Task 6 -week6

US Weather Events (2016 - 2022)

Names of the trainees: Safa Nasser, Areej Alnamlah , Nedaa Abuhussein

introduction!

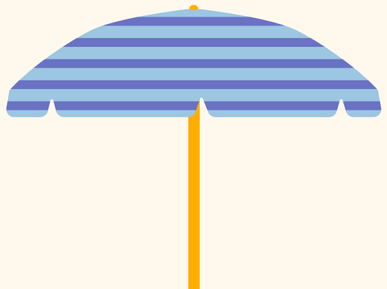
From 2016 to 2022, the US witnessed a variety of weather phenomena and weather events that affected the country's daily life, economy, and infrastructure from Hurricanes and tropical storms, especially in areas of the East Coast, flooding in some areas of the United States, and drought. Some areas were exposed to long and severe periods of drought during this period, which affected agricultural crops and fresh water supplies, and were exposed to snow storms, which disrupted movement, affected daily life, and increased temperatures. Many areas recorded unusual temperatures and were affected by some Unusual weather phenomena, such as hot air masses and heat waves

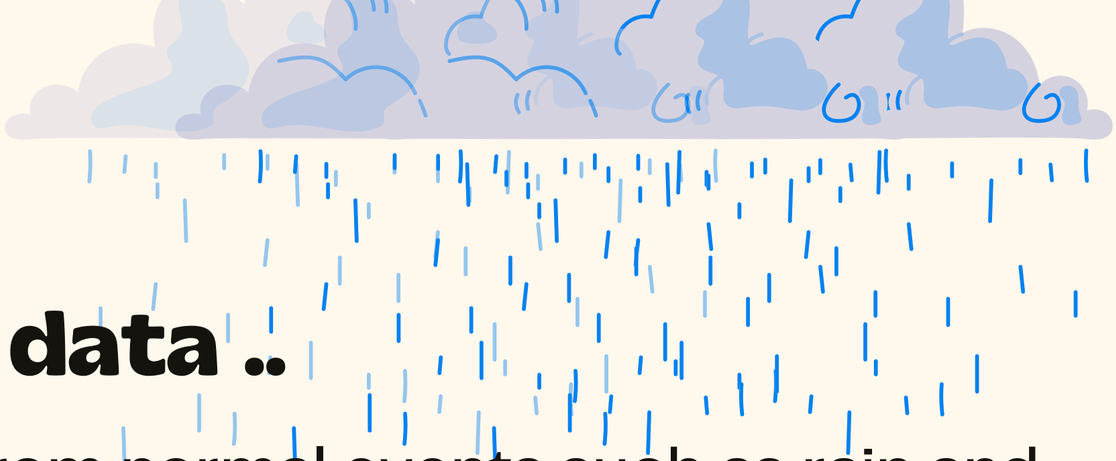
Source:

kaggle.com

About the data set.

This repository contains a comprehensive collection of weather events data across 49 states in the United States. The dataset comprises a staggering 8.6 million events, ranging from regular occurrences like rain and snow to extreme weather phenomena such as storms and freezing conditions. The data spans from January 2016 to December 2022 and is sourced from 2,071 airport-based weather stations nationwide



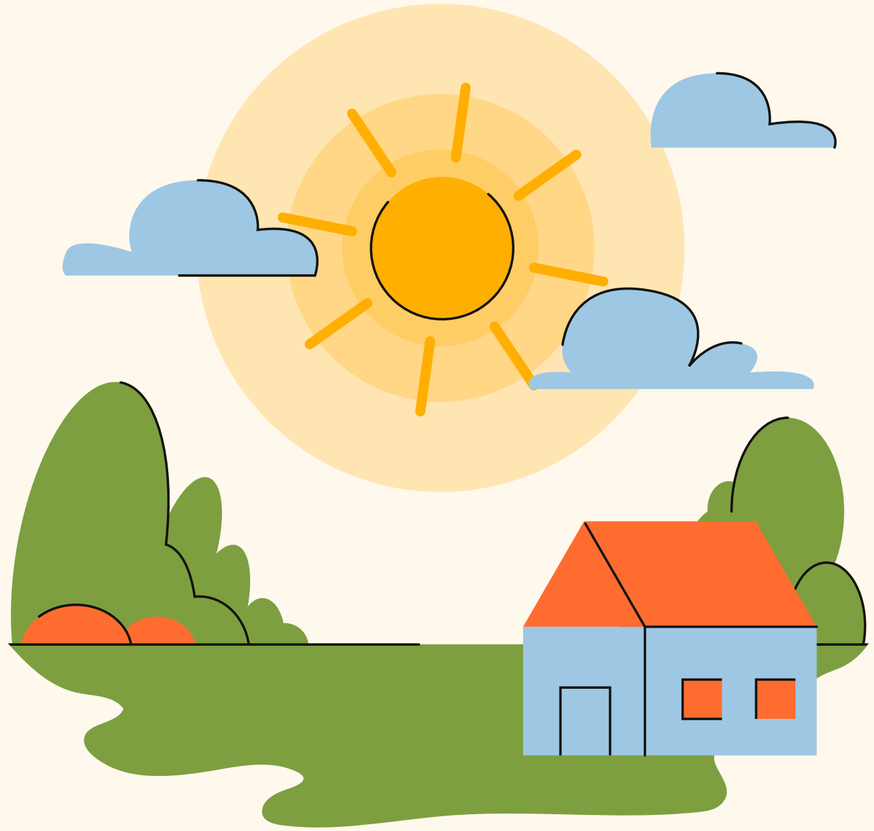


After cleaning the data ..

It was 14 columns ranging from normal events such as rain and snow to severe weather events such as storms and freezing conditions to... Event ID, type, intensity, start time, end time, precipitation, time panel, length and width of location, airport, city, county and state And zip code. Until we arrived after the cleaning process and deleted what we needed from the columns in the classification and training process, to reach 10 columns, and then we carried out several deep learning operations. on weather events from the years 2021 and 2022 based on the requirements, and Based on the requirements, we carried out classification operations. Based on the severity of weather conditions in our data

#categorical..

Building a model
with high accuracy to predict
the severity of weather events



What will we discuss? !

1

Overview of the neural network architectures experimented with, including their

2

Comparison of the performance of different neural network architectures and their hyperparameter-tuned versions

3

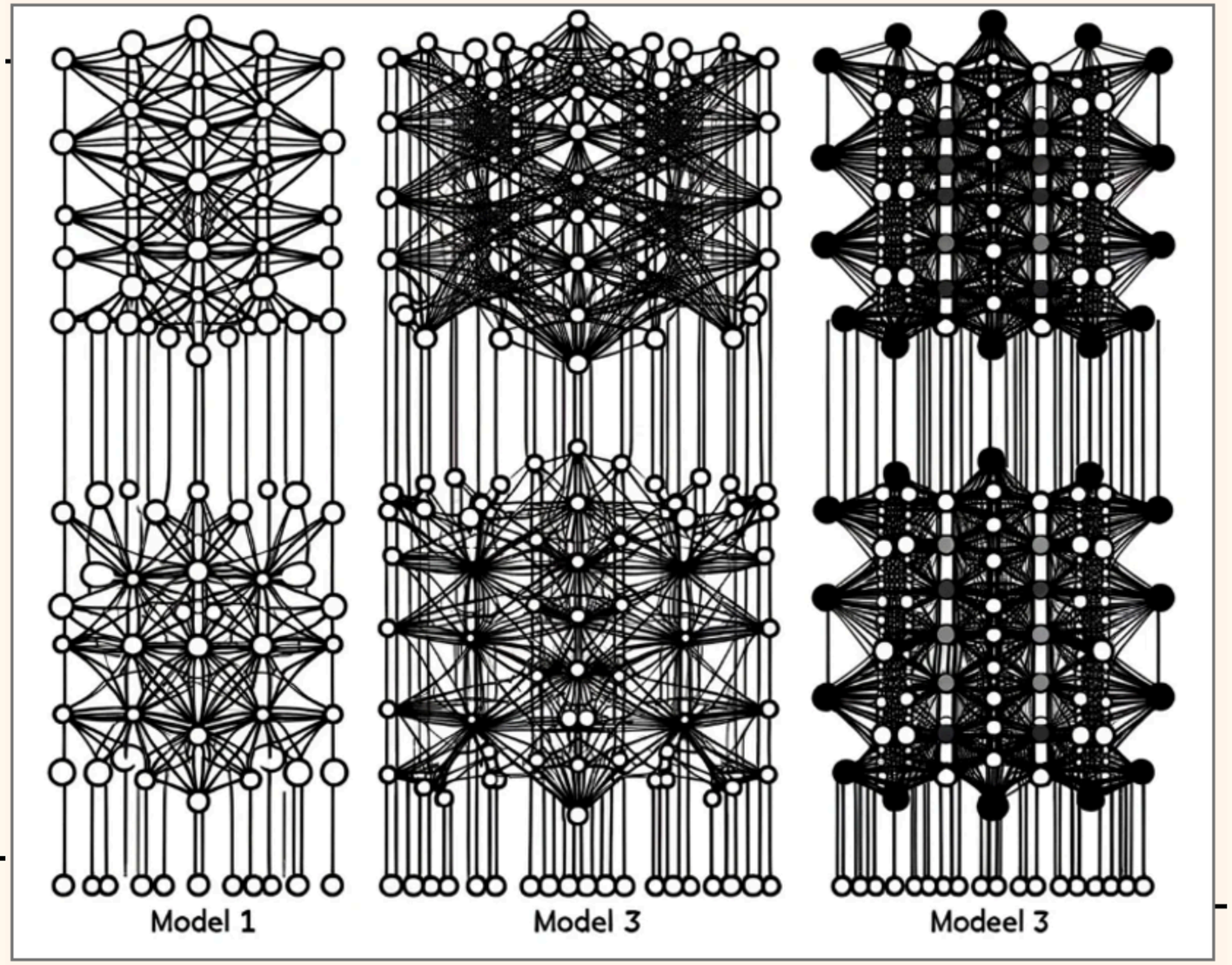
Discussion of overfitting in the neural network models and strategies employed to address it.

