



# ALLERGIC RHINITIS

## PROGRESS REPORT



*Bishal*



# MODEL SELECTION

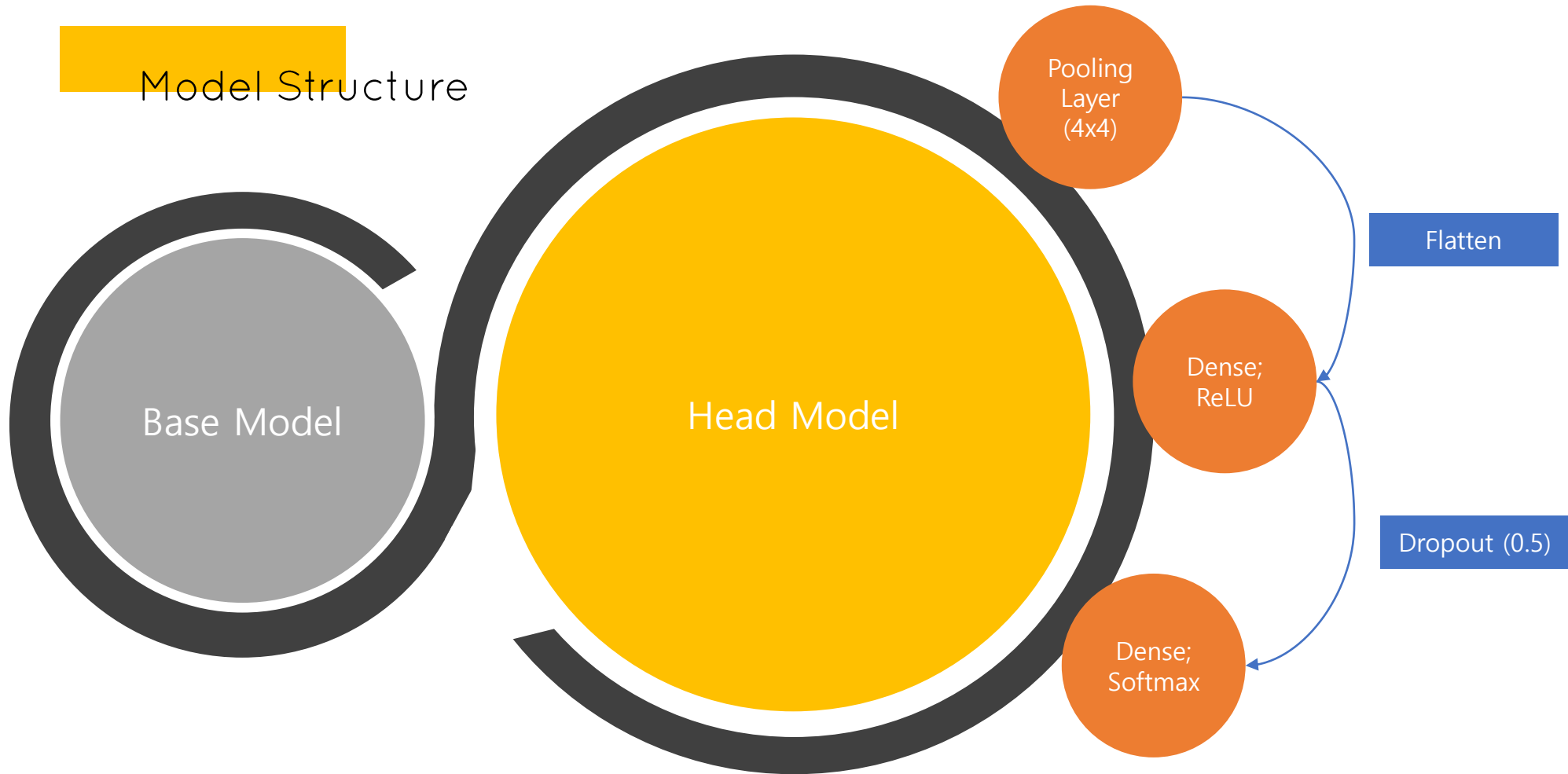
## AIM

*To select optimal models, several training sessions were carried out with following parameters*

- Data Preprocessing
  - Image read > convert to RGB > Prepare labels> normalize data and categorize labels
- Data Augmentation
  - Rotation -> 0-20
  - Zoom -> 0-0.15
  - Height, Width shift -> 0.2
  - Sheer ->0.15
  - With Horizontal Flip
- Data Partition
  - Partition ratio - 80:20; For a given input set, 80% is used for training and 20% as validation
- Transfer Learning Method was used for training of all the models.

