

# **EARLY DETECTION OF LEUKEMIA IN CHILDREN**

**(IMAGE CLASSIFICATION WITH NEURAL NETWORKS)**



**BY PATRICK ANASTASIO**

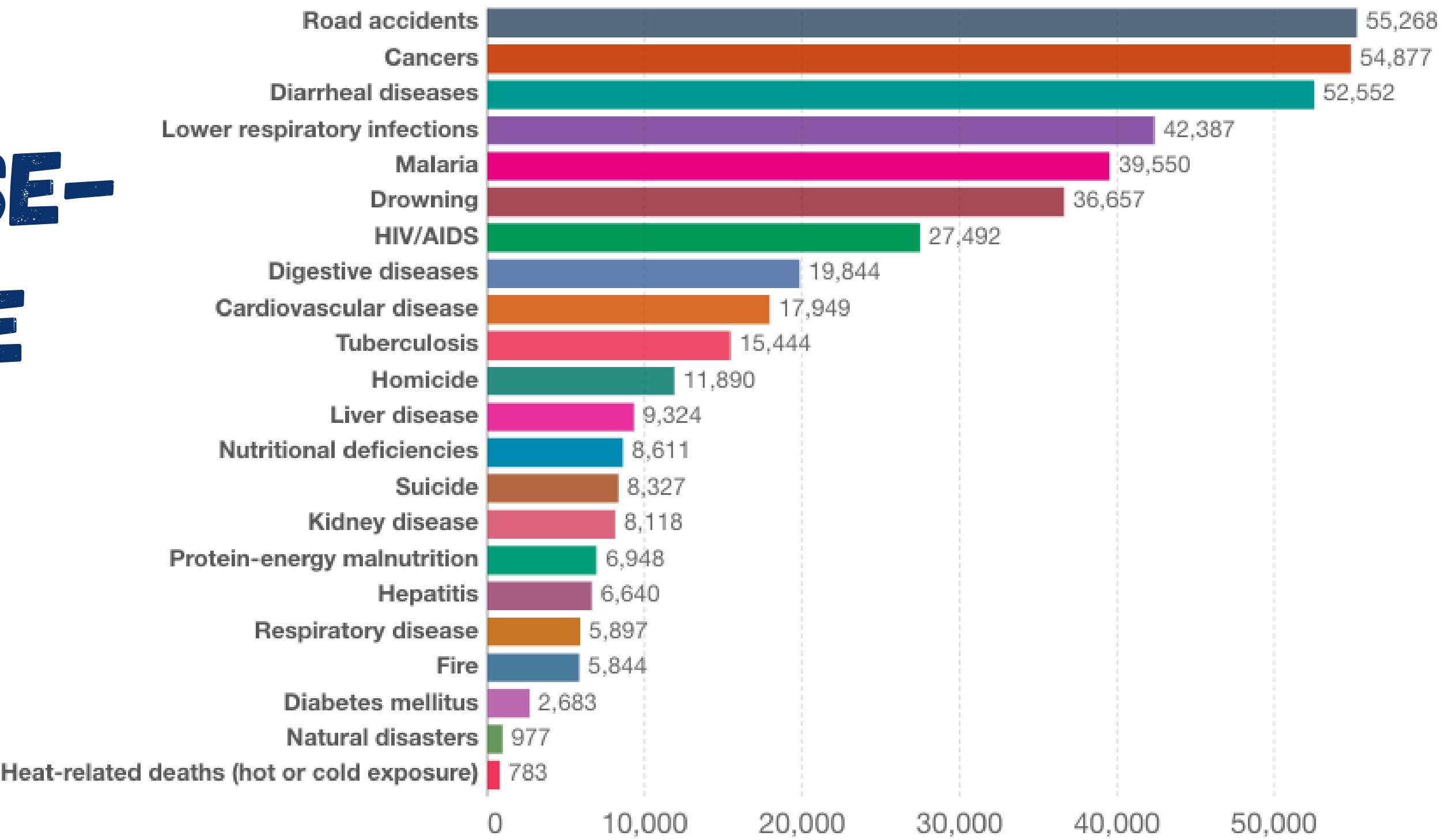