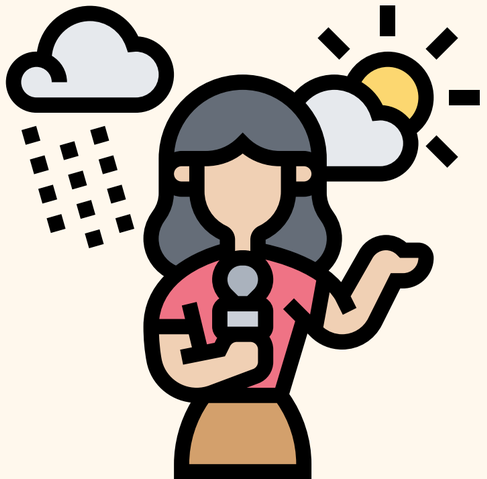
#Simple pattern recognition

The best model is Model 3 with validation accuracy :86.13%

Model 1 : two 64-neuron layers Complex patterns
Model 2 : 128 , 64- neuron layer More Complexed
Model 3 : multi-layered structure of 256, 128, and 64 neurons

#Architectures Overview





#Overfitting..

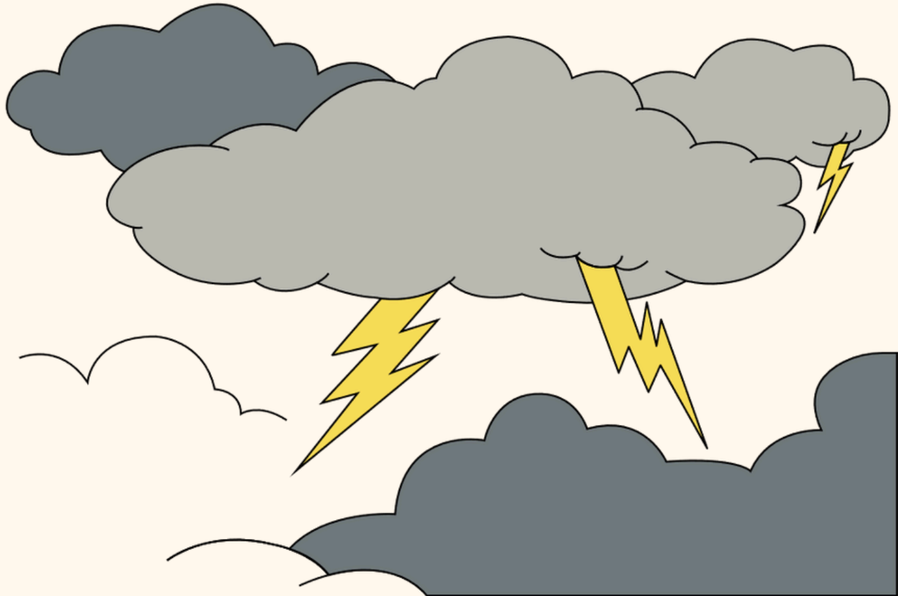
- Early stopping prevents overfitting by stoppingtraining when the model's performance on a validation set stops improving.
- Regularization: L1 and L2 regularization are applied to the weights of dense layers to prevent overfitting.
- The dropout layers randomly deactivate neurons during training to improve model robustness and prevent co-adaptation of neurons.

