

Training a Deep Learning Classifier for Detection of Acute Lymphoblastic Leukemia +

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Introduction



Acute lymphoblastic leukemia (ALL) is a type of cancer that affects the blood and bone marrow.

ALL is characterized by the rapid production of immature white blood cells (lymphoblasts) that can accumulate in the blood and bone marrow, interfering with the production of normal blood cells.

It is the most common cause of death from cancer among children.



Current methods of detecting ALL typically involve analyzing blood and bone marrow samples under a microscope. However, these methods can be time-consuming, expensive and may not always provide accurate results.



Introduction

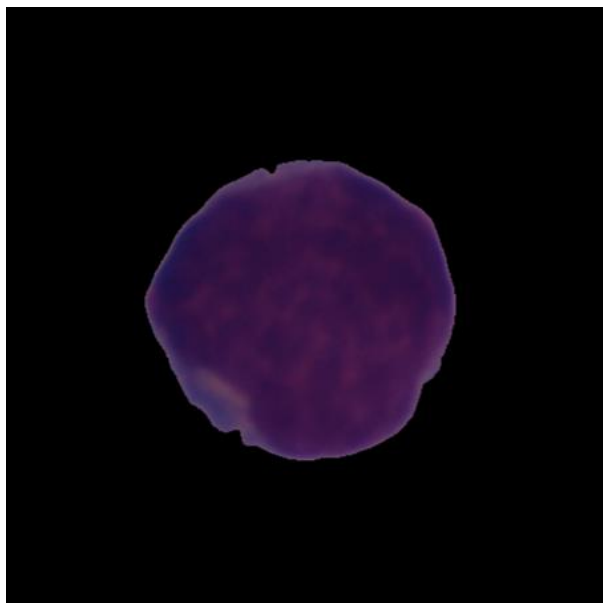
ALL is a very aggressive disease. It is very important to detect it in an early stage in order for it to be cured.

Deep learning can revolutionize the way we diagnose and treat diseases like ALL, offering faster, cheaper and more accurate diagnosis.

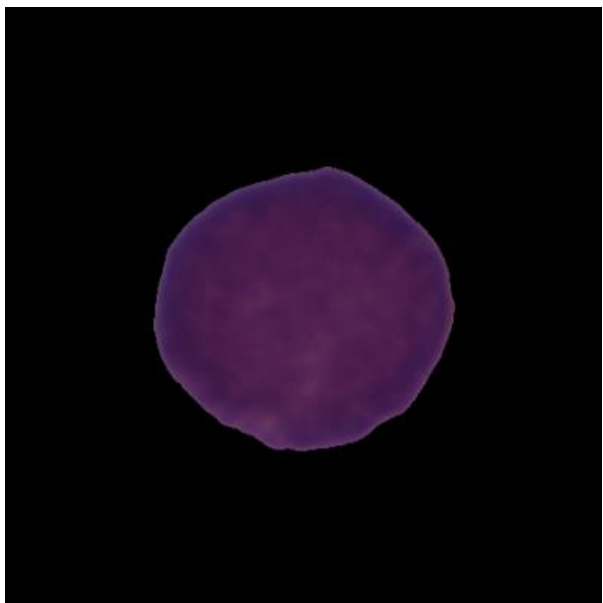


Deep learning models are well suited for analyzing medical images, as they can learn to recognize complex patterns within the images that are difficult for humans to identify.

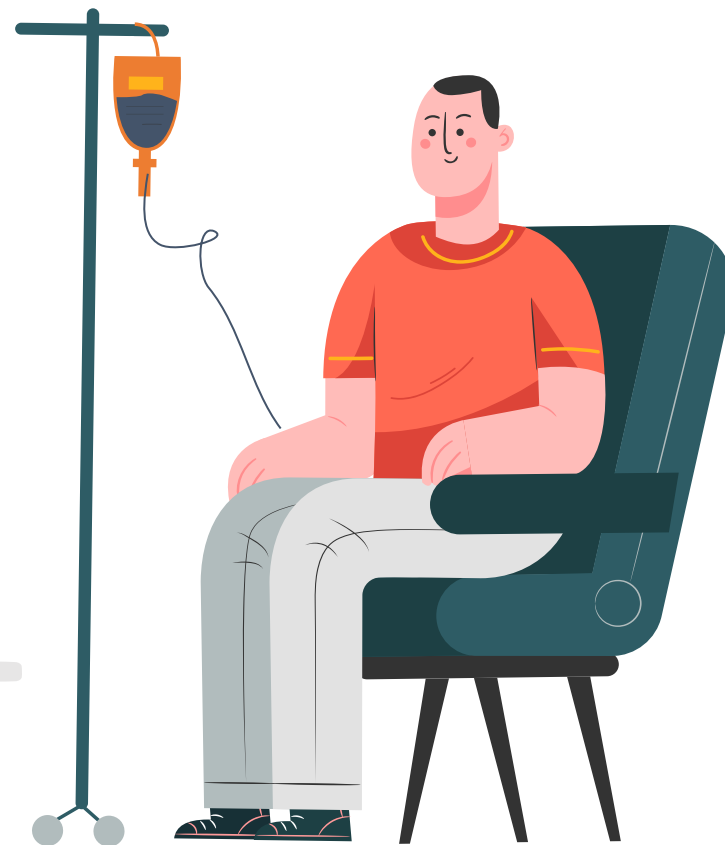




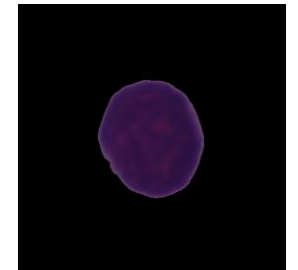
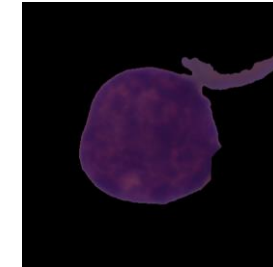
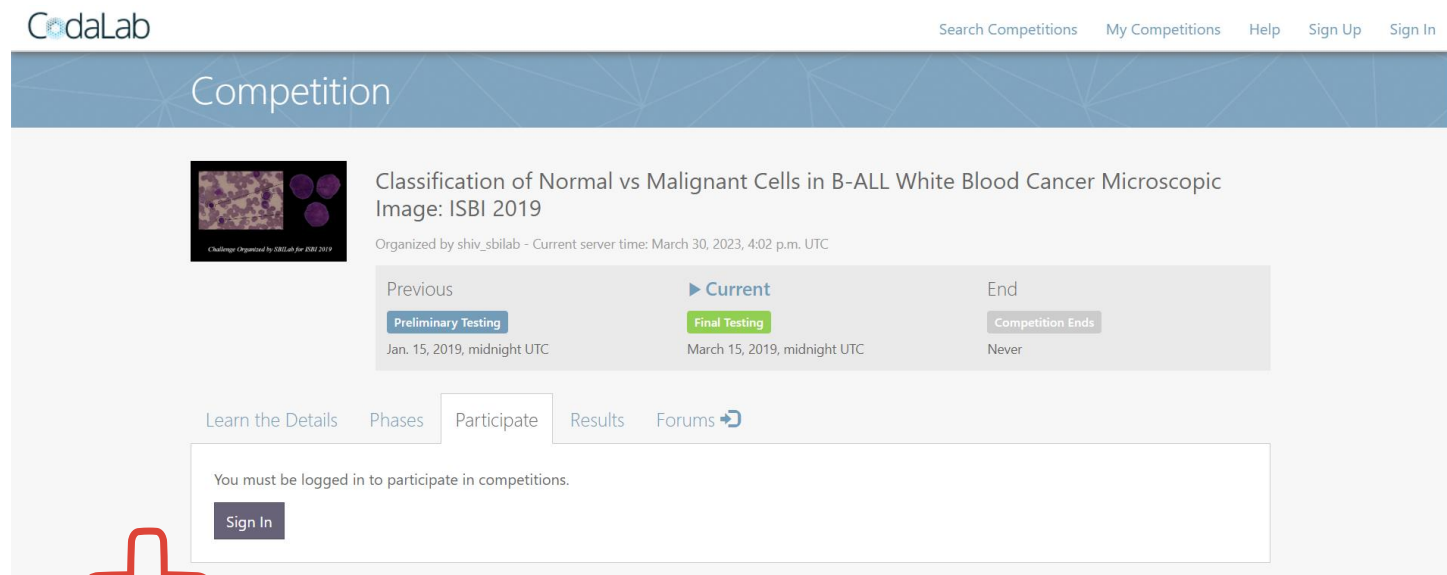
A lymphoblastic cell



