PROCESSING AND CLASSIFICATION OF MICROSCOPIC IMAGES

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Introduction

The subject of our project is the processing and classification of microscope images, and accordingly, the classification of classes varies according to the picture used and the equipment used. Then the classification of the data on the internet and the classification of the examples in the experimental applications are made.
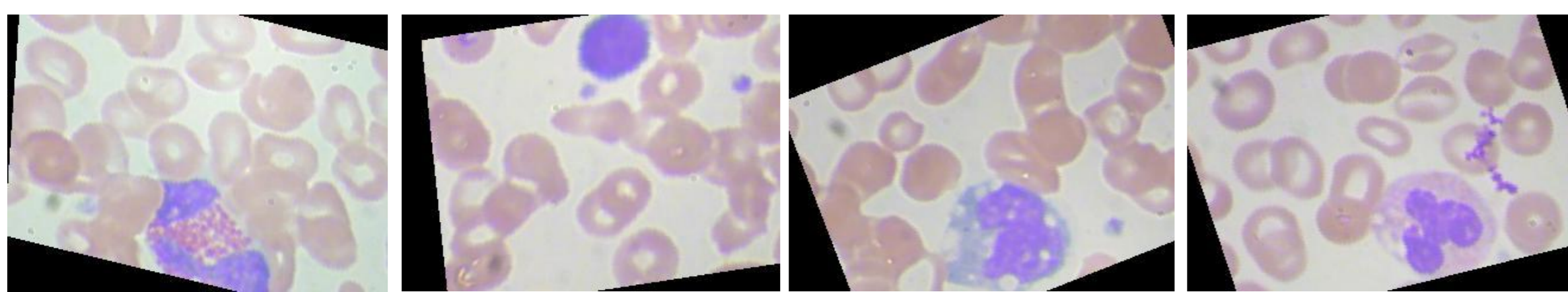
Methodology

It began with research and dataset analysis. The team selected an internet-sourced blood cell dataset and applied CNN classification for deep learning. In the second stage, they used a self-purchased microscope to examine various samples. They created a classification group for different onion varieties (onions, green onions, red onions). Images of these onions were taken at different zoom levels (x100, x400, x1200) and classified using CNN.

Internet Based Classification

The dataset of white blood cells was selected appropriately as the internet-sourced dataset. The number, structure and shape of leukocytes in the blood structure allow us to obtain clinically important information.

This dataset contains 12,500 augmented images of blood cells (JPEG) with accompanying cell type labels (CSV). There are approximately 3,000 images for each of 4 different cell types grouped into 4 different folders (according to cell type). The cell types are **Eosinophil, Lymphocyte, Monocyte, and Neutrophil**.

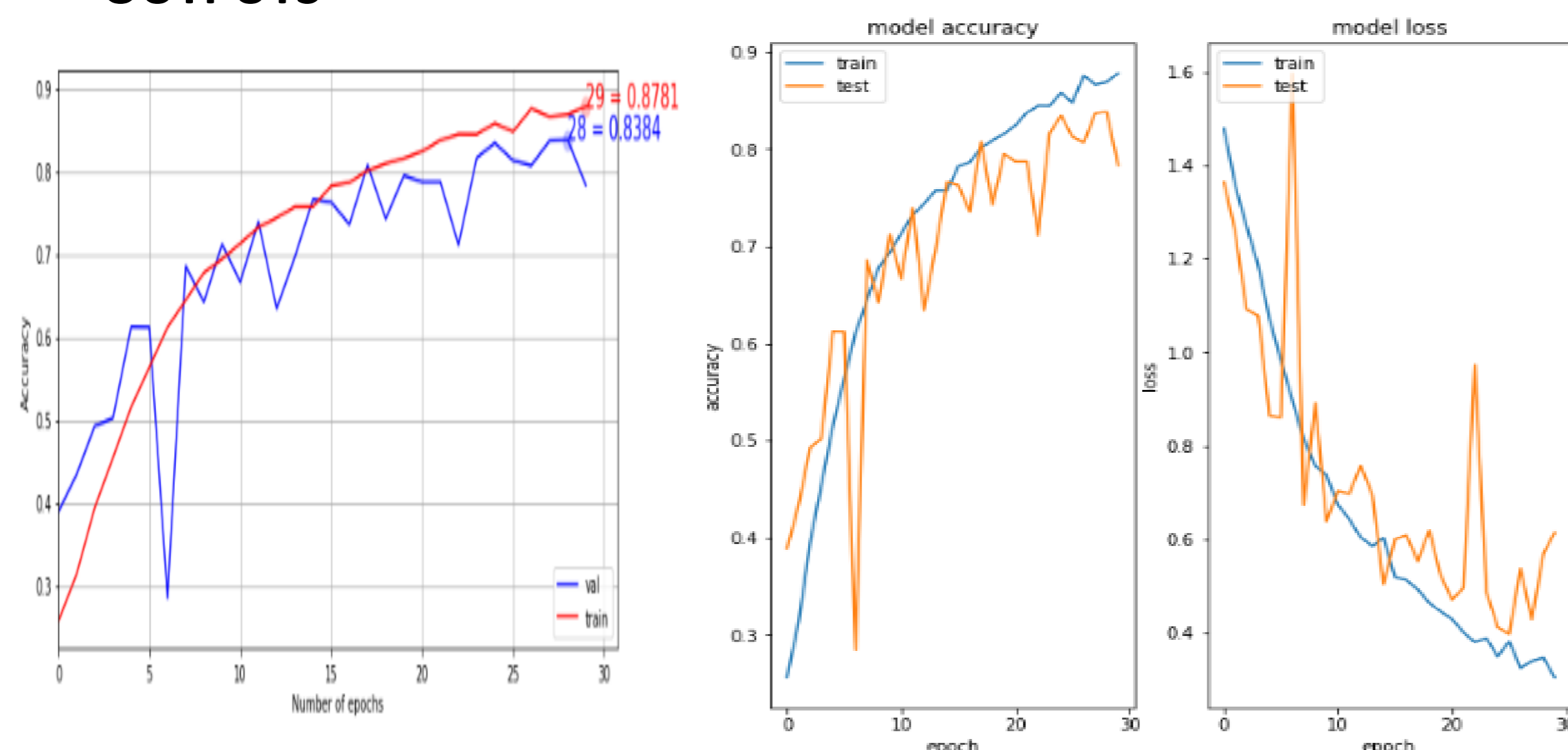**Convolutional Neural Network (CNN)**
CNN is an artificial neural network model inspired by biological visual systems. It is used in tasks such as image processing and image recognition.

