

EARLY DETECTION OF LEUKEMIA IN CHILDREN

(IMAGE CLASSIFICATION WITH NEURAL NETWORKS)



BY PATRICK ANASTASIO

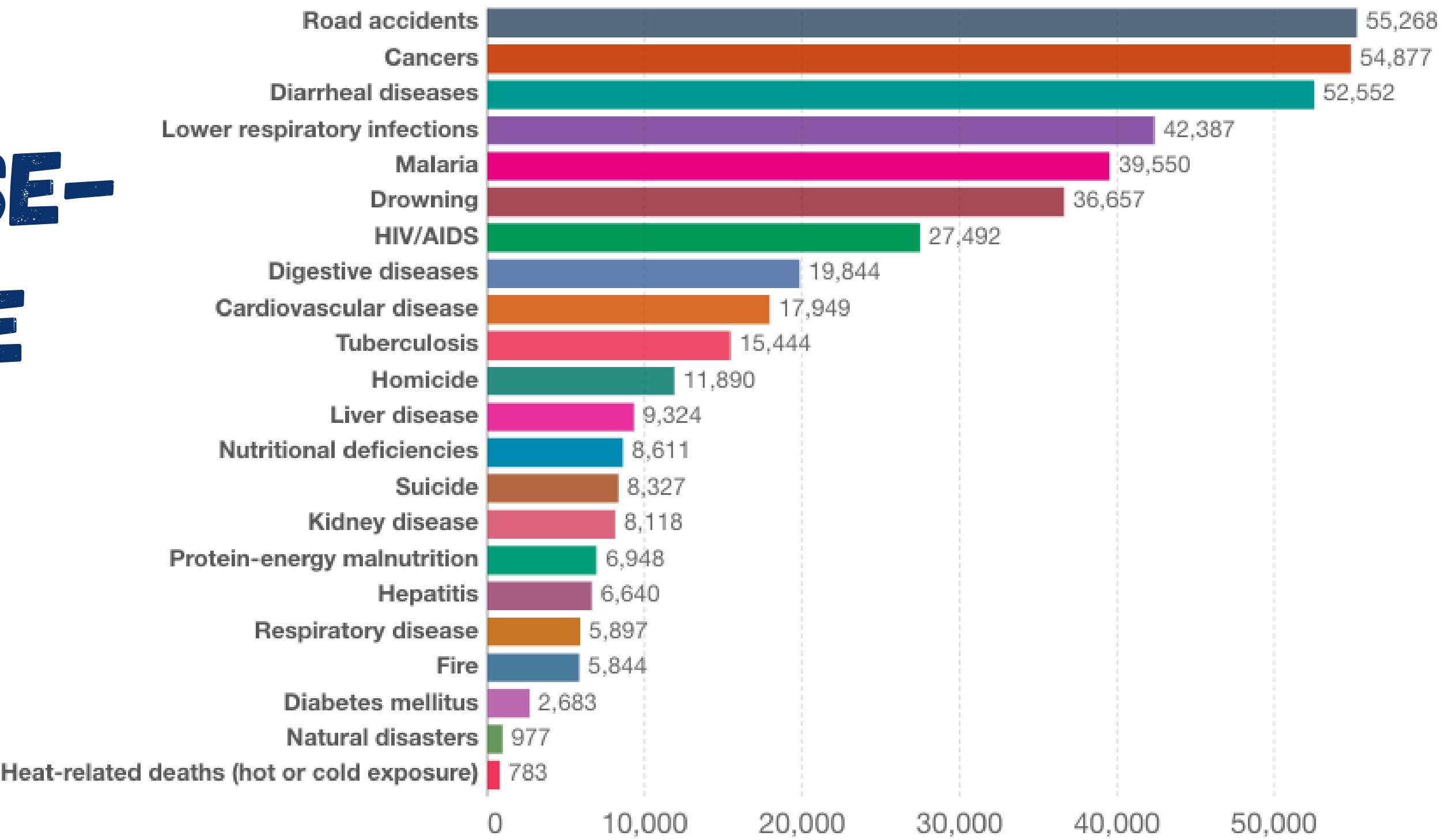
BUSINESS UNDERSTANDING

CANCER IS THE
LEADING DISEASE-
RELATED CAUSE
OF DEATH IN
CHILDREN
AGED 5 TO 14.

Causes of deaths for children between 5 and 14, World, 2019

Annual number of deaths – by cause – for children between 5 and 14 years old.