# BUSINESS UNDERSTANDING

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

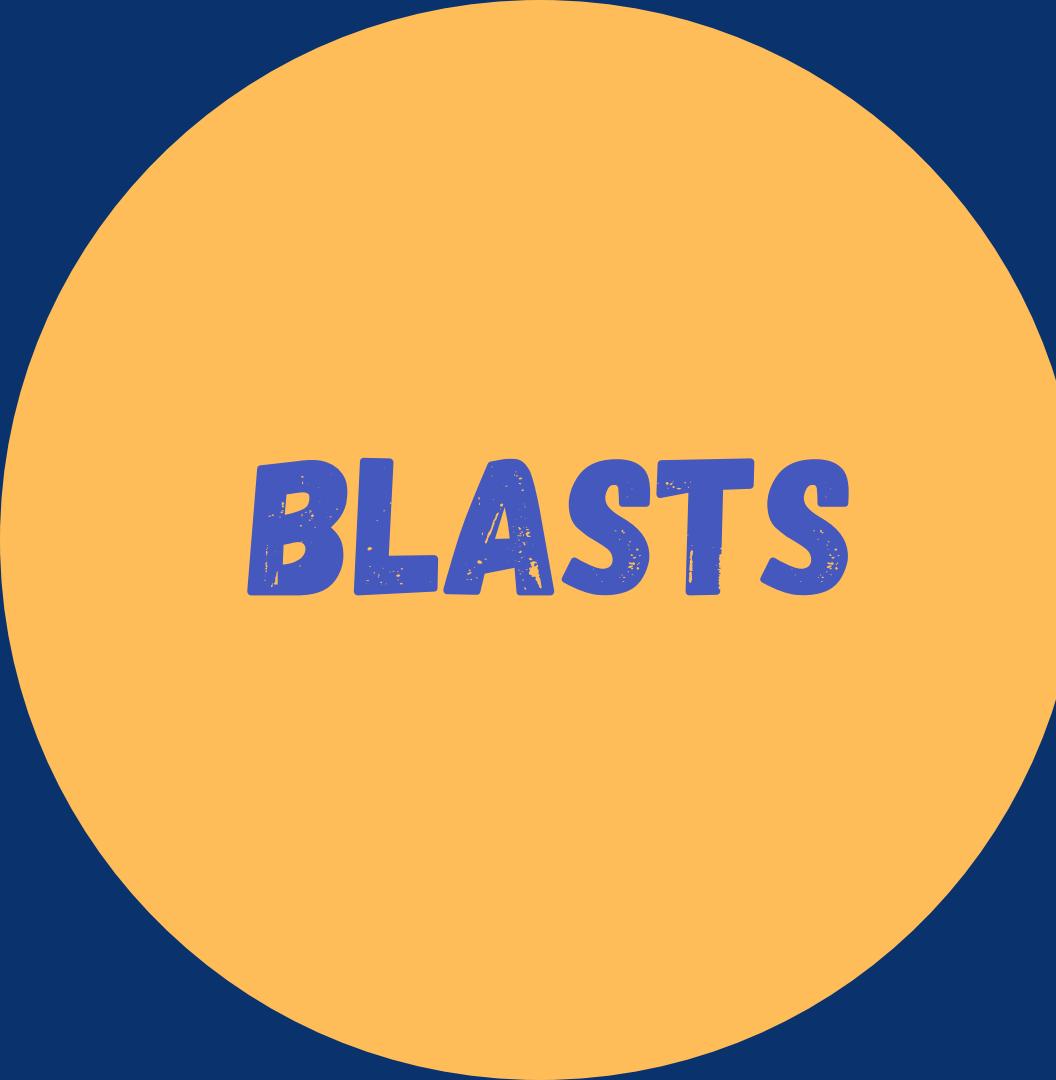
Annual number of deaths – by cause – for children between 5 and 14 years old.

