

# **CAPSTONE PROJECT :**

## **MALARIA DETECTION**

### **DEEP LEARNING**

EMINE BAYAR CILINGIR



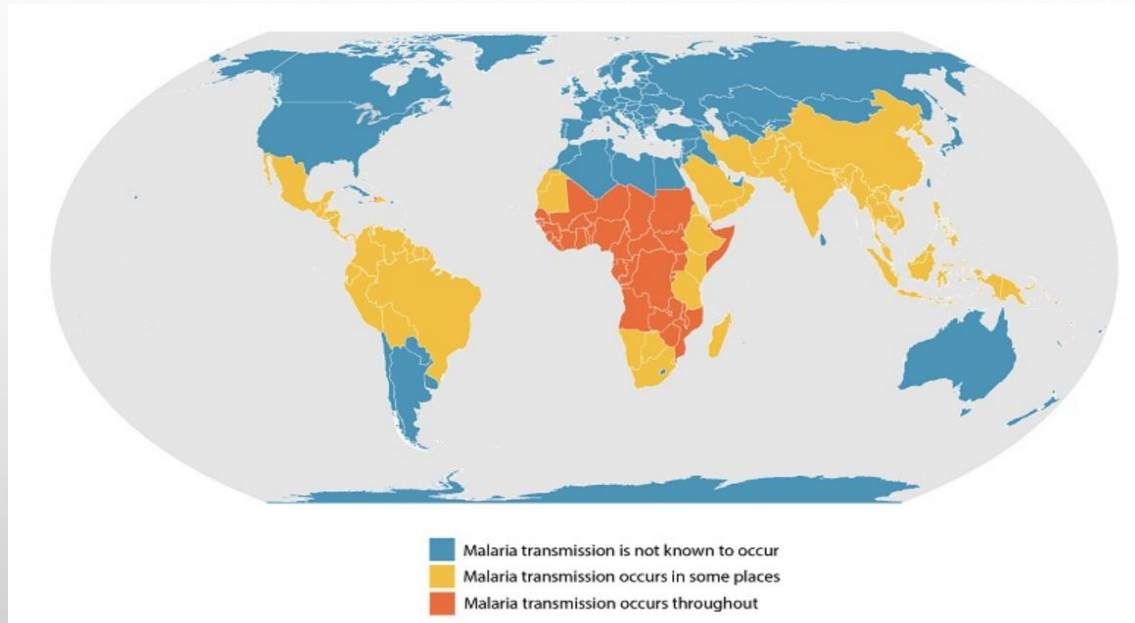


# AGENDA

- OVERVIEW OF THE PROBLEM
- APPROACH FOR THE SOLUTION
- KEY FINDINGS & INSIGHTS
- RECOMMENDATIONS AND NEXT STEPS

# OVERVIEW OF THE PROBLEM

## What is Malaria?



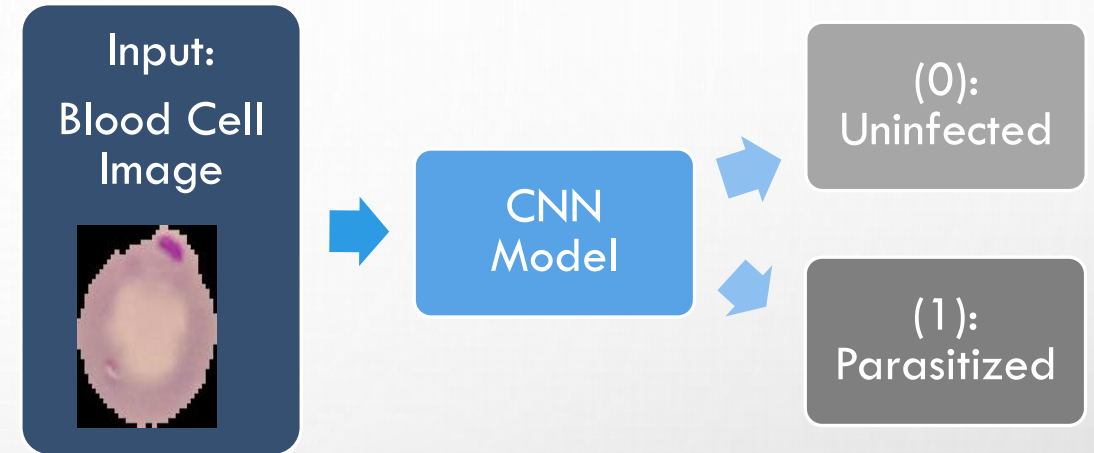
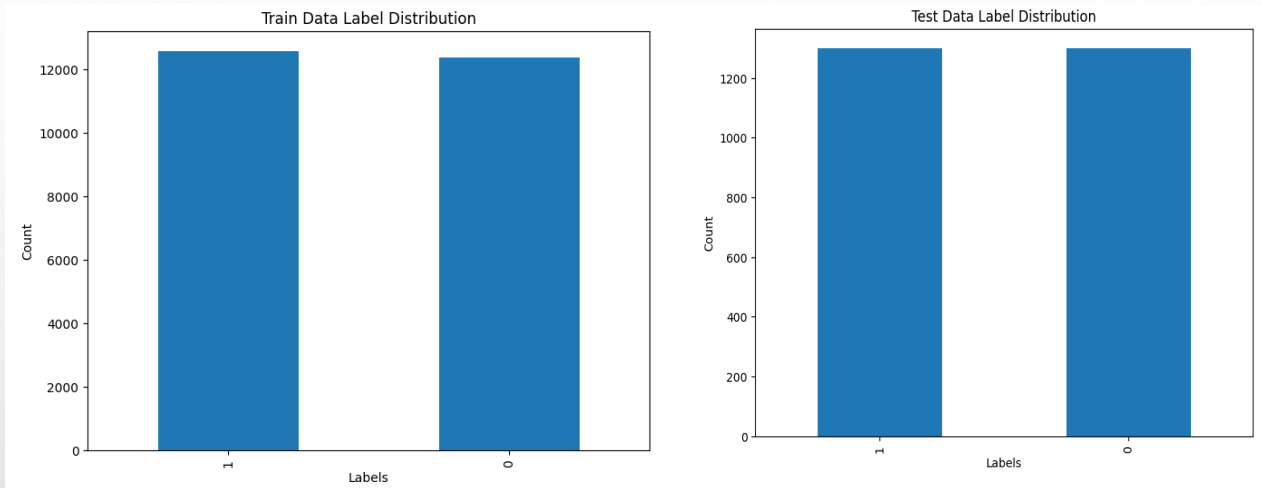
- **Malaria mostly transmitted in tropical regions.**
- **Disease caused by the bite of infected mosquitoes.**
- **In 2021, nearly half of the world's population was at risk of malaria. There were ~247 million cases of malaria worldwide and 619 thousand of death.**

## How to Detect Malaria?



- **Rapid Diagnostic Test (RDT) : Rapid and Cheap**
  - All positive RDT should be followed by Microscopy
- **Microscopy:** Slow, requires skilled lab technicians
  - In developed countries, this tests are not done frequently so error risk is high.