# MODEL SELECTION

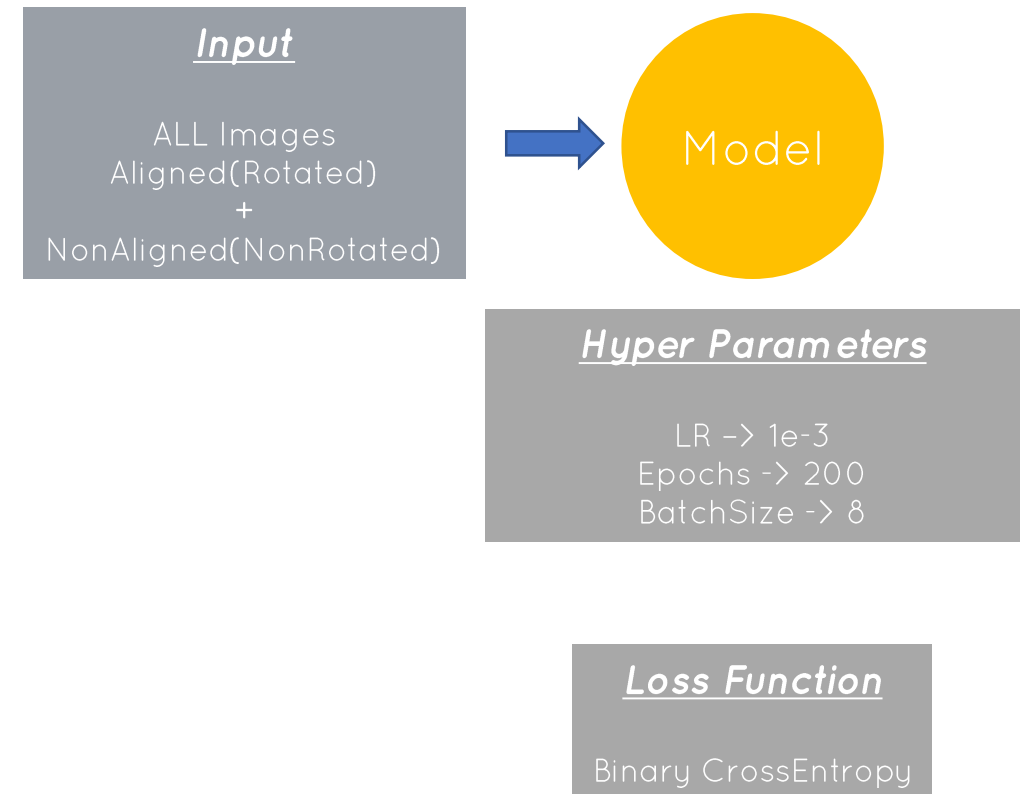
## Model Structure



# MODEL SELECTION

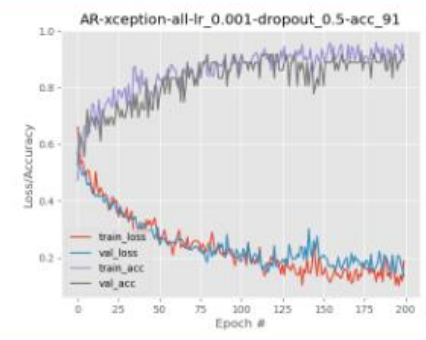
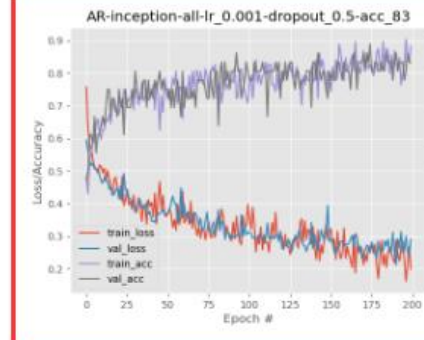
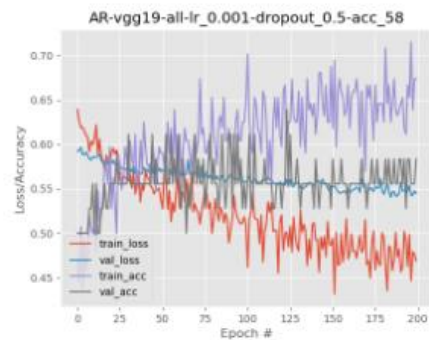
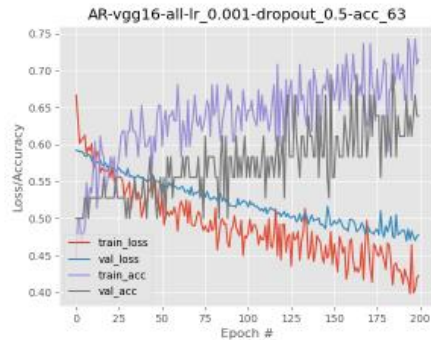
- The following models were used for the selection of an optimal model with progressing accuracy.
- The Input Size was constant in all the models – (224, 224, 3)

• <b>VGG16</b>	-	63% Accuracy
• <b>VGG19</b>	-	58%
• <b>InceptionNet</b>	-	83%
• <b>XceptionNet</b>	-	91%
• <b>ResNet50</b>	-	75%
• <b>ResNet101</b>	-	75%
• <b>DenseNet</b>	-	75%
• <b>InceptionResNet</b>	-	66%

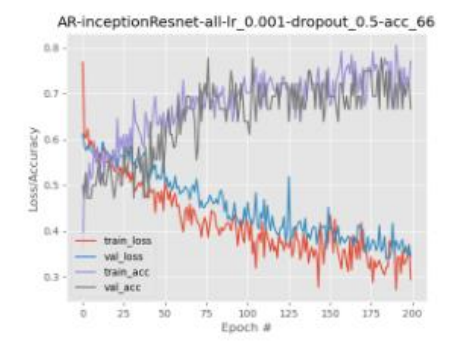
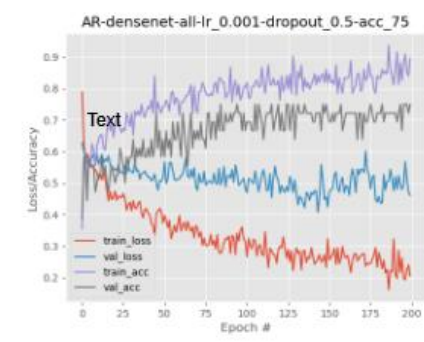
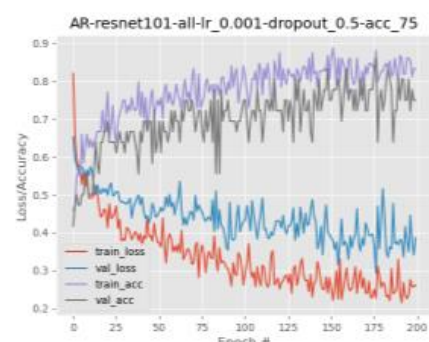
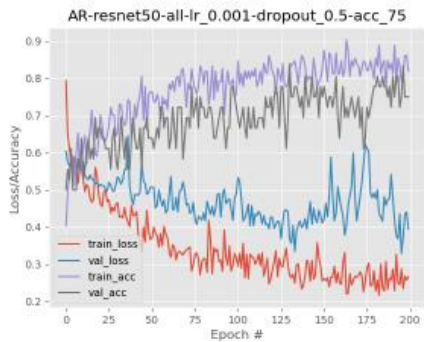


# MODEL SELECTION

Based on the Observed output – XceptionNet and InceptionNet were selected for further inspection.



Model Selection



# DATA COMPARISON

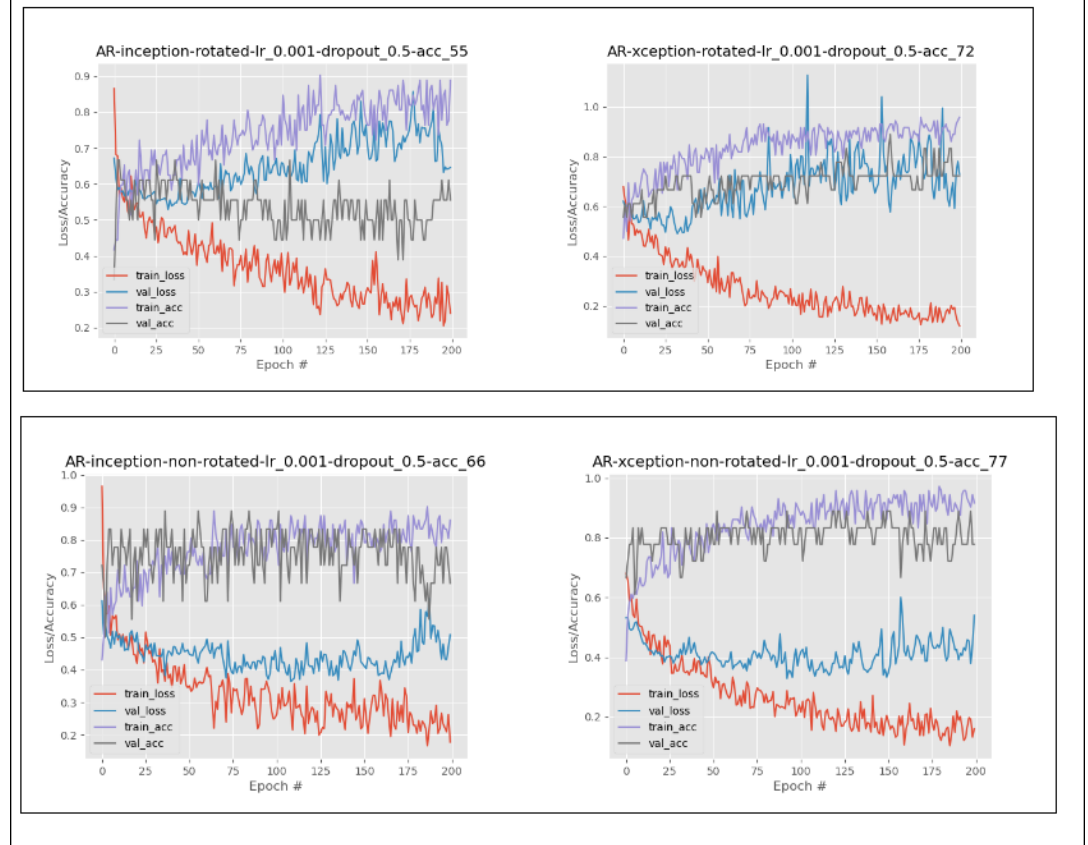
Comparison was drawn between -  
Aligned(Rotated) V Non-Aligned(Non-Rotated) Images

	InceptionNet	XceptionNet
Aligned(Rotated)	55	72
Non-Aligned(Non-Rotated)	66	77

There is a difference in Accuracy even though they are the same image is because of a minor noise in the Aligned(Rotated) image set.

For all inputs(both aligned & non-aligned)

## RotateVsNon-Rotate



# DATA COMPARISON

Non-Aligned(Non-Rotated)



Aligned(Rotated)

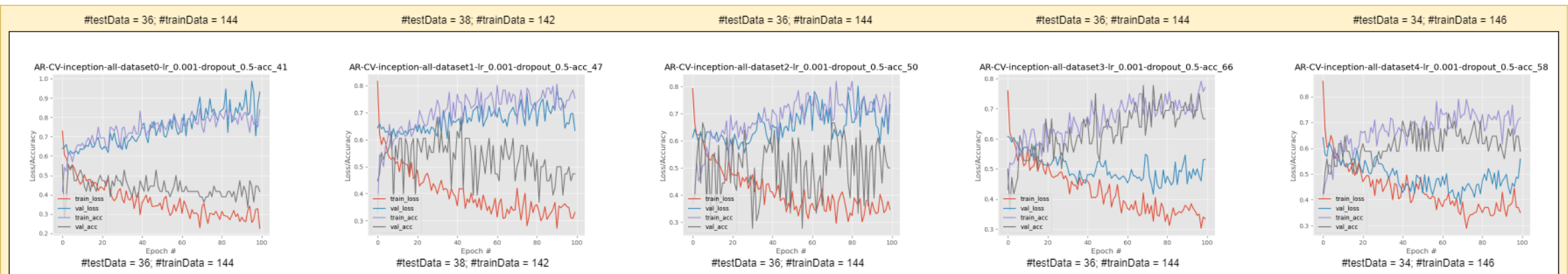


*Can you see the noise?*

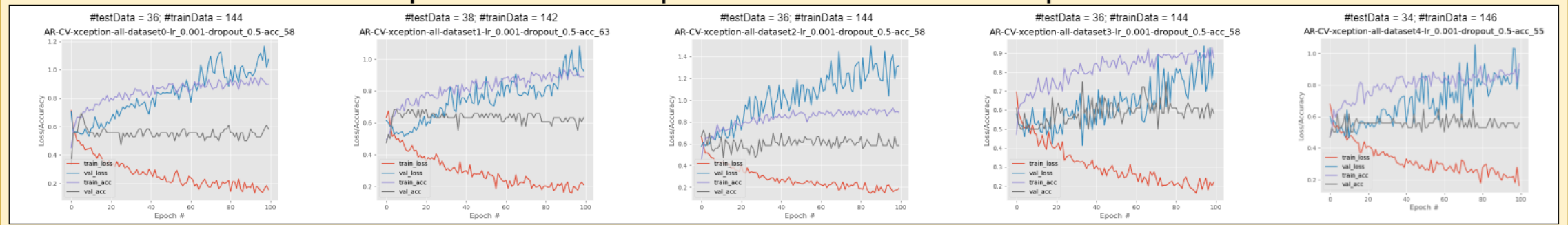
# DATA COMPARISON

Standard Model

5 Fold Cross Validation for aligned(rotated) and non-aligned(non-rotated) data



All - InceptionNet & XceptionNet with standard parameters



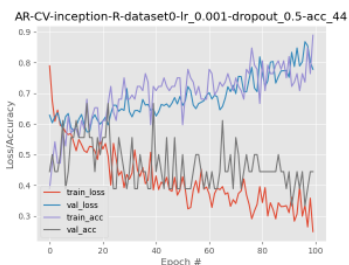


# DATA COMPARISON

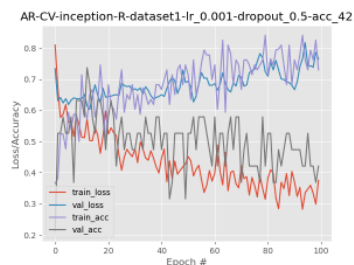
Standard Model

5 Fold Cross Validation for aligned(rotated) data

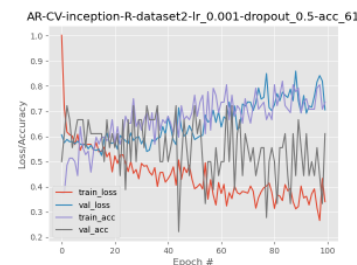
#testData = 18; #trainData = 72



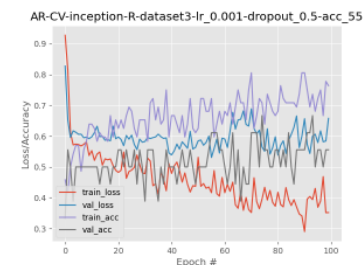
#testData = 19; #trainData = 71



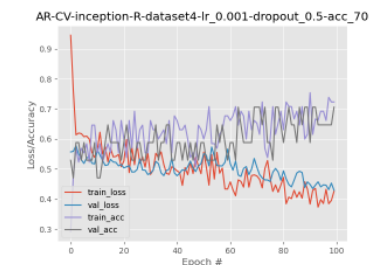
#testData = 18; #trainData = 72



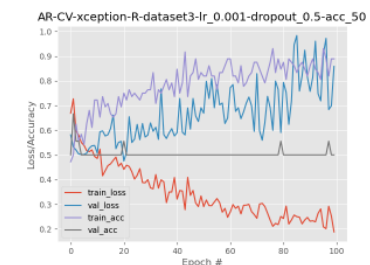
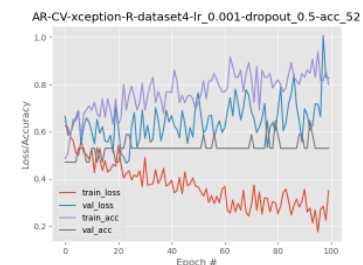
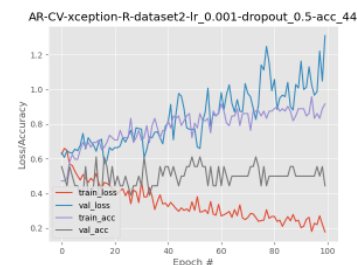
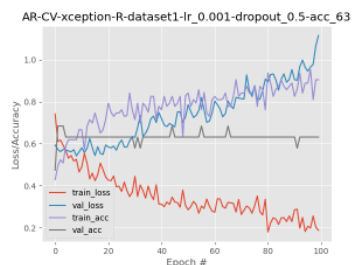
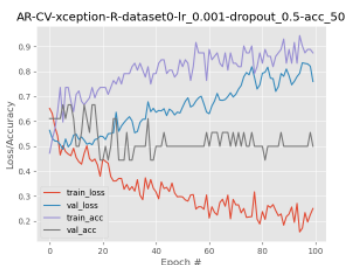
#testData = 18; #trainData = 72



#testData = 17; #trainData = 73



Rotated - std. InceptionNet & XceptionNet

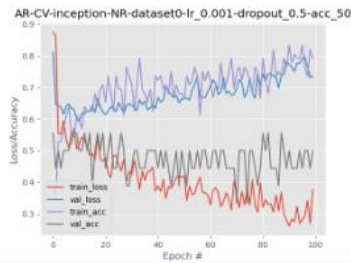


# DATA COMPARISON

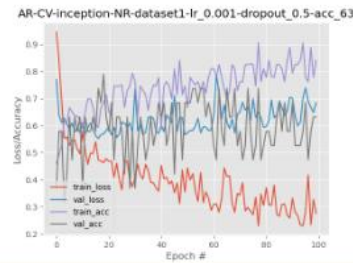
Standard Model

5 Fold Cross Validation for non-aligned(non-rotated) data

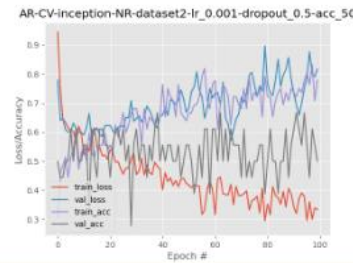
#testData = 18; #trainData = 72



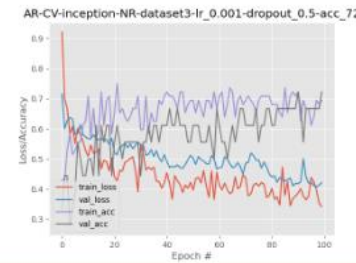
#testData = 19; #trainData = 71



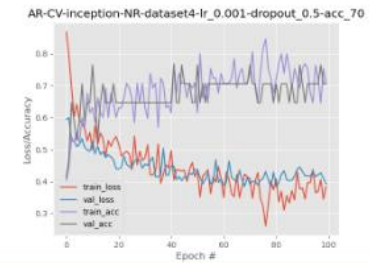
#testData = 18; #trainData = 72



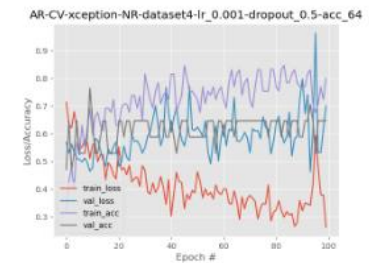
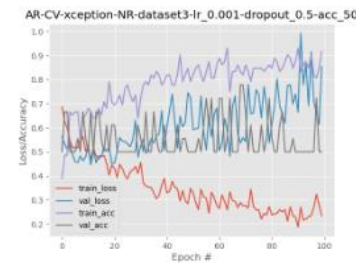
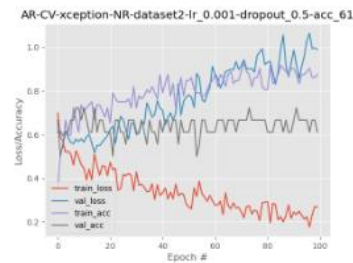
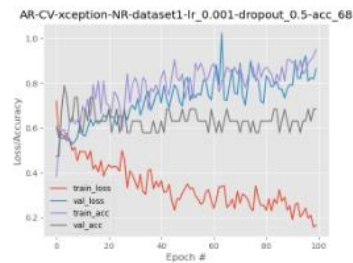
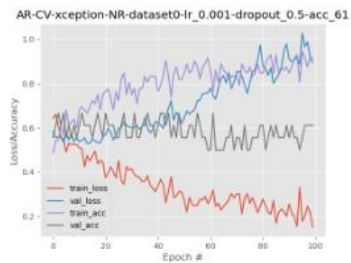
#testData = 18; #trainData = 72



#testData = 17; #trainData = 73



Non-Rotate - std. InceptionNet & XceptionNet



# DATA COMPARISON

Comparison was drawn between -  
Aligned(Rotated) V Non-Aligned(Non-Rotated) Images

Off all the **modified hyper-parameter** combinations, the following provided better outputs,

Learning Rate -  $5e-4$   
DropOut - 0.7

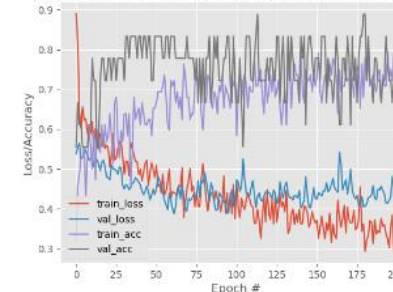
Against the standard hyper-parameters in slide-6

	InceptionNet	XceptionNet
Aligned(Rotated)	55 61	72 72
Non-Aligned(Non-Rotated)	66 77	77 88

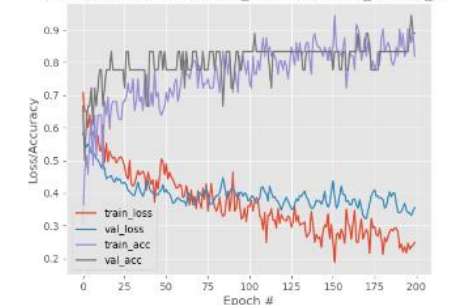
For all inputs(both aligned & non-aligned)

## Modified HP RotateVsNon-Rotate

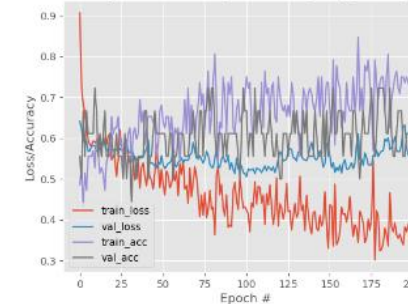
AR-inception-non-rotated-lr\_0.0005-dropout\_0.7-acc\_77



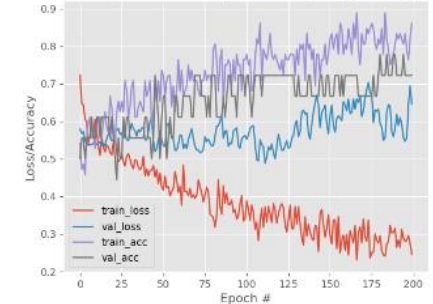
AR-xception-non-rotated-lr\_0.0005-dropout\_0.7-acc\_88