Our World
in Data

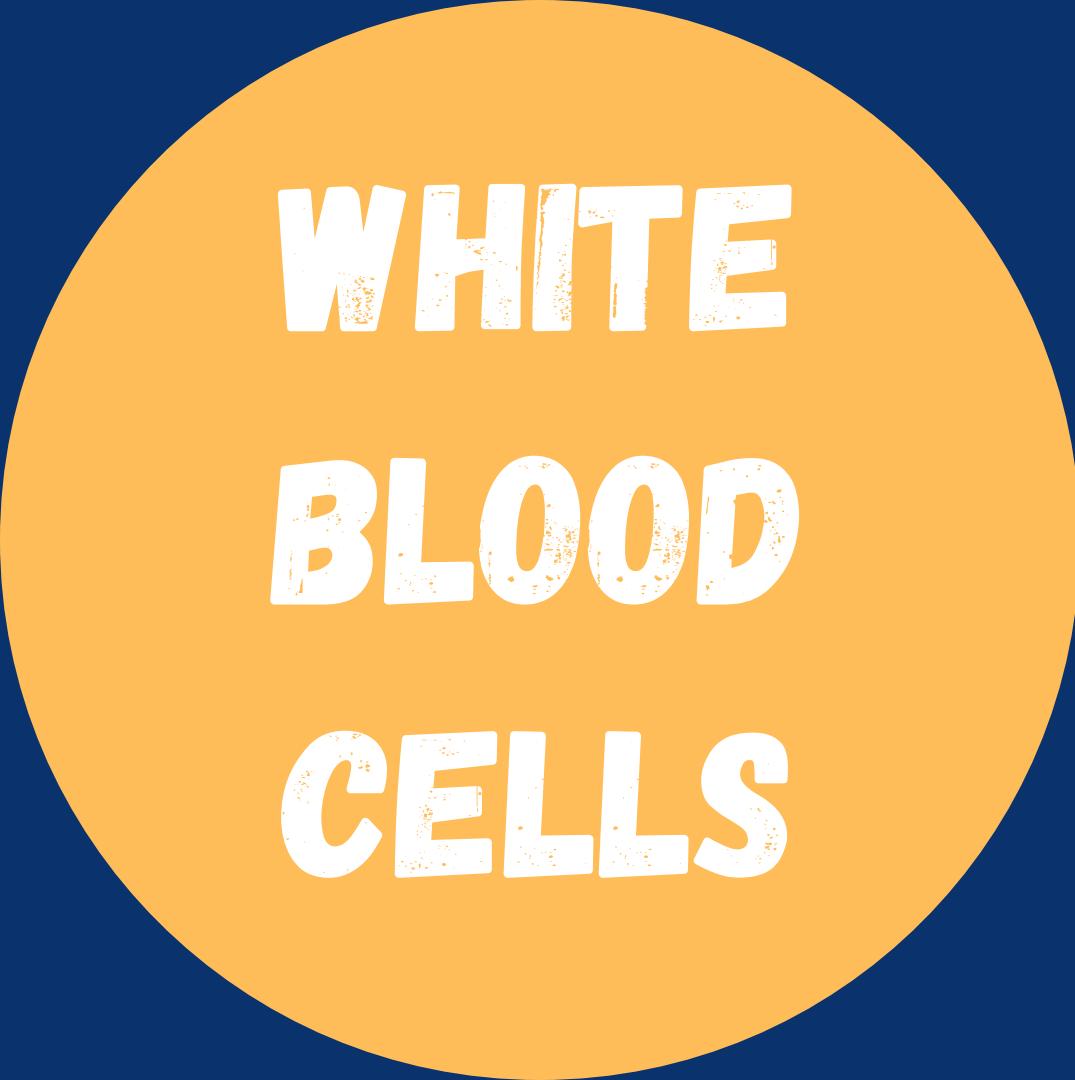


BUSINESS UNDERSTANDING

- LEUKEMIA IS THE MOST PREVALENT FORM OF CANCER IN CHILDREN, 75% IS ACUTE LYMPHOBLASTIC LEUKEMIA (ALL).
- SURVIVAL RATE IS DIRECTLY CORRELATED WITH EARLY DETECTION.
- A MODEL THAT CAN ACCURATELY IDENTIFY LEUKEMIA WILL ENHANCE THE MEDICAL PROFESSION'S ABILITY TO DIAGNOSIS AT AN EARLY STAGE AND ALLEViate HUMAN ERROR.