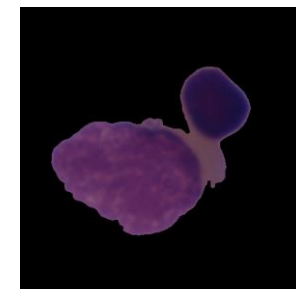
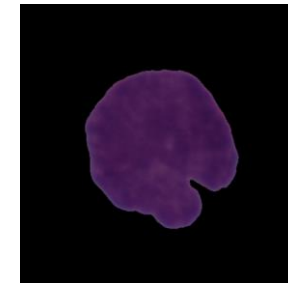
A healthy cell



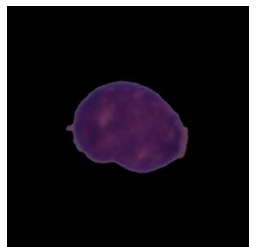
Dataset



Lymphoblastic



Healthy

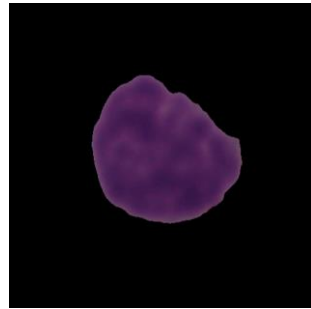
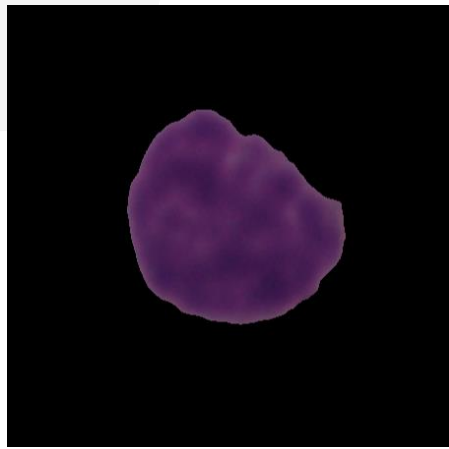


+ 15000 microscopic images

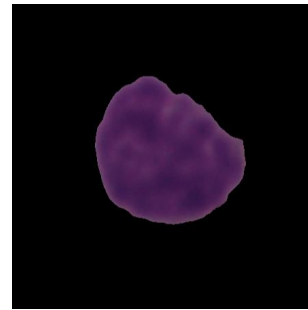
+ 118 patients

+ Labeled by an oncologist

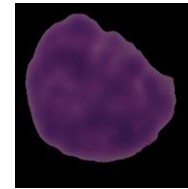
Preprocessing & Augmentation



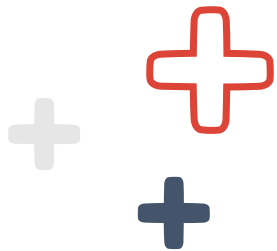
Resizing & Normalization



Cropping

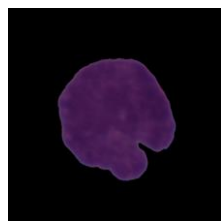


Random Rotation
(45 degrees)