METHOD:
Code trains and evaluates a CNN for image classification using Keras. It:
1. Imports Keras, Matplotlib, NumPy, and scikit-learn.
2. Defines a custom Keras callback for saving training metrics.
3. Provides functions for visualizing training metrics, confusion matrices, and learning curves.
4. Performs model training and evaluation.
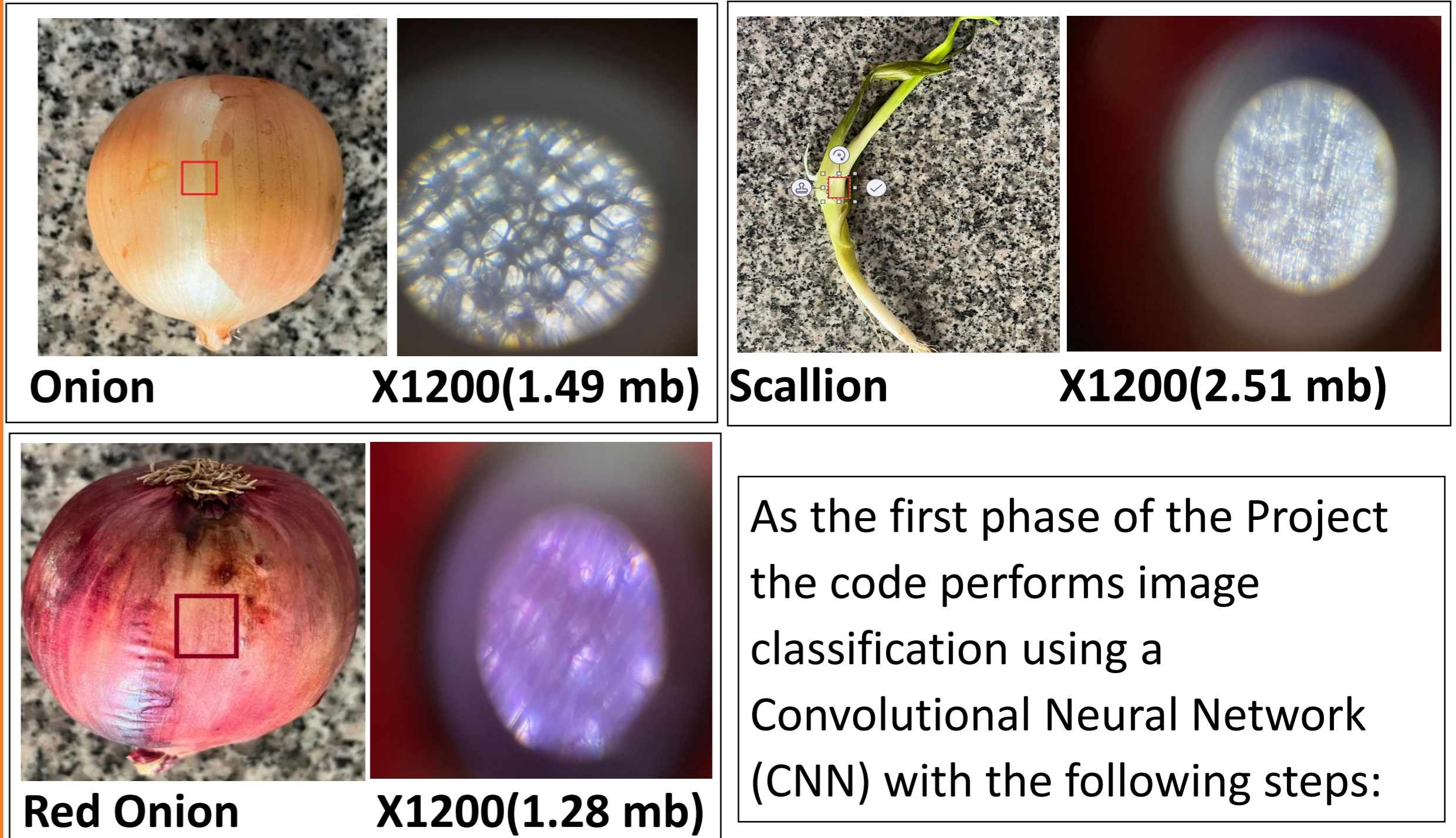5. Includes visualization steps.