AR-inception-rotated-lr\_0.0005-dropout\_0.7-acc\_61



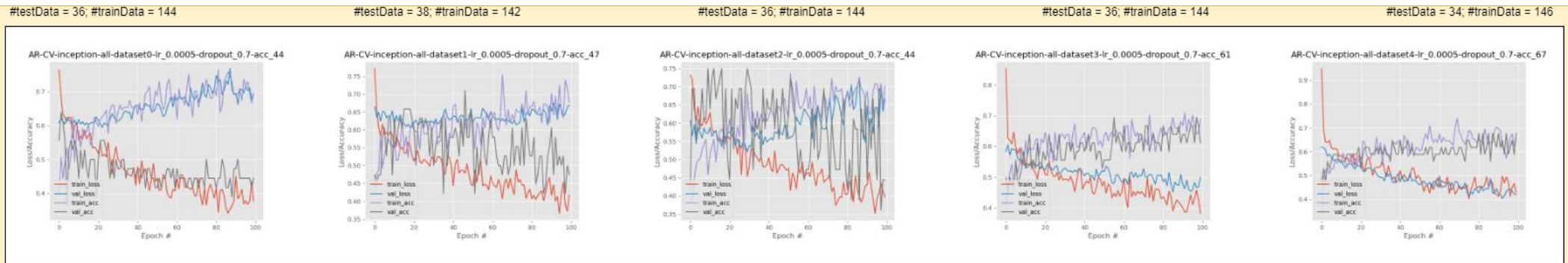
AR-xception-rotated-lr\_0.0005-dropout\_0.7-acc\_72



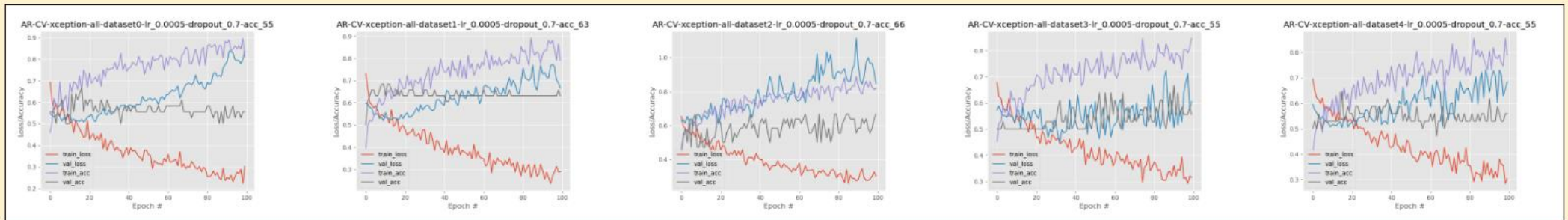
# DATA COMPARISON

Modified Model

5 Fold Cross Validation for aligned(rotated) and non-aligned(non-rotated) data



All - InceptionNet & XceptionNet with modified parameters



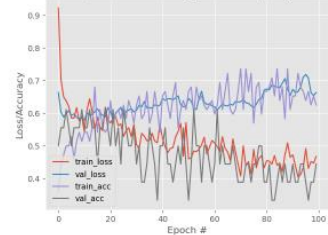


# DATA COMPARISON

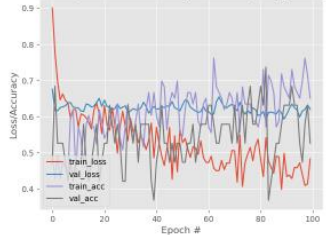
Modified Model

5 Fold Cross Validation for aligned(rotated) data

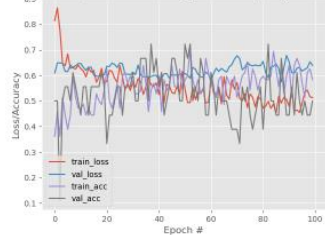
AR-CV-inception-R-dataset0-lr\_0.0005-dropout\_0.7-acc\_44



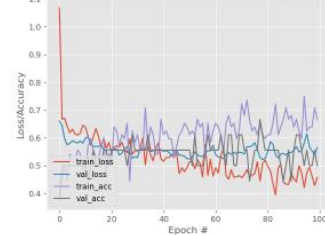
AR-CV-inception-R-dataset1-lr\_0.0005-dropout\_0.7-acc\_52



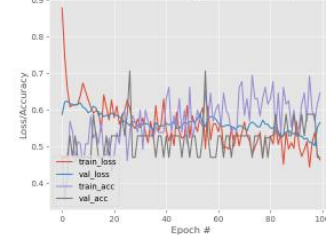
AR-CV-inception-R-dataset2-lr\_0.0005-dropout\_0.7-acc\_50



AR-CV-inception-R-dataset3-lr\_0.0005-dropout\_0.7-acc\_50

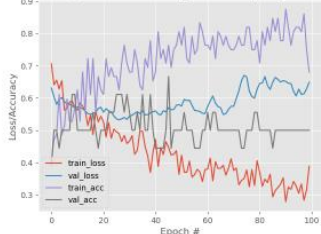


AR-CV-inception-R-dataset4-lr\_0.0005-dropout\_0.7-acc\_47

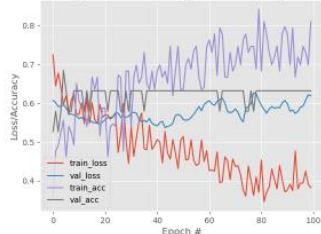


Rotated - InceptionNet & XceptionNet with modified parameters

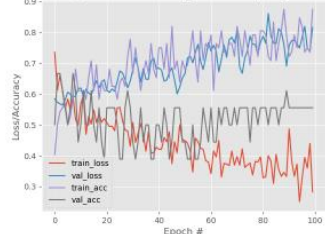
AR-CV-xception-R-dataset0-lr\_0.0005-dropout\_0.7-acc\_50



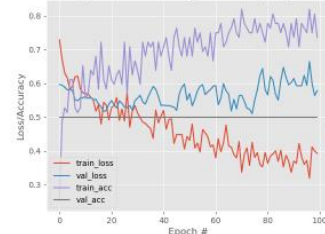
AR-CV-xception-R-dataset1-lr\_0.0005-dropout\_0.7-acc\_63



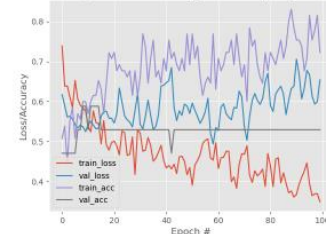
AR-CV-xception-R-dataset2-lr\_0.0005-dropout\_0.7-acc\_55



