggle.com/datasets/draaslan/blood-cell-detection-dataset

Abnormal cells
Aml cells
https://www.kaggle.com/datasets/akhiljethwa/blood-cancer-image-dataset

Abnormal cells
ALL cells
https://www.kaggle.com/datasets/mohammadamireshraghi/blood-cell-cancer-all-4class