

## CS 396 Selected Topics in CS-2

### Research Project

Report Submitted for Fulfillment of the Requirements and ILO's  
for Selected Topics in CS-2 course for Fall 2021

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## • Paper Details

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Paper Name:

**Name:** Multi-Class Weather Classification Using ResNet-18 CNN for Autonomous IoT and CPS Applications.

**Paper Link:** <https://american-cse.org/sites/csci2020proc/pdfs/CSCI2020-6SccvdzjqC7bKupZxFmCoA/762400b586/762400b586.pdf>

**Publisher Name:**

International Conference on Computational Science and Computational Intelligence (CSCI)

Year of Publishing:

2020

Dataset used in paper: Weather Recognition dataset with 4 Classes

The implemented Algorithm: ResNet18

Results:

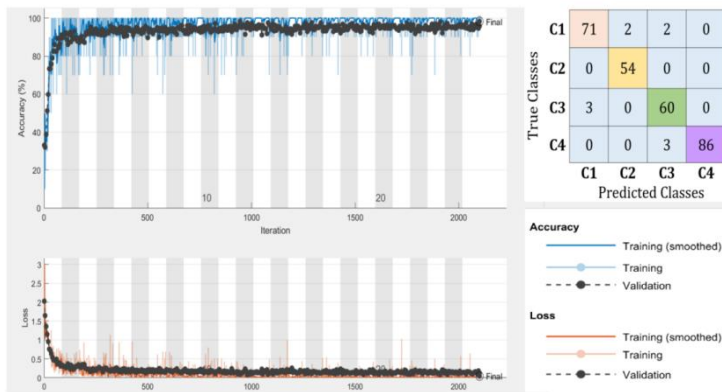


Fig. 8. (a) Training/Testing Accuracy/Loss vs. number of epochs (b) Confusion Matrix and Summary of Evaluation metrics

Research Method	/ Year	Accuracy (%)	Enhancement %
C. Zheng et. al.	[4] / 2016	94.00 %	≈ 105%
W. Chu, et. al.	[33] / 2017	96.30 %	≈ 102%
Z. Zhu et. al.	[34] / 2017	95.46 %	≈ 103%
Y. Shi et. al.	[35] / 2018	94.71 %	≈ 104%
L. Kang et. al.	[36] / 2018	92.00 %	≈ 107%
O. Luwafemi et. al.	[37] / 2019	86.00 %	≈ 114%
M. Ibrahim et. al.	[38] / 2019	97.69 %	≈ 101%
Y. Wang et. al.	[39] / 2020	81.25 %	≈ 121%
J. Xia et. al.	[40] / 2020	96.03 %	≈ 102%
<b>Proposed Model</b>	<b>/ 2020</b>	<b>98.22 %</b>	<b>—</b>

## • Project Description

### a. General Information on the selected dataset:

**Dataset name:** Weather Classification

**Link:** <https://www.kaggle.com/code/kamalkhumar/weather-classification-with-augmentation/data>

Total Number Of Samples in the dataset: 1500

**The Dimension of images:** ( 256,256,3)

**Number of Classes:**

There are 5 classes ['cloudy', 'foggy', 'rainy', 'shine', 'sunrise']

## B. Implementation details

we divided the dataset into train and validation(Testing) by ratio of 75% to the train data

**number of images in each:**

**train:**

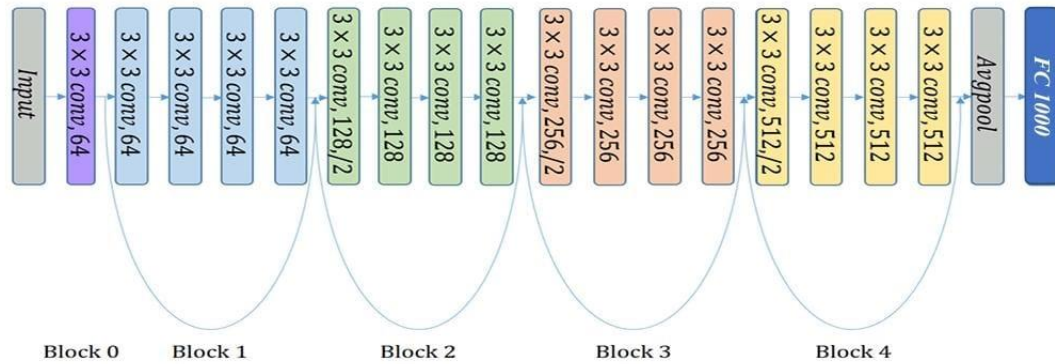
```
Training cloudy images are: 225
Training foggy images are: 225
Training rainy images are: 225
Training shine images are: 187
Training sunrise images are: 262
Total: 1124
```