Our World  
in Data

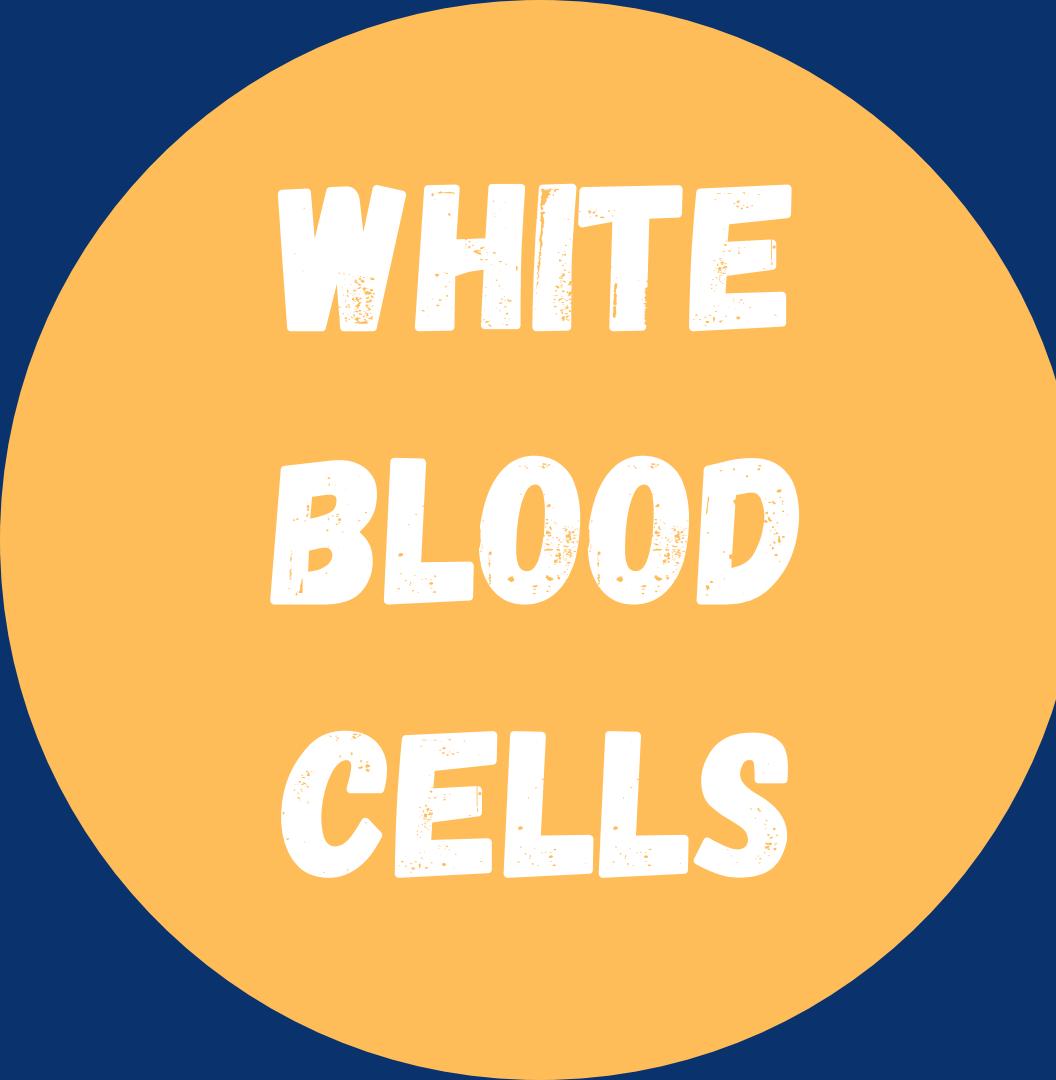


# BUSINESS UNDERSTANDING

- 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**



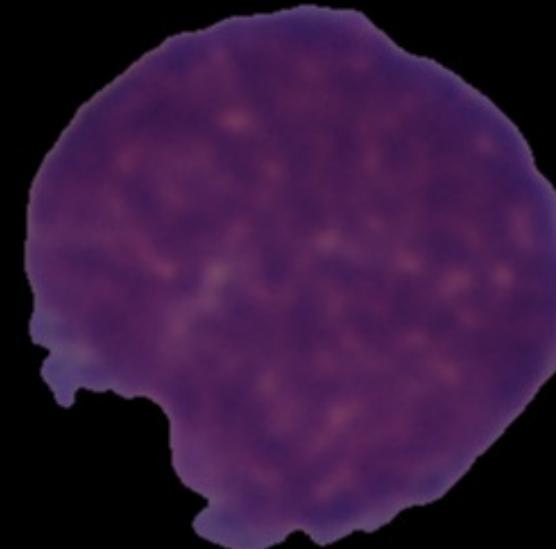
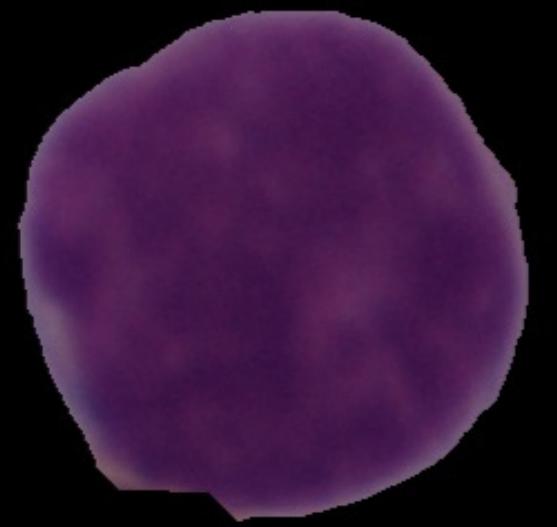
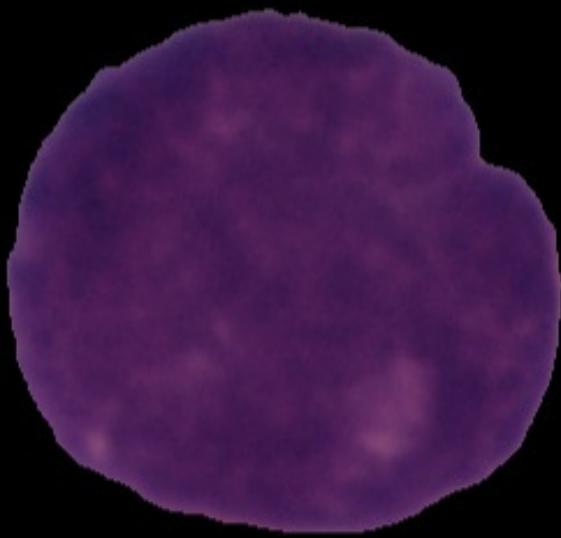
**WHITE  
BLOOD  
CELLS**