# APPROACH FOR THE SOLUTION

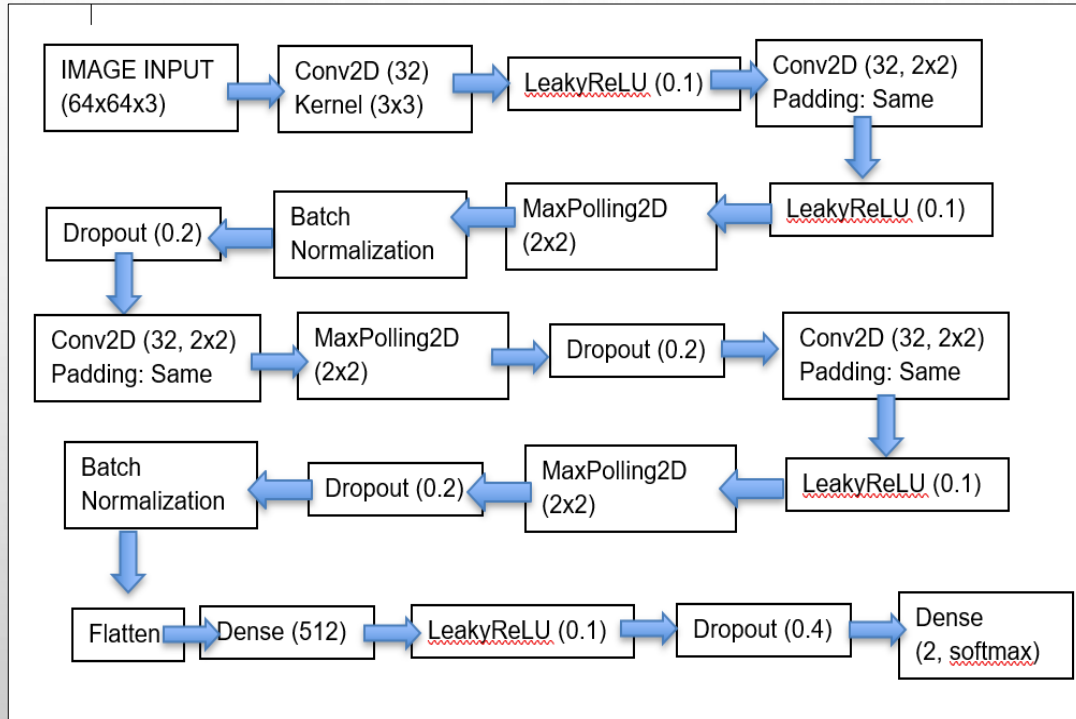


- 24,958 Train and 2,600 Test images.
- In total 27,558 images.

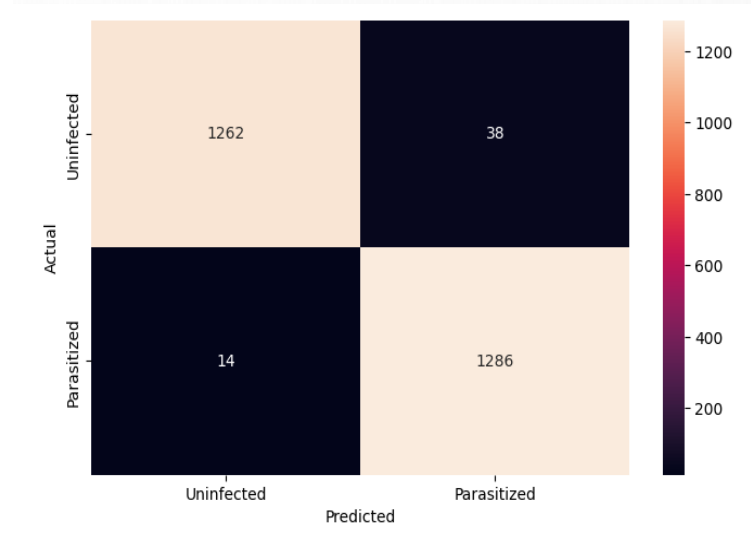
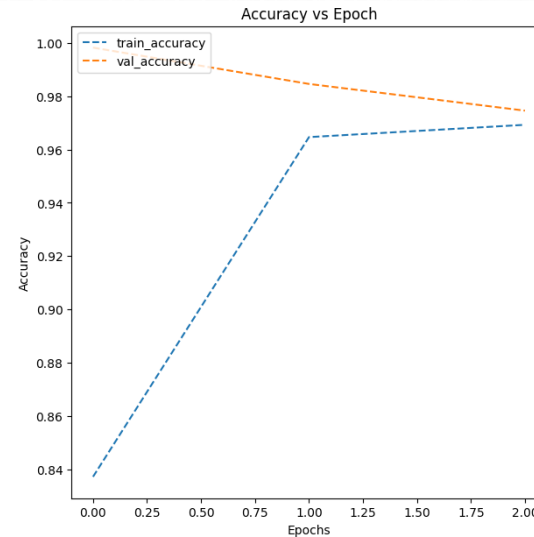
Model #	About CNN Models	Test Accuracy	False Negatives
Base Model	Base	0.99	17
Model 1	Add new layers	0.97	19
Model 2	LeakyReLU and Batch Normalization	0.98	14
Model 3	Data Augmentation	0.98	26
Model 4	Pre-Trained Model (VGG16)	0.97	46