**Validation(testing data):**

```
Valid cloudy images are: 75
Valid foggy images are: 75
Valid rainy images are: 75
```

Valid shine images are: 63  
Valid sunrise images are: 88  
Total:376

### Block Diagram:



Hyperparameters: stochastic Gradient Descent with momentum and decay

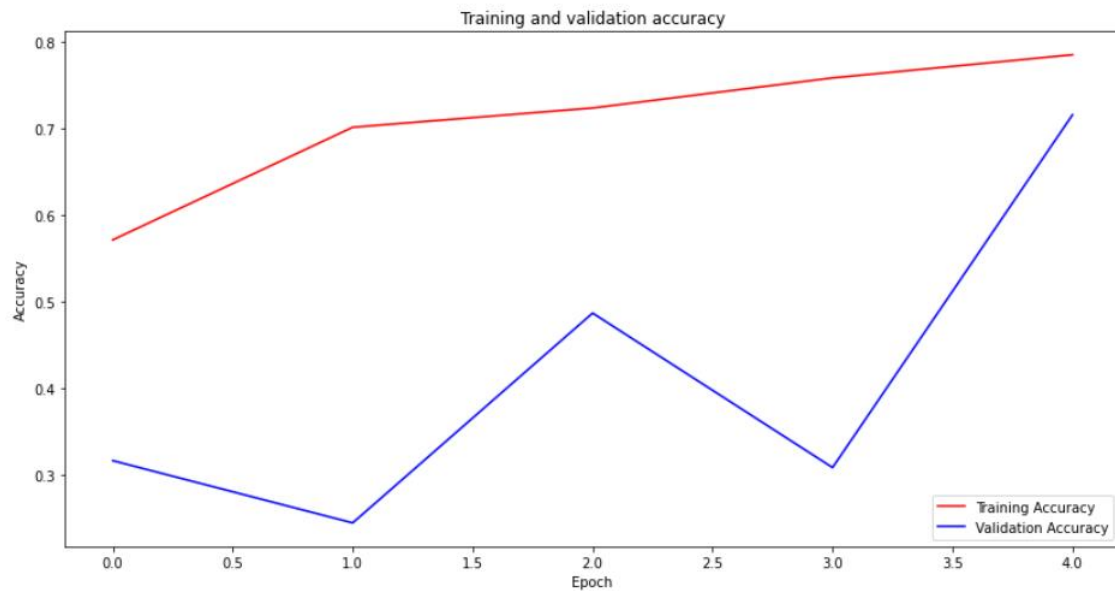
Optimizers: Adam

{ opt = SGD(learning rate=0.15,momentum=0.9,decay = 1e-04)}

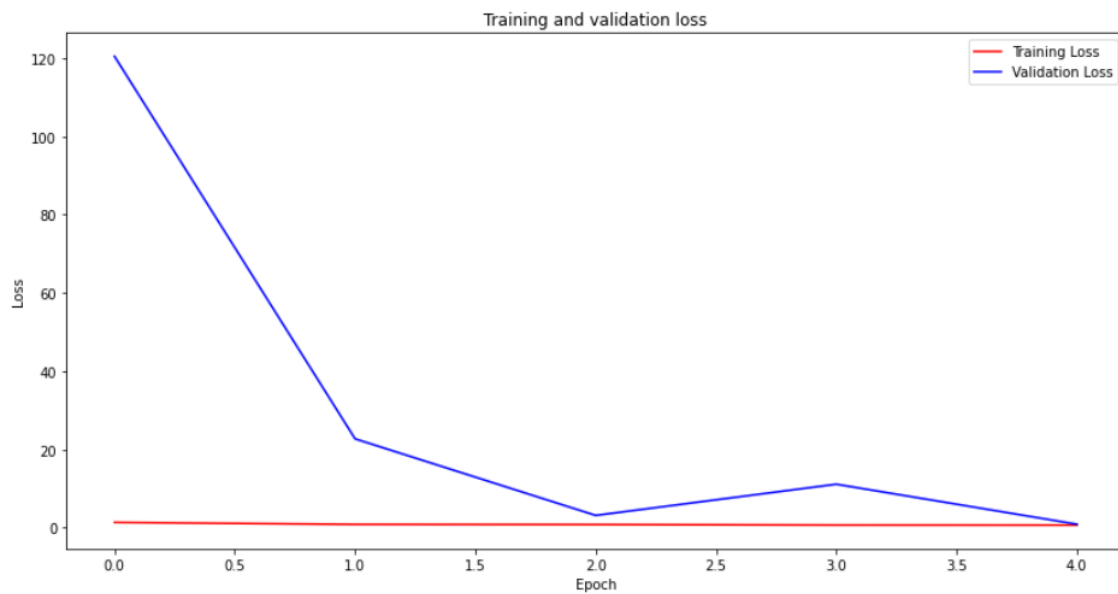
# Results Details:

## Learning Curves:

Accuracy:



Loss:



## Testing accuracy:

```
5]: ModelLoss, ModelAccuracy = model.evaluate(validation_generator)
print('Model Loss is {}'.format(ModelLoss))
print('Model Accuracy is {}'.format(ModelAccuracy))

24/24 [=====] - 3s 131ms/step - loss: 0.8675 - accuracy: 0.7154
Model Loss is 0.8675402402877808
Model Accuracy is 0.7154255509376526
```

## Confusion Matrix:

