



Allergic Rhinitis

Progress Report



Bishal



Model Selection

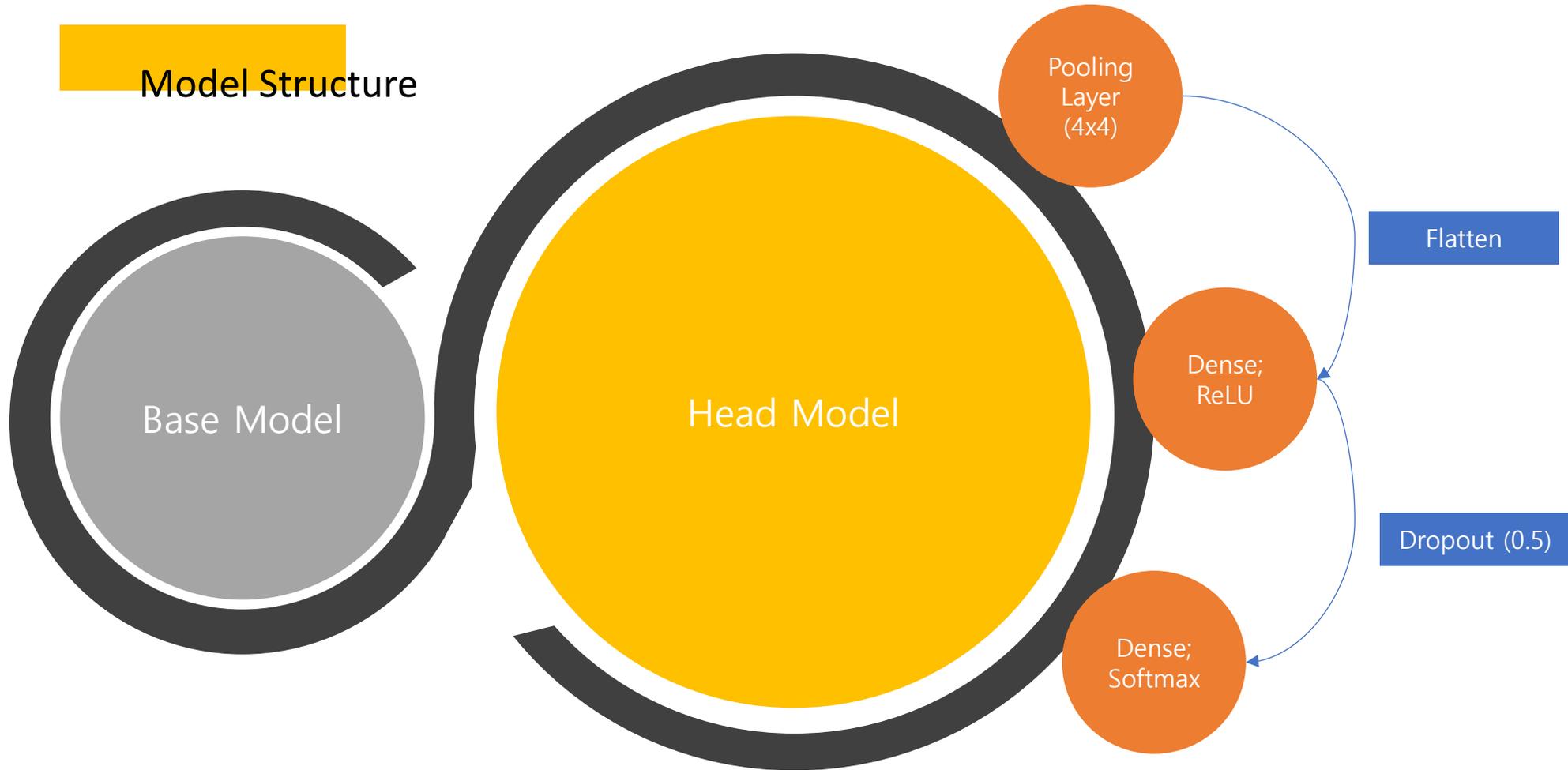
AIM

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

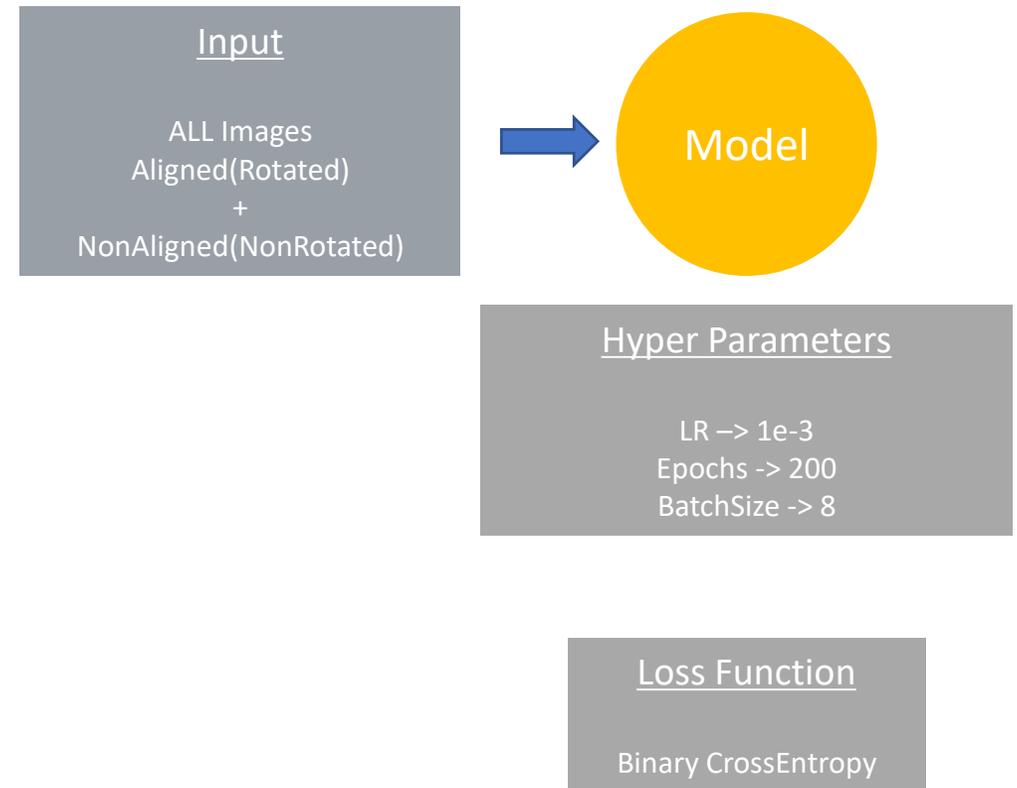
Model Structure



Model Selection

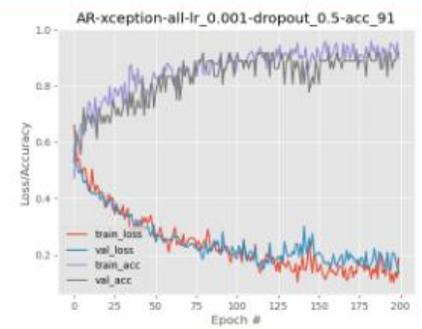
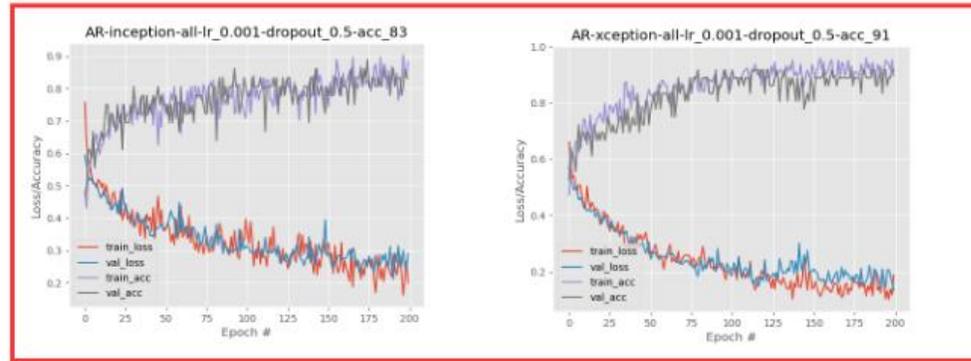