Improvement Architectures

In the improvement phase

L1 and L2 : 0.01
Droput : 0.2
EarlyStopping : patience=5, monitor='val_accuracy'

The best model is Model # 1 with
validation accuracy : 86.13%

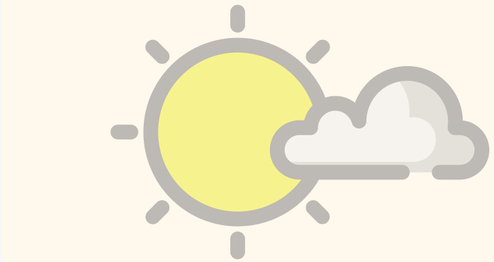


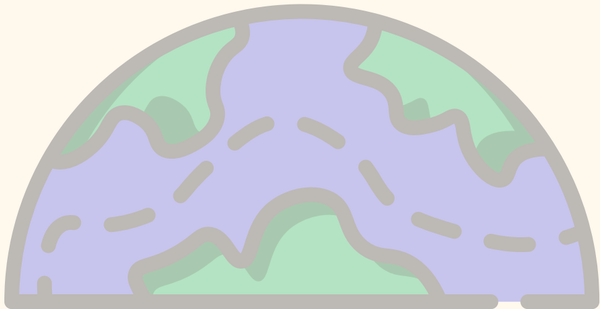
#Hyperparameter Settings..

Using 2 optimization algorithms :
-Hyperband
-Random Search

Build model
With improved parameters

```
dropout_rate  =  min_value=0.1, max_value=0.5
activation    =  'relu', 'elu', 'selu'
n_hidden      =  min_value=0, max_value=8
learning_rate =  min_value=1e-4, max_value=1e-2
batch_size    =  min_value=32, max_value=256, step=32
optimizer     =  'sgd', 'adam', 'rmsprop', 'nadam'
n_neurons     =  min_value=16, max_value=512, step=32 # for each hidden layer
```