AR-CV-xception-R-dataset3-lr\_0.0005-dropout\_0.7-acc\_50



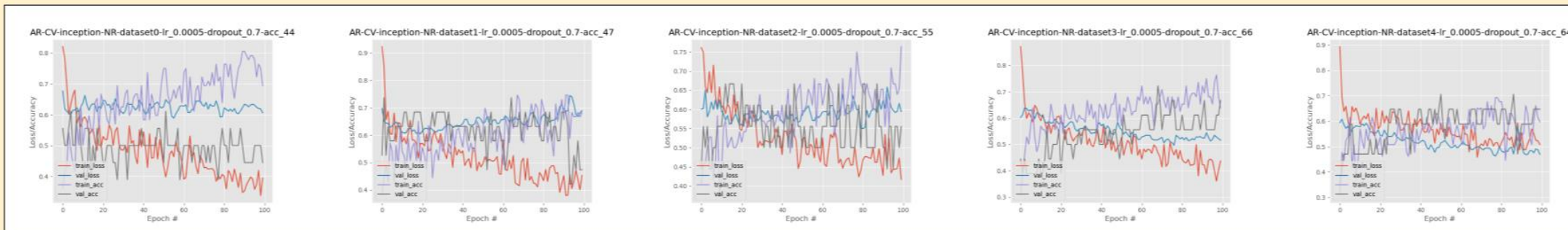
AR-CV-xception-R-dataset4-lr\_0.0005-dropout\_0.7-acc\_52



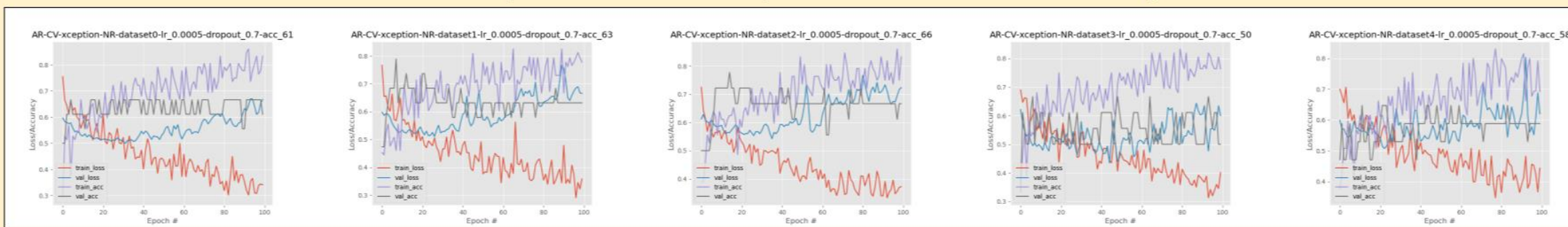
# DATA COMPARISON

Modified Model

5 Fold Cross Validation for non-aligned(non-rotated) data



Non-Rotate - InceptionNet & XceptionNet with modified parameters



# DATA COMPARISON

## 5 Fold Cross Validation Comparison

The set {0, 1, 2, 3, 4} represents the case where Dataset0 was used as validation and Dataset1-4 was used as training

	Standard Model					Modified Model				
All	0	1	2	3	4	0	1	2	3	4
	41, 58	47, 63	50, 58	66, 58	58, 55	44, 55	47, 63	44, 66	61, 55	67, 55
Non- aligned (Non-Rotated)	0	1	2	3	4	0	1	2	3	4
	50, 61	63, 68	50, 61	72, 50	70, 64	44, 61	47, 63	55, 66	66, 50	64, 58
Aligned (Rotated)	0	1	2	3	4	0	1	2	3	4
	44, 50	42, 63	61, 44	55, 52	70, 50	44, 50	52, 63	50, 55	50, 50	47, 52

AccuracyTable: (InceptionNet, XceptionNet)