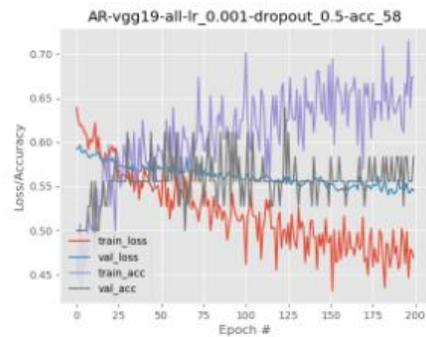
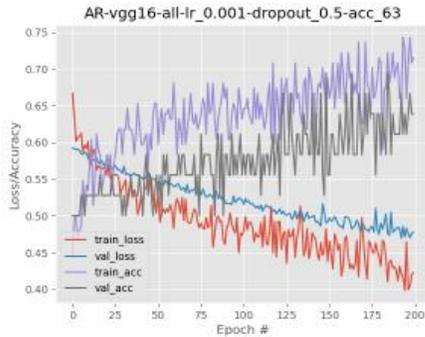
- The following models were used for the selection of an optimal model with progressing accuracy.
- The Input Size was constant in all the models – **(224, 224, 3)**

- | | | |
|--------------------|-----|--------------|
| • VGG16 | - | 63% Accuracy |
| • VGG19 | - | 58% |