# 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

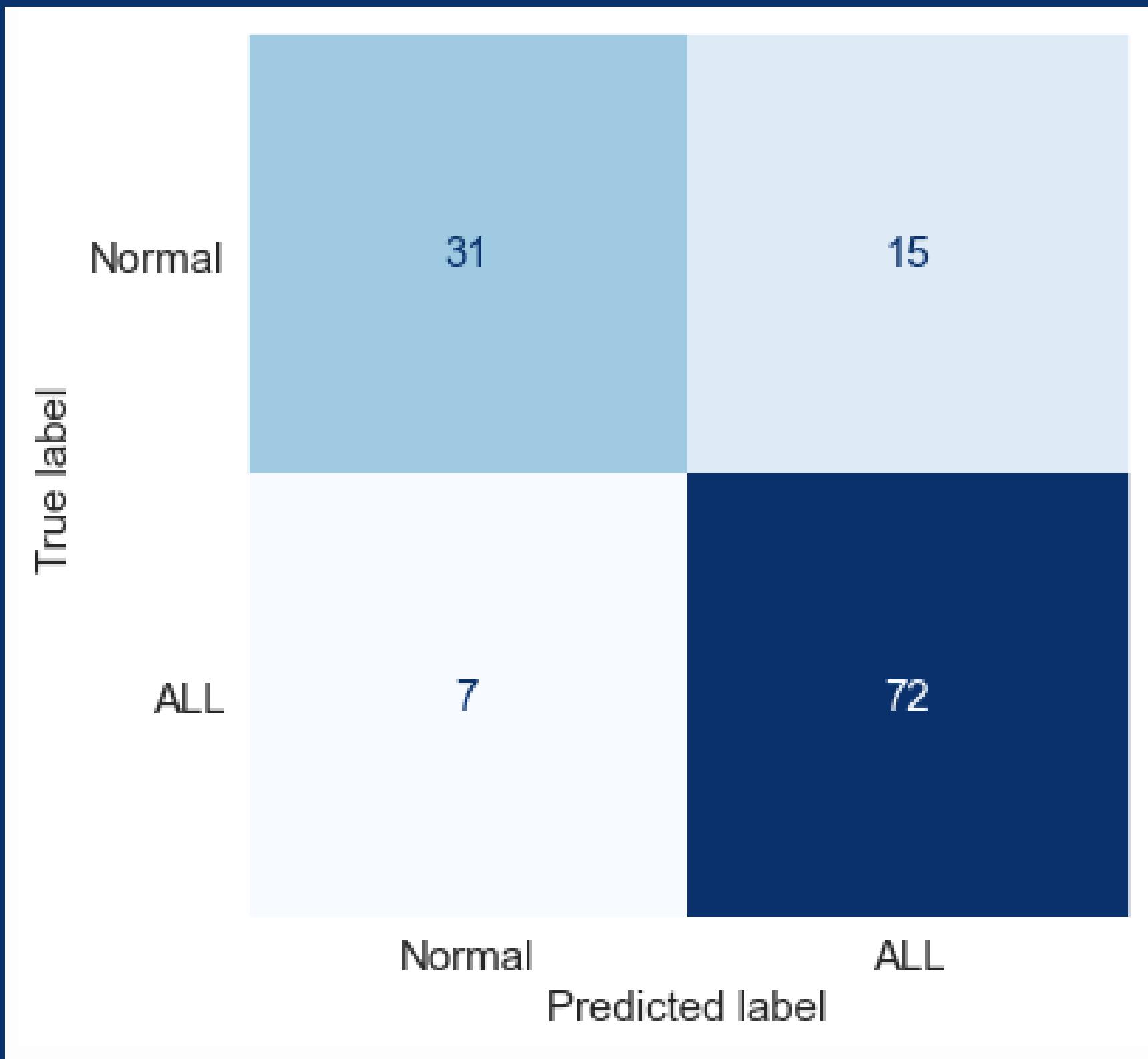
- PREPROCESSING DATA USING TENSORFLOW
- BALANCING THE DATASET AND RANDOMLY AUGMENTING IMAGES FOR OPTIMAL MODEL TRAINING
- ITERATING THROUGH VARIOUS NEURAL NETWORK MODELS TO MAXIMIZE PREDICTION RECALL

# 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**

# RECOMMENDATIONS

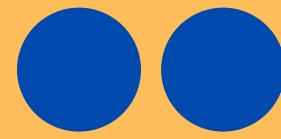
● A CONCERTED EFFORT MUST BE MADE TO ANALYZE WHITE BLOOD CELLS IN CHILDREN FOR EARLY DETECTION OF LEUKEMIA

● 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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