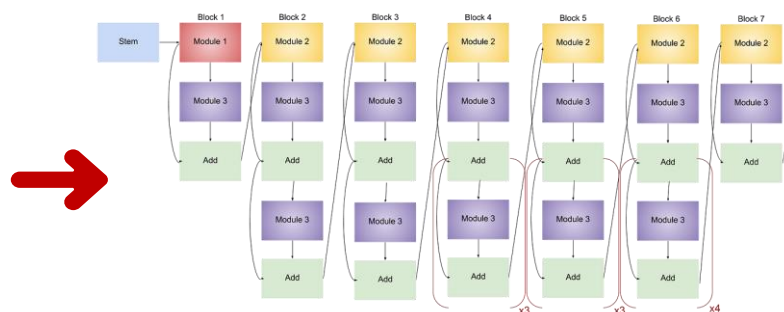




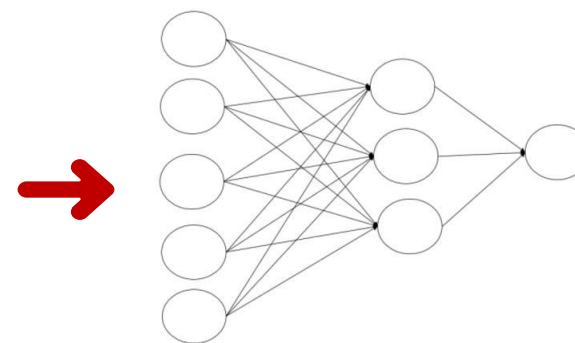
+ Model



Input Image



Feature Extraction



Fully Connected
Layers

→ 0/1

Binary
Classification

+ Preprocessed

+ Augmented

+ EfficientNet / VGG

+ Pretrained

+ Frozen Layers

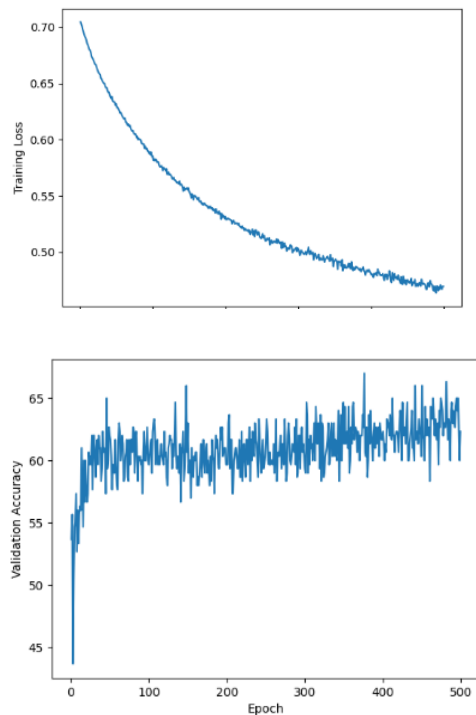
+ Custom Layers

+ Trainable Weights

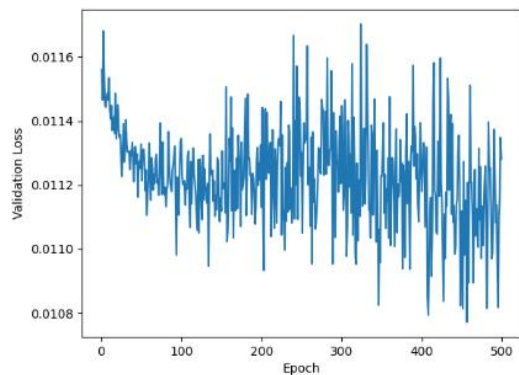
+ One Output Node

Performance

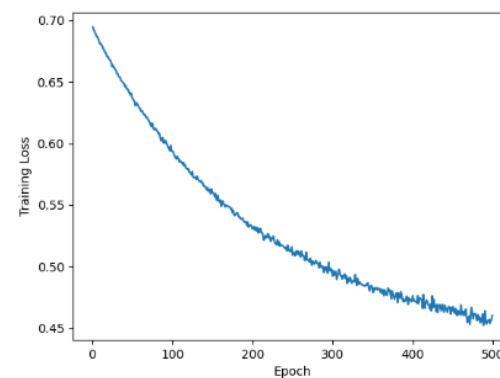
I Model



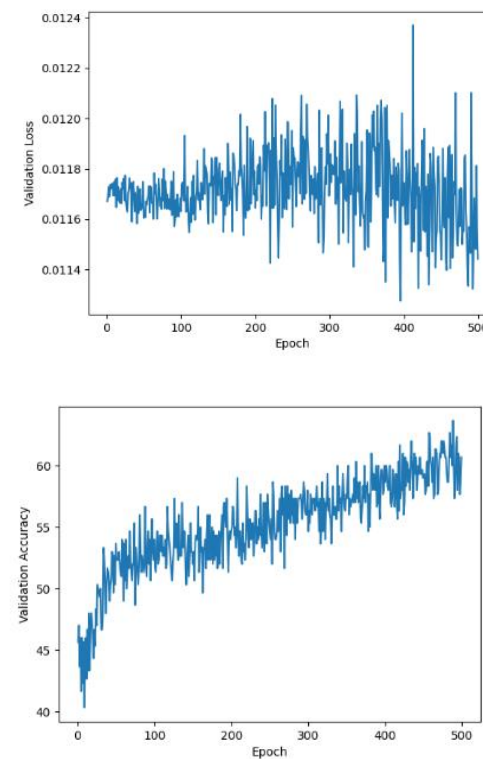
- + 500 epochs
- + Preprocessing



- + 500 epochs
- + Preprocessing
- + Augmentation + Cropping



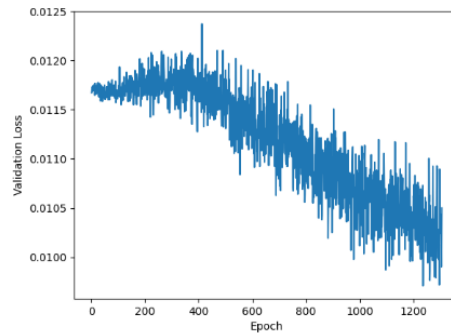