| • InceptionNet | - | 83% |
| • XceptionNet | - | 91% |
| • ResNet50 | - | 75% |
| • ResNet101 | - | 75% |
| • DenseNet | - | 75% |
| • InceptionResNet- | 66% | |

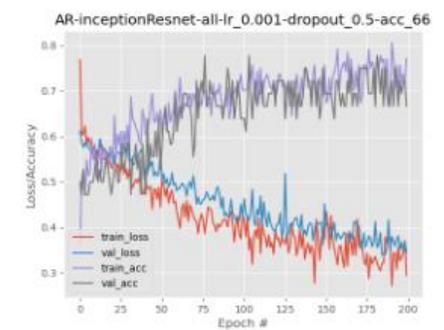
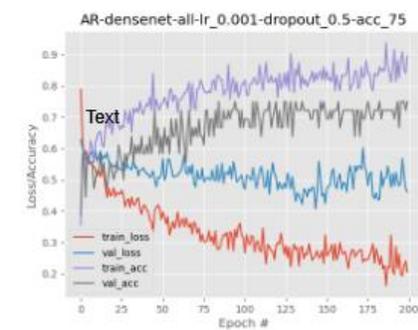
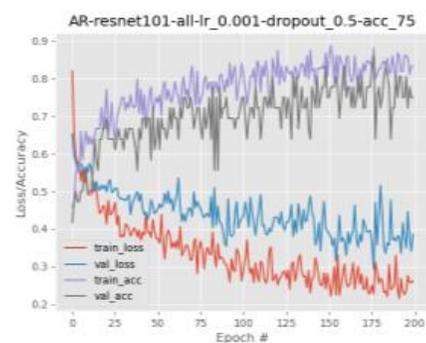
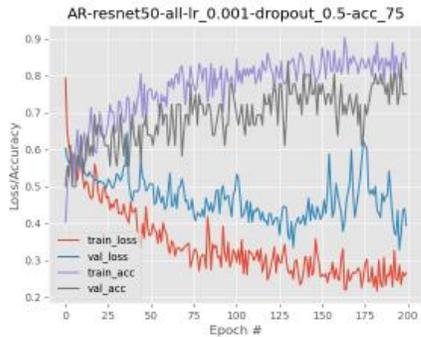