OUTPUTS

Experiment Based Classification

Jwin JM-452M Mobile Compatible Microscope Kit

• 3-stage magnification (100x/400x/1200x), easy image acquisition with the lighting unit with 10 different experimental materials, sharpening with fine and coarse adjustment, transfer to phone with mobile device, magnifies objects up to 1200 times.
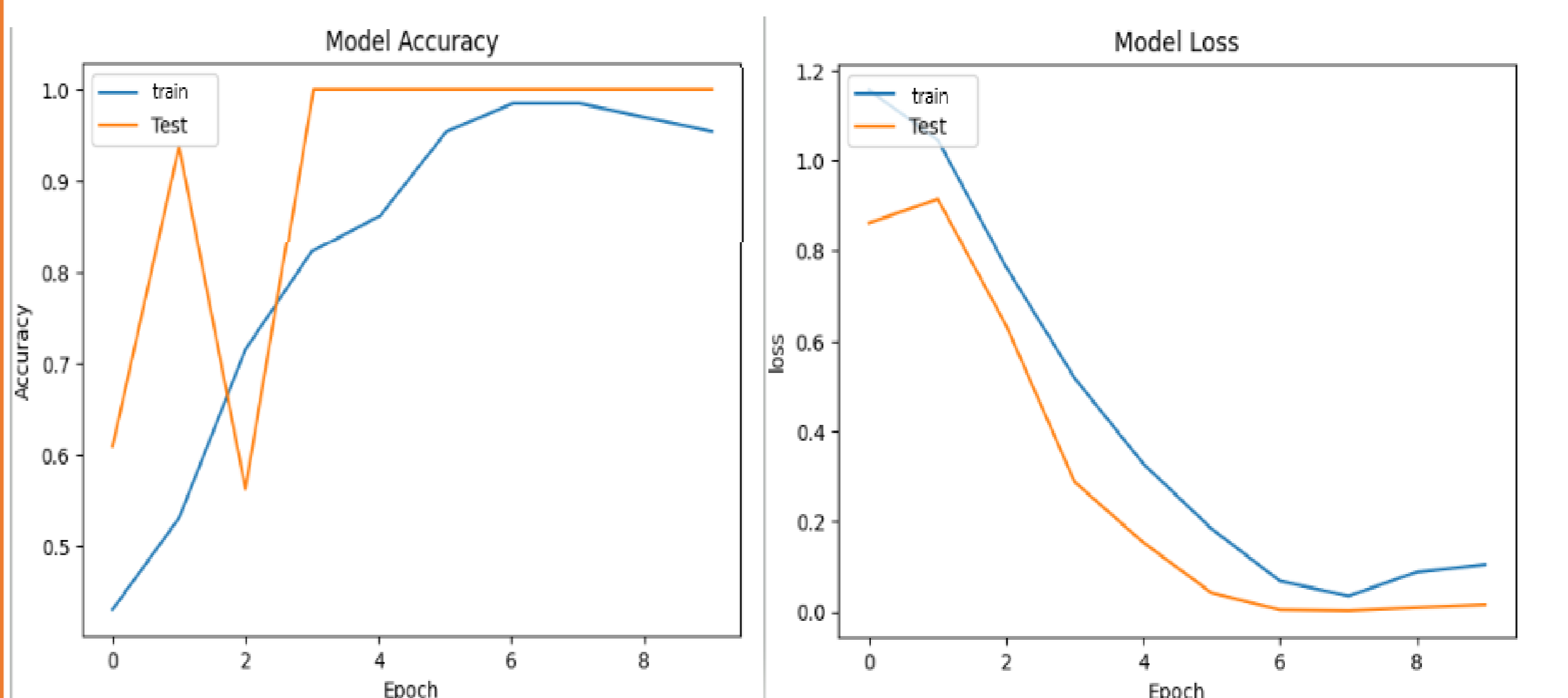
Onion Skin Dataset

| **Onion** | X1200(1.49 mb) | **Scallion** | X1200(2.51 mb) |

Red Onion X1200(1.28 mb)

As the first phase of the Project the code performs image classification using a Convolutional Neural Network (CNN) with the following steps:

1. Import deep learning and evaluation libraries.
2. Set data parameters and paths.
3. Apply data augmentation.
4. Create data generators.
5. Build CNN model.
6. Train and validate.
7. Visualize training stats.
8. Evaluate using confusion matrix & report.

OUTPUTS

References

- https://www.kaggle.com/datasets/paultimothymooney/blood-cells