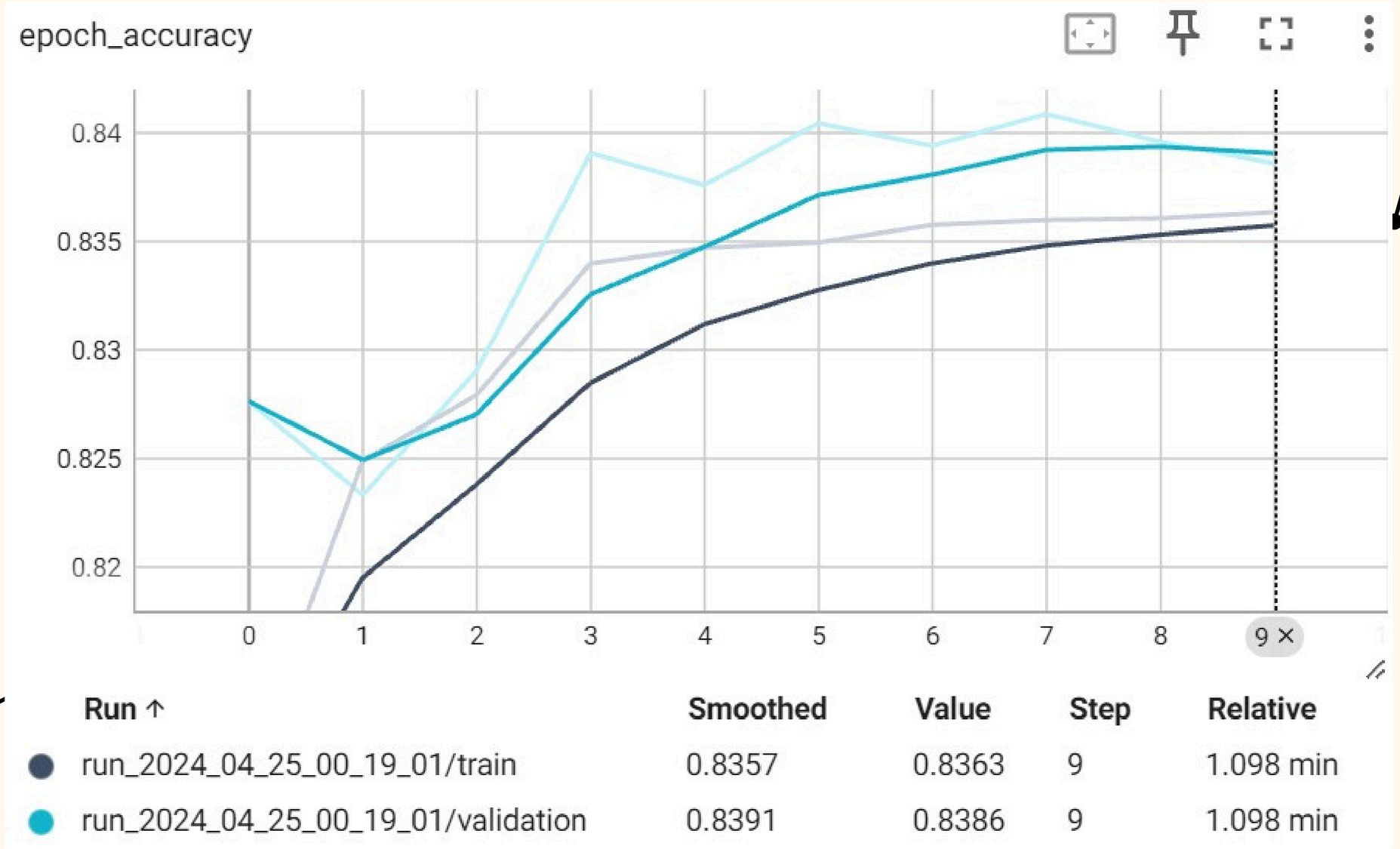


#Architectural Models Comparison

Simple Architectures Model	Improvement Simple Architectures	Random Search Tuner	Hyperband Tuner
Model 1 : two 64-neuron layers Model 2 : two layers 128, 64-neuron Model 3 : multi-layered structure 256, 128, and 64	Model 1 : two 64-neuron layers Model 2 : two layers 128, 64-neuron Model 3 : multi-layered structure 256, 128, and 64 Parameters: • L1 and L2 : 0.01 • Droput : 0.2 • EarlyStopping : patience= 5 monitor= val_accuracy	No. of Layers: 2 No. of Neurons: 48 Parameters: Droput: 0.1268 Learning Rate: 0.009 Batch_size: 160 activation: elu Optimizer: nadam	No. of Layers: 6 No. of Neurons: 304 Parameters: Droput: 0.1284 Learning Rate: 0.001 Batch_size: 256 activation: selu Optimizer: sdg
Validation Accuracy 86,13%	**Validation Accuracy** 86,13%	**Validation Accuracy** 83,06%	**Validation Accuracy** 84,07%