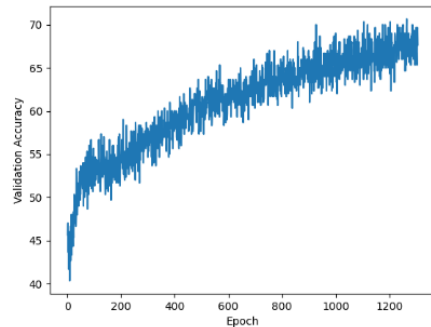
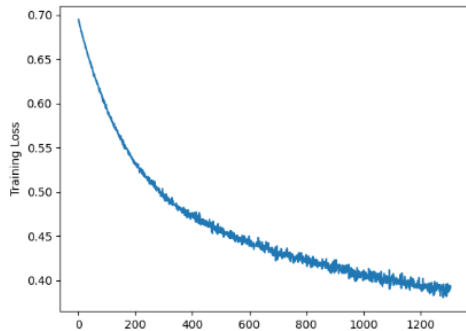
II Model



Performance

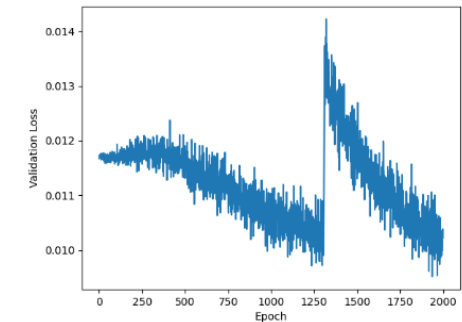
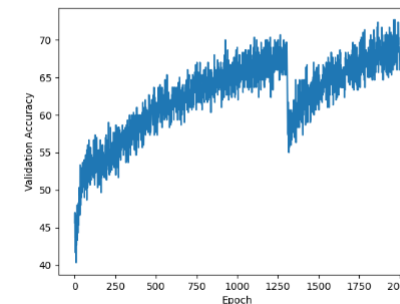
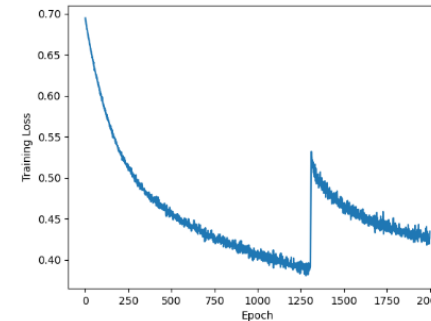
III Model
(II Model + 800 epochs)

- + 1300 epochs
- + Preprocessing
- + Augmentation + Cropping



IV Model
(III Model + 700 epochs
whole images)

- + 2000 (1300 + 700) epochs
- + Preprocessing
- + Augmentation + Cropping



Further Steps

Continue training while the
model still learns.



Use oversampling methods to
deal with dataset imbalance.



Experiment with other feature
extraction methods.

