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Faculty of Computers and Artificial Intelligence

Computer Science Department

2021/2022

**CS 396 Selected Topics in CS-2**

**Research Project**

Report Submitted for Fulfillment of the Requirements for Selected Topics in CS-2 course for Spring 2022

Team ID No. 21

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**Paper Details:**

**Paper title:** Blood Cell Types Classification UsingCNN.

Authors Name: Ishpreet Singh, Narinder Pal Singh, Harnoor Singh, Saharsh Bawankar and Alioune Ngom.

Publisher Name : Springer, Cham

Publish Year: 2020

# Dataset used in the paper : Identify white Blood Cell Subtypes

# Algorithm : Multiclassification using CNN

# Dataset link : <https://www.kaggle.com/code/khurramabbas/identify-white-blood-cell-subtypes-from-images/log>

# Results:

# 10 epochs:

# Training loss :0.85 (high loss)

# Validation loss :0.82 (high loss)

# Testing loss:0.80 (high loss)

# Training accuracy :64.5%

# Validation accuracy :66.9%

# Testing accuracy :66.98%

# 100 epochs

# Training loss :0.165

# Validation loss :0.17

# Testing loss:1.02

# Training accuracy :93.48%

# Validation accuracy :93.5%

# Testing accuracy :80.9%

# 200 epochs

# Training loss :0.06

# Validation loss :0.11

# Testing loss:0.94

# Training accuracy :97.7%

# Validation accuracy :96.1%

# Testing accuracy :86%

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**Project Description:**

**1 – Selected dataset :**

## **Name:** [Raabin-WBC Data](https://www.testing.com/tests/complete-blood-count-cbc/)

**Link :** <http://dl.raabindata.com/WBC/Cropped_double_labeled/>

**Total number of samples : 14514**

**Train :** **10,175**

**Test:** **4,339**

**No of classes :** 5

**Classes :** Basophil  **,** Eosinophil , Lymphocyte , Monocyte and Neutrophil

**Image dimension :** 575 \* 575

**2 – Implementation Details :**

Training Ratio : 60% no of images : 9159

Testing Ratio : 30% no of images: 4339

Validation Ratio: 10% no of images: 1016

Model block diagram:

Input shape : 120 ,160 ,3

Total params: 16,741

Trainable params: 16,677

Non-trainable params: 64

Diagram

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**Hyper Parameters:**

**First Layer:**

(Convolution(16,5) , activation function -> relu, strides(2,2),inputs size shape(120,160,3) ,padding ((Input width) / (stride width) + 1.,(Input height) / (stride height) + 1.) , Dropout = 0.2)

**Second Layer:**

(Convolution(8,5) , activation function -> relu, strides(2,2),padding ((Input width) / (stride width) + 1.,(Input height) / (stride height) + 1.) , Dropout = 0.2)

**Third Layer:**

(Convolution(4,5) , activation function -> relu, strides(2,2),padding ((Input width) / (stride width) + 1.,(Input height) / (stride height) + 1.) , Dropout = 0.2)

**Fourth Layer:**

(Convolution(4,5) , activation function -> relu, strides(2,2),padding ((Input width) / (stride width) + 1.,(Input height) / (stride height) + 1.) , Dropout = 0.2)

**First Dense Layer:**

(Size of Dense Layer = 32,activation = relu, Dropout = 0.2)

**Second Dense Layer:**

(Size of Dense Layer = 16,activation = relu, Dropout = 0.2)

**Third Dense Layer:**

(Size of Dense Layer = 8,activation = relu, Dropout = 0.2)

**Output Dense Layer:**

(Size of Dense Layer = 5,activation = SoftMax)

Optimizer : RMSprop

Loss :categorical\_crossentropy

Metrics : accuracy

Results :

We trained our model for 100 epochs but it started to overfit after the epoch number 20 so we used early stopping function to stop after 20 more epochs and save the best model

So we stopped at 40 epoch and the best model was at 20 epoch so we used it.

Chart, scatter chart

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**Train loss : 0.23**

**Validation loss: 0.36**

**Train accuracy: 92.3%**

**Testing accuracy: 93.293%**

**Validation accuracy: 92.6%**

**Confusion Matrix :**

Chart

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**Classification Report :**

Table

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**Accuracy curve:**Chart, line chart

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**Loss curve :**

Chart, histogram

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