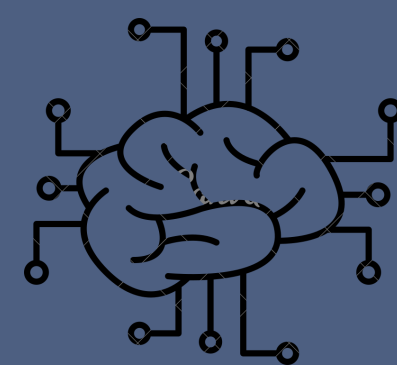


CS4243 MINI PROJECT

IMAGE CLASSIFICATION WITH MACHINE LEARNING



ABSTRACT

Threshold-Moving on a classification Convolutional Neural Network(CNN) to minimize false positives of a particular class.

Normal: Weapon not present **Carrying:** Weapon being held **Threat:** Weapon being used

INITIAL APPROACH W BASELINE MODEL

PARAMETERS

- Pretrained Model: Resnet18
- Batch Size: 512 (High batch size performs better)
- Epoch: 15
- Dropout: 0.1 (Due to small dataset)
- Optimizer: Adam

Description

- Basic data processing and split data into training and testing
- Use pretrained resnet18 and fine tuned model
- Achieved an accuracy of 0.829 but we identified an important aspect that should be improved

RESULTS

	ACTUAL			
		NORMAL	CARRYING	THREAT
	PREDICTED			
	NORMAL	274	29	26
	CARRYING	20	221	29
	THREAT	17	31	243

	PRECISION	RECALL	F1
NORMAL	0.832	0.881	0.856
CARRYING	0.818	0.786	0.802
THREAT	0.835	0.815	0.825
ACCURACY	0.829		

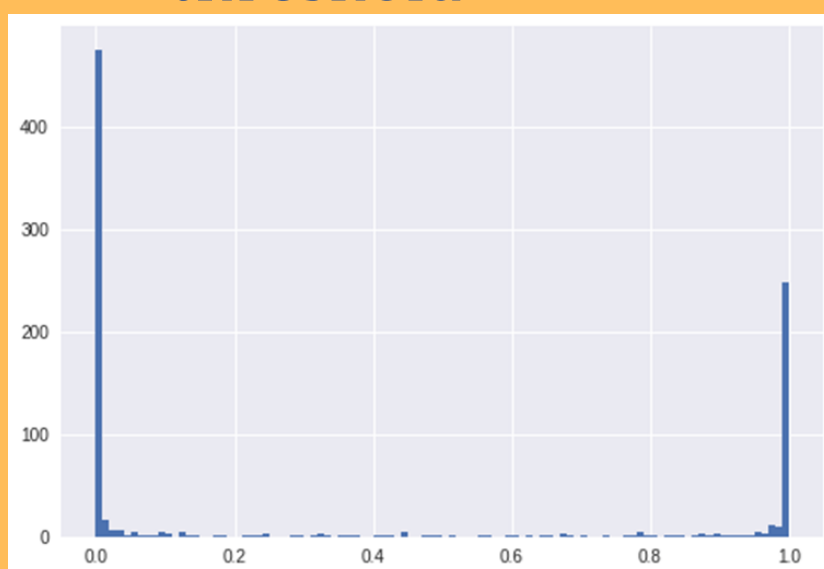
MODIFIED APPROACH

Motivation

- Identification of any possible weapons in a school environment is paramount
- Reduce the number of false positives in Normal Class

Modification

- Modified argmax to only return Normal if the predicted probability of Normal is above a threshold



Looking at the Normal prediction probabilities of the test set, we can see that the model is usually certain on the classification

To remove the "undecided voters", we can set a high threshold of 0.9

```
def modified_argmax(preds, minimum):  
    if preds[0][0]>minimum:  
        return torch.LongTensor([0])  
    elif preds[0][1]>preds[0][2]:  
        return torch.LongTensor([1])  
    else:  
        return torch.LongTensor([2])
```

Contributions

Leong En Ze Hope - Developed baseline and modified model
Wong Kok Ian - Training and testing of model
Chan Wa Wai - Modified approach
Bryan Beh Wah Jun - Compile data and analysis with design of poster

FINAL RESULTS

	ACTUAL			
		NORMAL	CARRYING	THREAT
	PREDICTED			
	NORMAL	248	20	16
	CARRYING	36	226	33
	THREAT	27	35	249

	PRECISION	RECALL	F1
NORMAL	0.873	0.797	0.833
CARRYING	0.766	0.804	0.785
THREAT	0.800	0.836	0.818
ACCURACY	0.812		

Evaluation:

- Precision of Normal increased but recall and F1 score dropped
- Precision and F1 of Carrying and Threat dropped but recall increased
- Overall accuracy of the model dropped
- Achieved what we wanted to do at the tradeoff of a slight decrease in accuracy

CONCLUSION:

Our group managed to build a model that has high sensitivity with regards to Normal, and yet is still able to have high accuracy when predicting Carrying or Threat.