Model Selection

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



Model Selection



Data Comparison

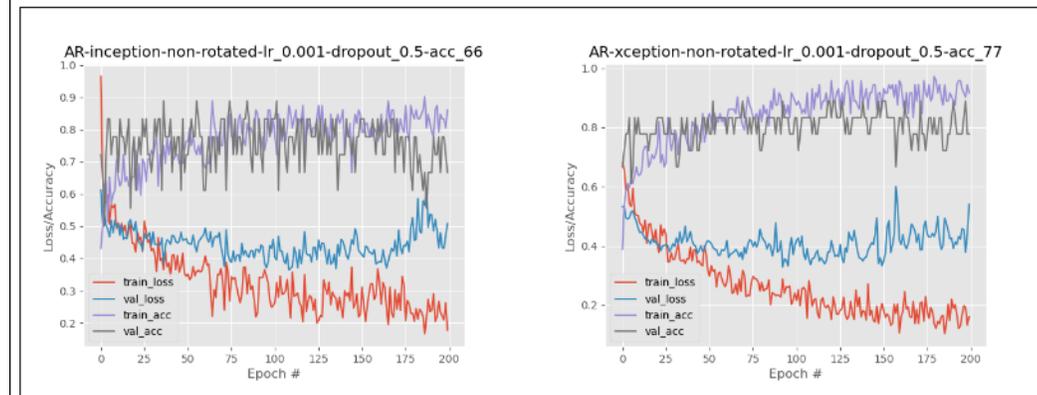
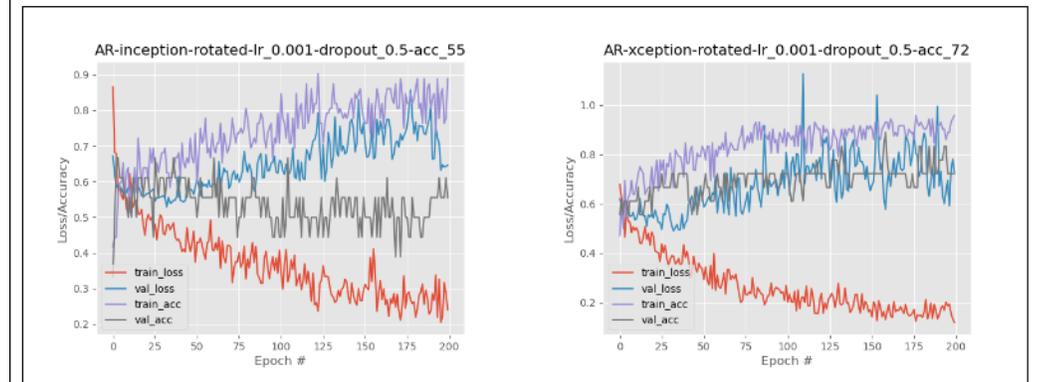
Comparison was drawn between –
 Aligned(Rotated) V Non-Aligned(Non-Rotated) Images

	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)

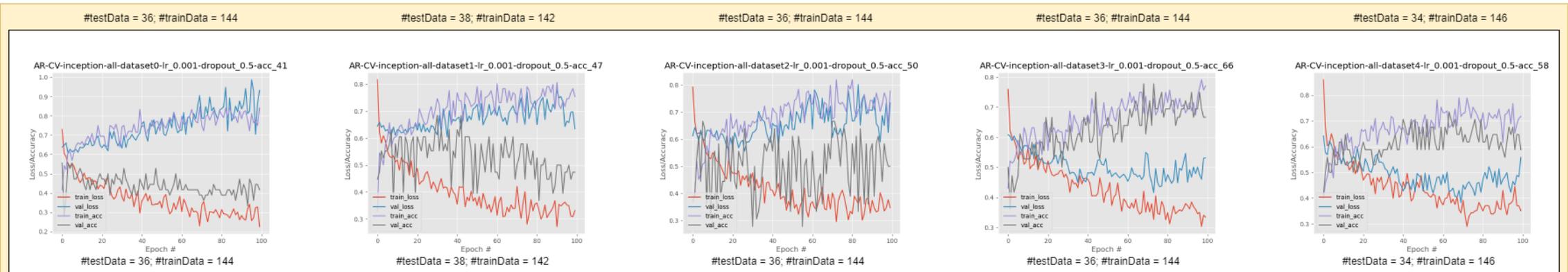


Can you see the noise?