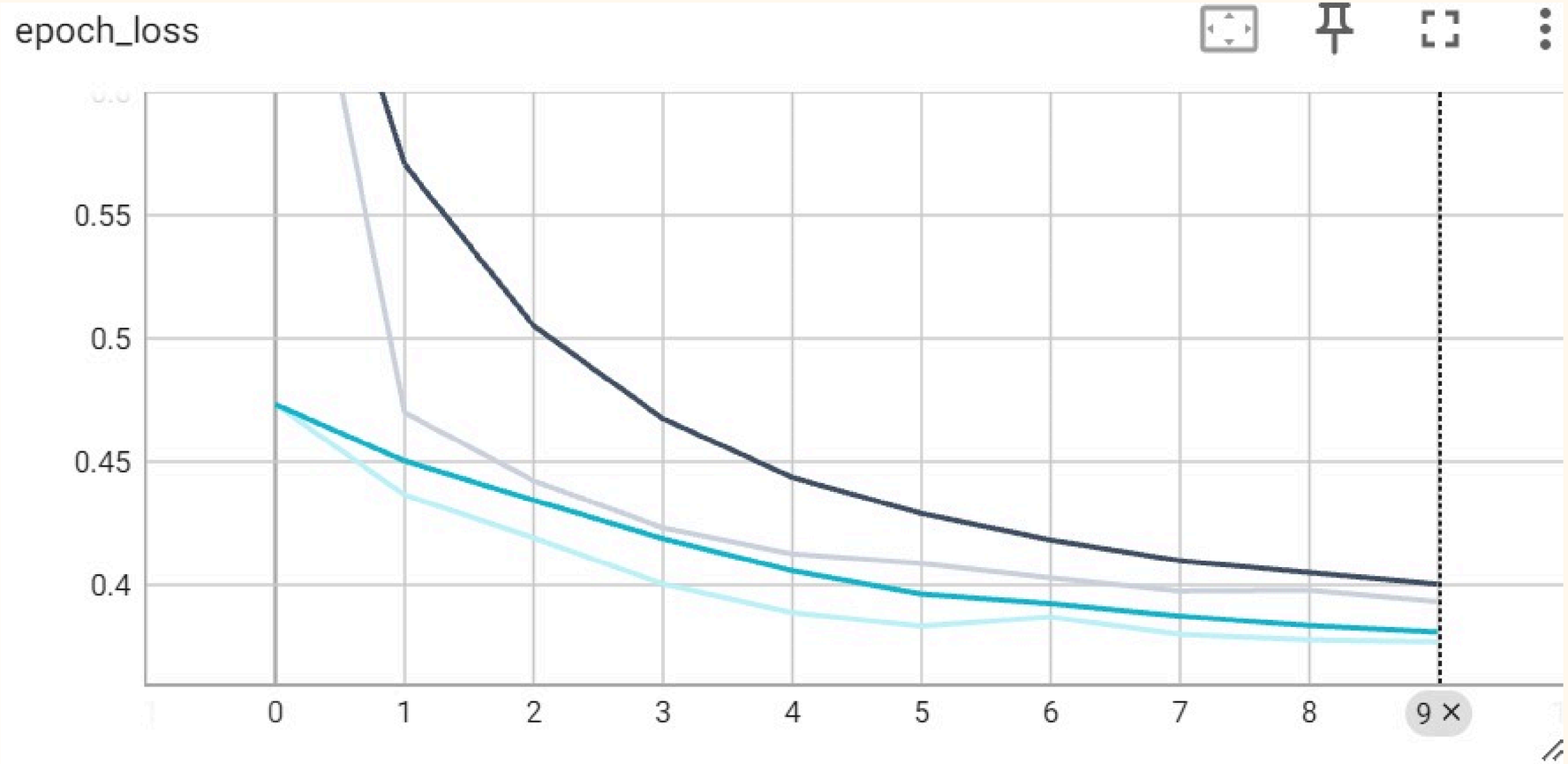
visualization :

accuracy



Run ↑	Smoothed	Value	Step	Relative
run_2024_04_25_00_19_01/train	0.8357	0.8363	9	1.098 min
run_2024_04_25_00_19_01/validation	0.8391	0.8386	9	1.098 min

#loss..



Run ↑	Smoothed	Value	Step	Relative
run_2024_04_25_00_19_01/train	0.4003	0.3933	9	1.098 min
run_2024_04_25_00_19_01/validation	0.3808	0.3768	9	1.098 min

Summary ..

We built multiple models using neural networks with different layers, neurons, and parameters to achieve the best weather severity prediction, We found that the **best model** was the Simple Architectures Model, with a validation accuracy of 86.13%.

Thank You