BLASTS



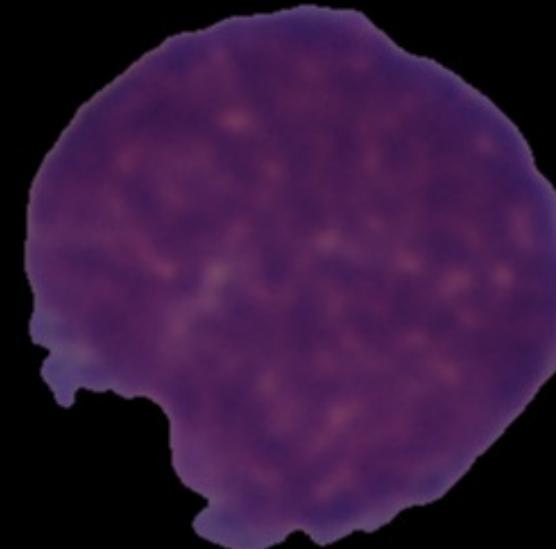
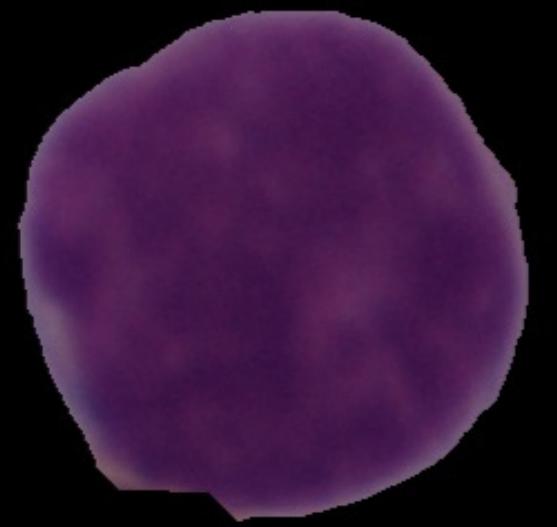
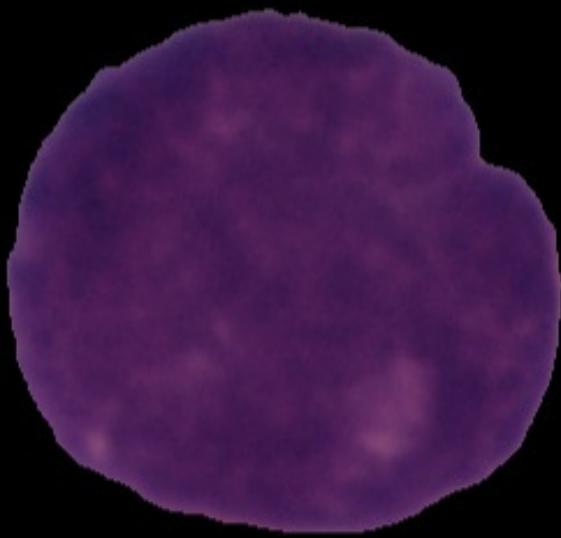
**WHITE
BLOOD
CELLS**

THE DATA

- ALL MANIFESTS ITSELF AS IMMATURE WHITE BLOOD CELLS CALLED LYMPHOBLASTS, OR JUST "BLASTS."
- THE DATASET CONSISTS OF IMAGES OF WHITE BLOOD CELLS TAKEN FROM DIAGNOSED CHILDREN AS WELL AS HEALTHY CHILDREN