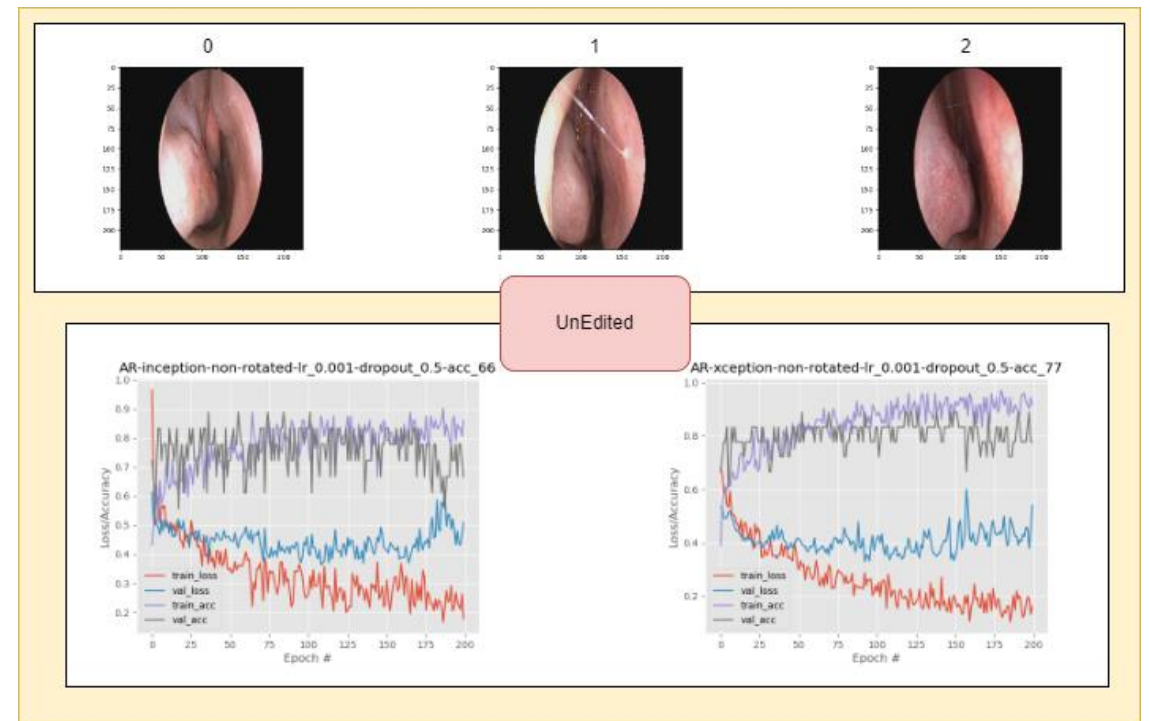
# IMAGE PREPROCESSING

Image Used till now

{0, 1, 2} represents the images from Dataset0-2 respectively

	UnEdited
InceptionNet	66
XceptionNet	77

For all non-aligned(non-rotated) Inputs





# IMAGE PREPROCESSING

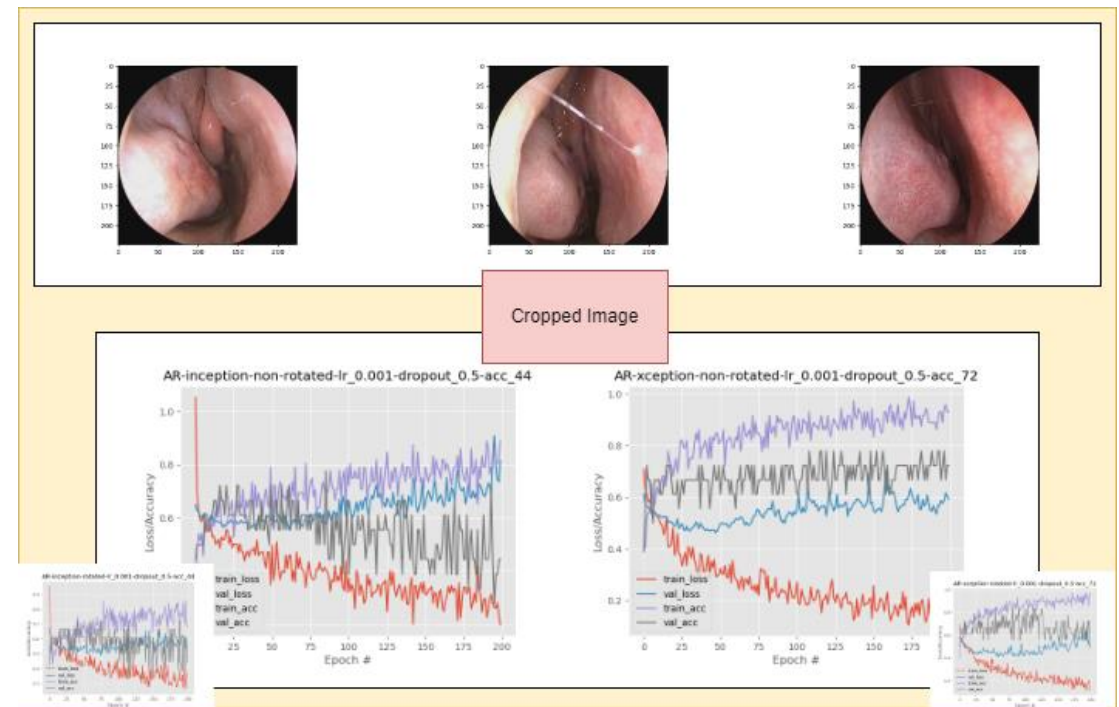
## Using Square Cropped Image

	UnEdited	Cropped
InceptionNet	66	44
XceptionNet	77	72

Do you remember the abnormality in the outputs because of the noise in rotated data?

Such output is not observed here as the images are cropped based on their position using a **contrast based edge-detected algorithm**.

For all non-aligned(non-rotated) Inputs



# IMAGE PREPROCESSING

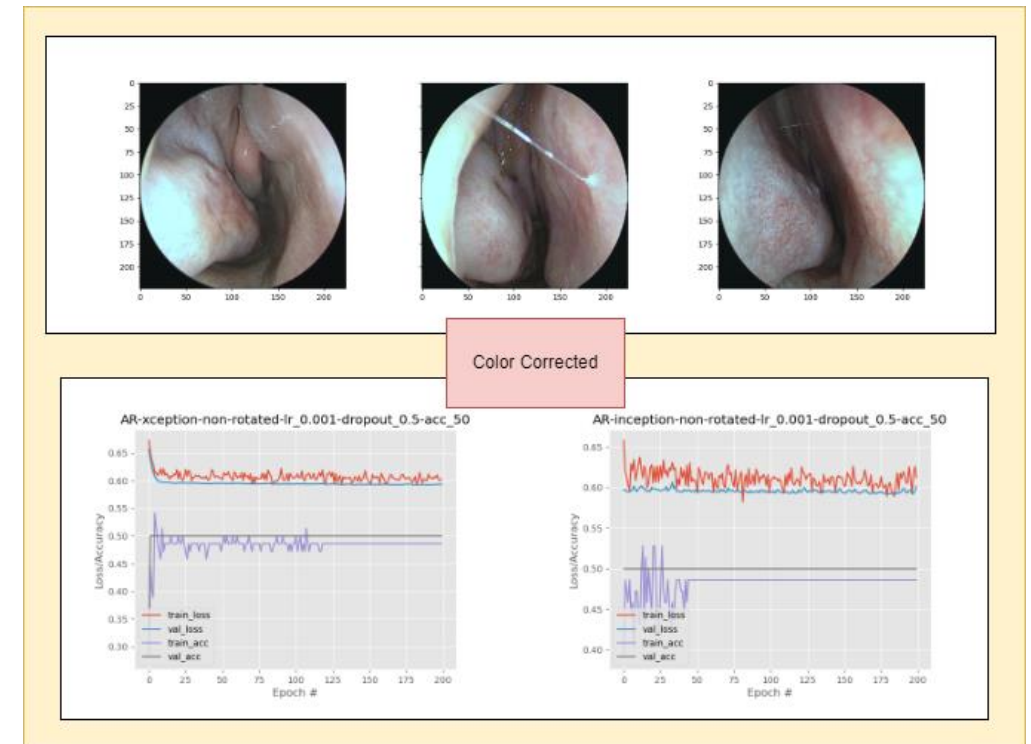
## Using Color Correction

	UnEdited	Cropped	ColorCorr
InceptionNet	66	44	50
XceptionNet	77	72	50

It is inferred that the key information that was used for **feature extraction** is **lost** in the **Color Correction** process, as a result the model was unable to train and learn properly.

Hence, it was dropped from consideration for future possible configurations.

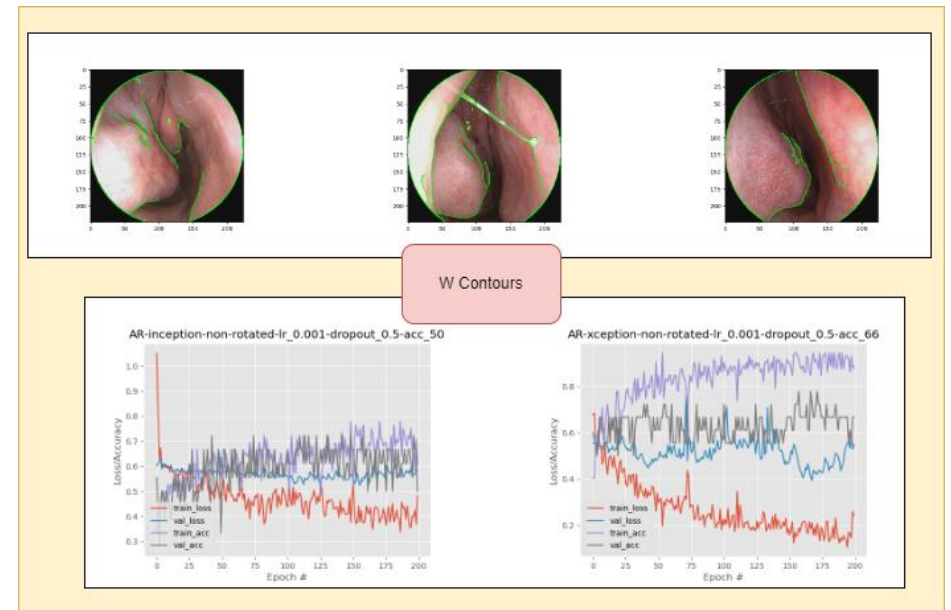
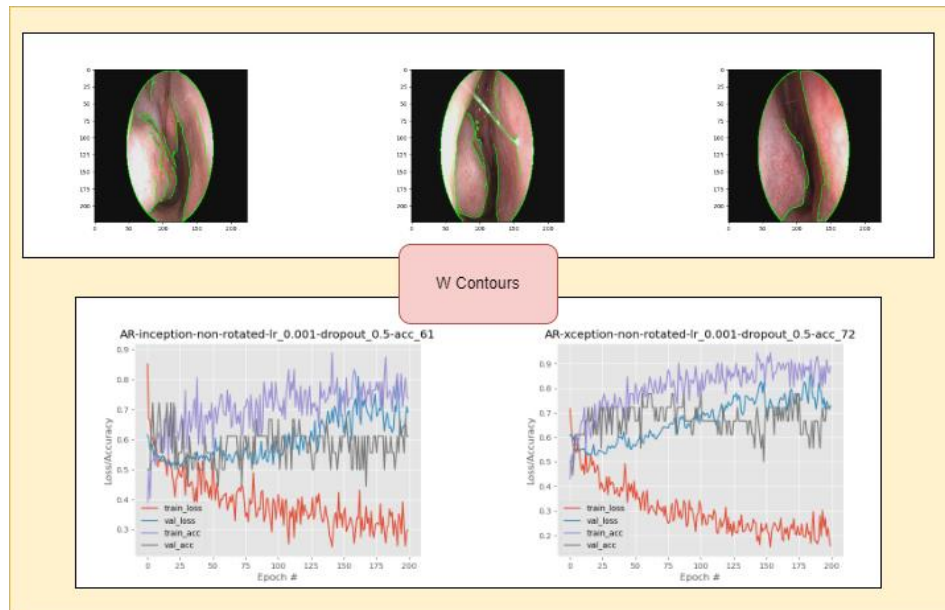
For all non-aligned(non-rotated) Inputs