# KEY FINDINGS & INSIGHTS

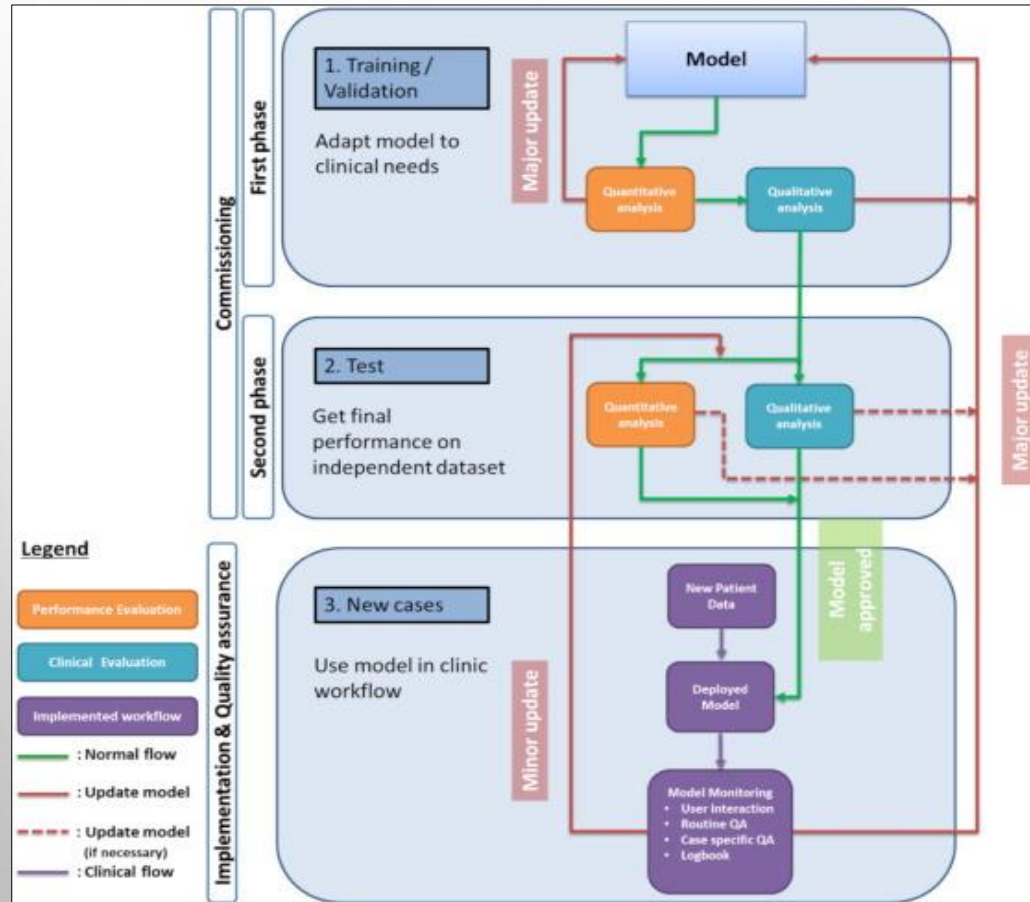


Suggested Model 2 Layers and Filters



- The test accuracy rate is 98% (f1-score is 0.98). Loss rate is 0.09.
- Above are confusion matrix and accuracy plot.
  - Test accuracy merging with the train accuracy as epochs progress.
  - False Negatives: 14 out of 1300
  - False Positives: 38 out of 1300

# RECOMMENDATIONS AND NEXT STEPS



Recommended Implementation Flow

## Key actions for stakeholders:

- Physicians and Data Scientist work together for an end-to-end testing

## Expected Benefits:

- Faster, Lower Cost, Standard result delivery

## Expected Costs:

- Annual accuracy assessment

## Key Risks and Challenges:

- Room for Improvement (False Negatives and False Positives)

## Further Improvements:

- Data sharing agreements among clinics to access more images

**THANK YOU**

QUESTIONS ?