**THE DATASET COMES FROM THE
CANCER IMAGING ARCHIVE**

DATA EXAMPLES



THE METHOD

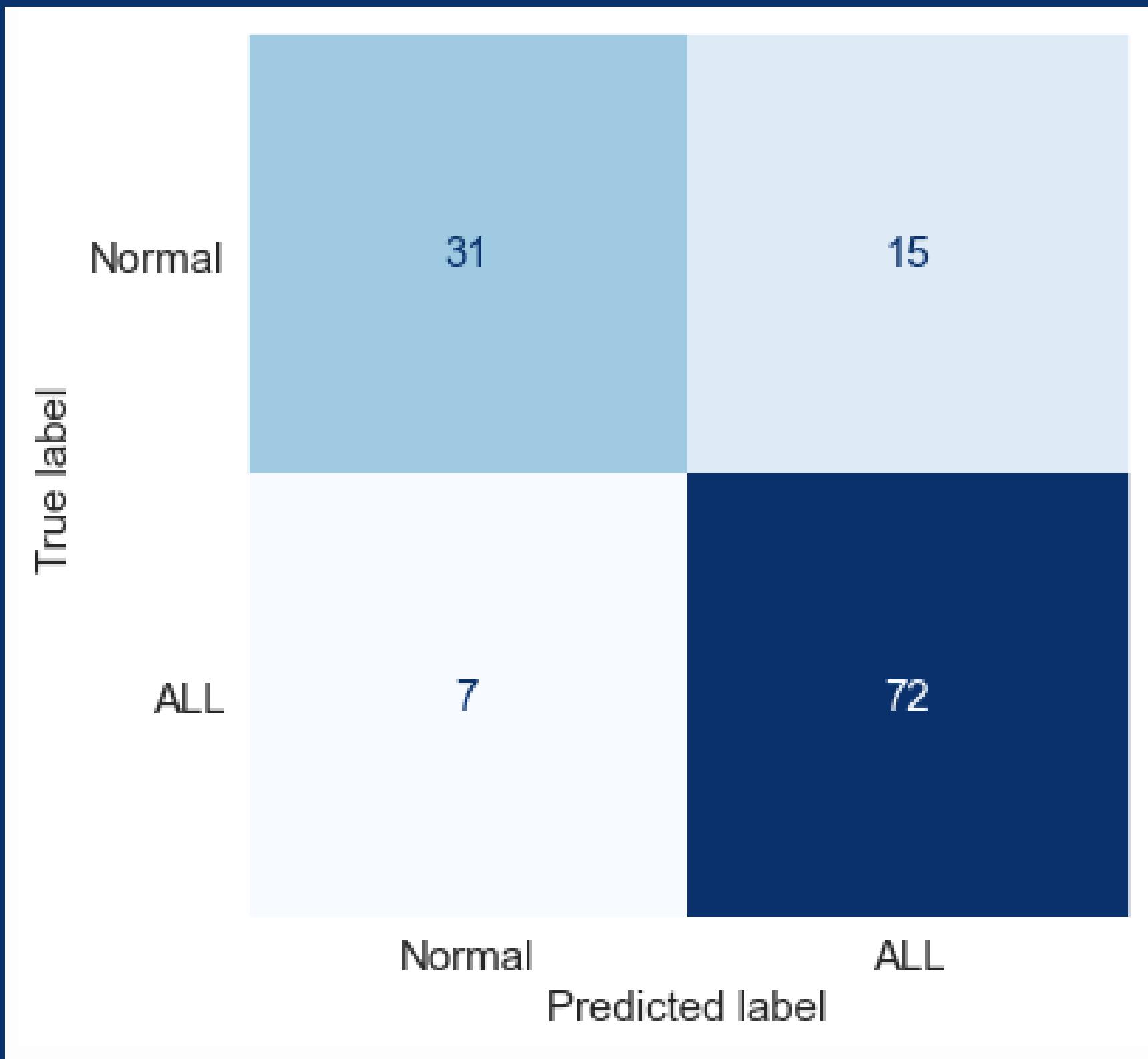
- PREPROCESSING DATA USING TENSORFLOW
- BALANCING THE DATASET AND RANDOMLY AUGMENTING IMAGES FOR OPTIMAL MODEL TRAINING
- ITERATING THROUGH VARIOUS NEURAL NETWORK MODELS TO MAXIMIZE PREDICTION RECALL

MEASURING

- **FALSE NEGATIVE:**
 - **LABELING A CANCEROUS CELL AS NORMAL**
- **FALSE POSITIVE:**
 - **LABELING A NORMAL CELL AS CANCEROUS**

WE ARE LOOKING TO MINIMIZE
FALSE NEGATIVES AND MAXIMIZE
THE **RECALL METRIC**

FINAL RESULTS



91.1%
Recall

82.4%
Accuracy

INTERPRETATION

- THE USE OF DROPOUT LAYERS AND REGULARIZATION RESULTED IN POORER PERFORMING MODELS.
- THE USE OF MORE DEEP LAYERING RESULTED IN POORER SCORING MODELS.
- THE IMAGES WERE OF TINY CELLS WITH OUT MANY DEEP FEATURES, SO ADDING DEEPER LAYERS WAS JUST CREATING NOISE.

RECOMMENDATIONS

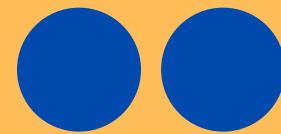
● A CONCERTED EFFORT MUST BE MADE TO ANALYZE WHITE BLOOD CELLS IN CHILDREN FOR EARLY DETECTION OF LEUKEMIA

● IMAGE CLASSIFICATION CAN CUT DOWN ON HUMAN ERROR AND AID HEALTHCARE PROFESSIONALS IN RECOGNIZING & DIAGNOSING LEUKEMIA

FURTHER STEPS



**FURTHER TUNE THE MODEL'S CONVOLUTIONAL LAYERS TO IMPROVE
RECALL AND ACCURACY... (I.E. ACTIVATION FUNCTIONS, # OF NODES)**



**APPLY IMAGE FILTERS SUCH AS THE LAPLACIAN OPERATOR FOR
DEEPER FEATURE RECOGNITION**



**EXPLORE DIFFERENT POOLING, NORMALIZATION AND
REGULARIZATION, AS WELL AS TUNING PRE-TRAINED MODELS**

WEBAPP

Q & A

THANK YOU

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