# IMAGE PREPROCESSING

## Addition for Contour Information in the Image

For all non-aligned(non-rotated) Inputs

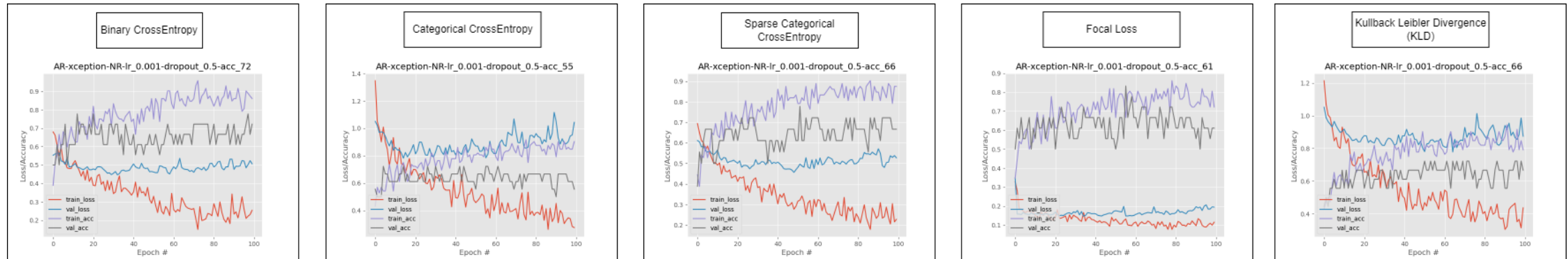


	UnEdited	Cropped	ColorCorr	UnEdit+C	Crop+C
InceptionNet	66	44	50	61	50
XceptionNet	77	72	50	72	66

# LOSS FUNCTIONS

## Comparing various Loss functions

For all non-aligned(non-rotated) Inputs



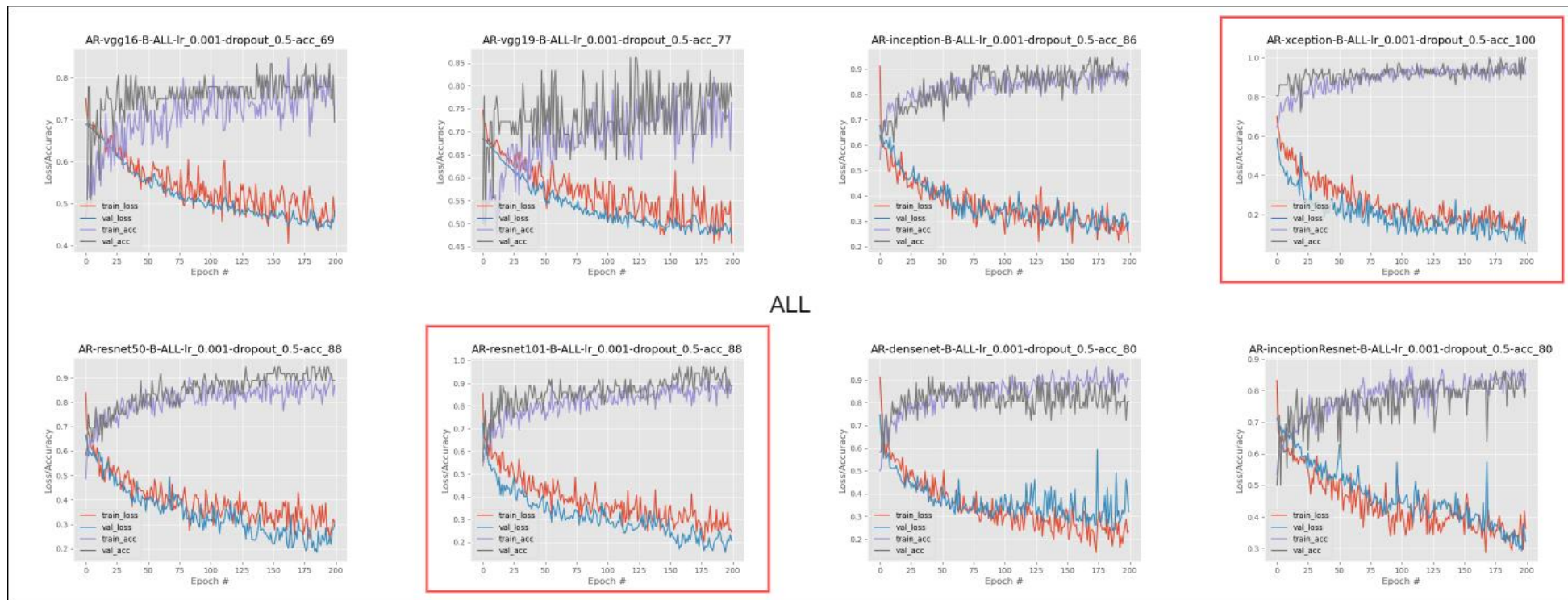
The results were obtained from standard model and the output accuracies are as follows -

	Binary-CE	Categorical-CE	Sparse-CCE	Focal	KLD
XceptionNet	72	55	66	61	66

# BINARY CLASSIFICATION

## Performing Binary Classification on various Models

For all inputs(both aligned & non-aligned)



Against the output accuracies of MultiClass Classification

	VGG16	VGG19	Inception	Xception	ResNet50	ResNet101	DenseNet	IncResNet
Accuracy	63 69	58 77	83 86	95 100	75 88	75 88	75 80	66 80