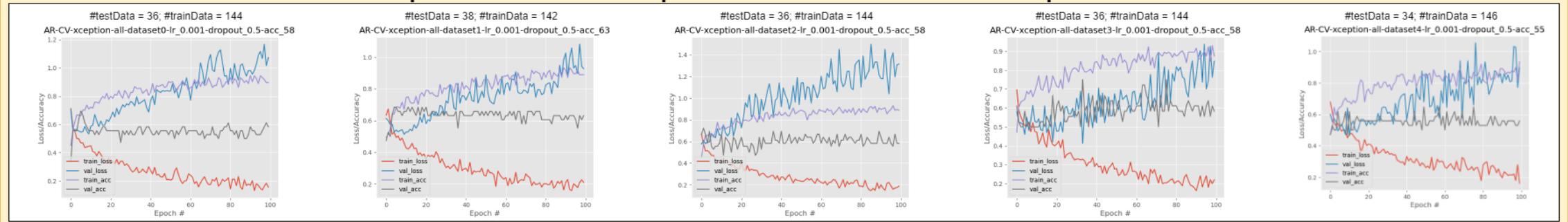
Data Comparison

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

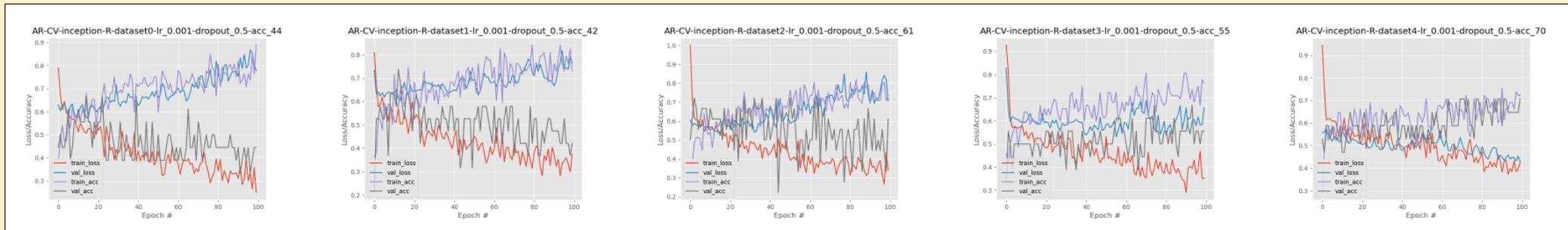
#testData = 18; #trainData = 72

#testData = 19; #trainData = 71

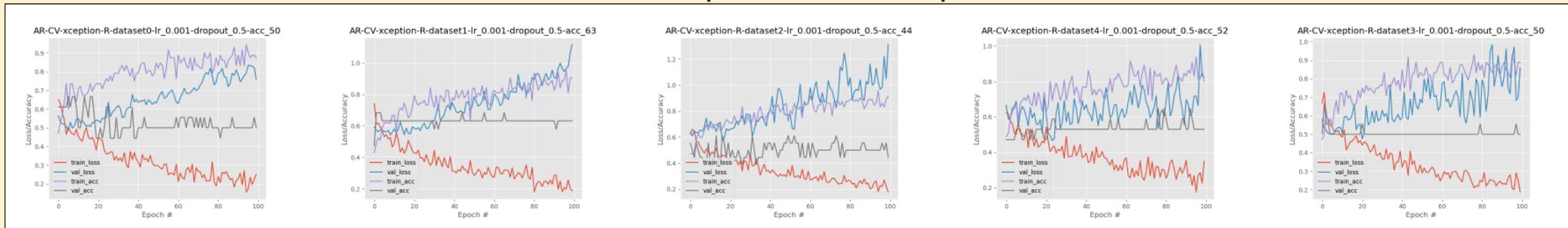
#testData = 18; #trainData = 72

#testData = 18; #trainData = 72

#testData = 17; #trainData = 73



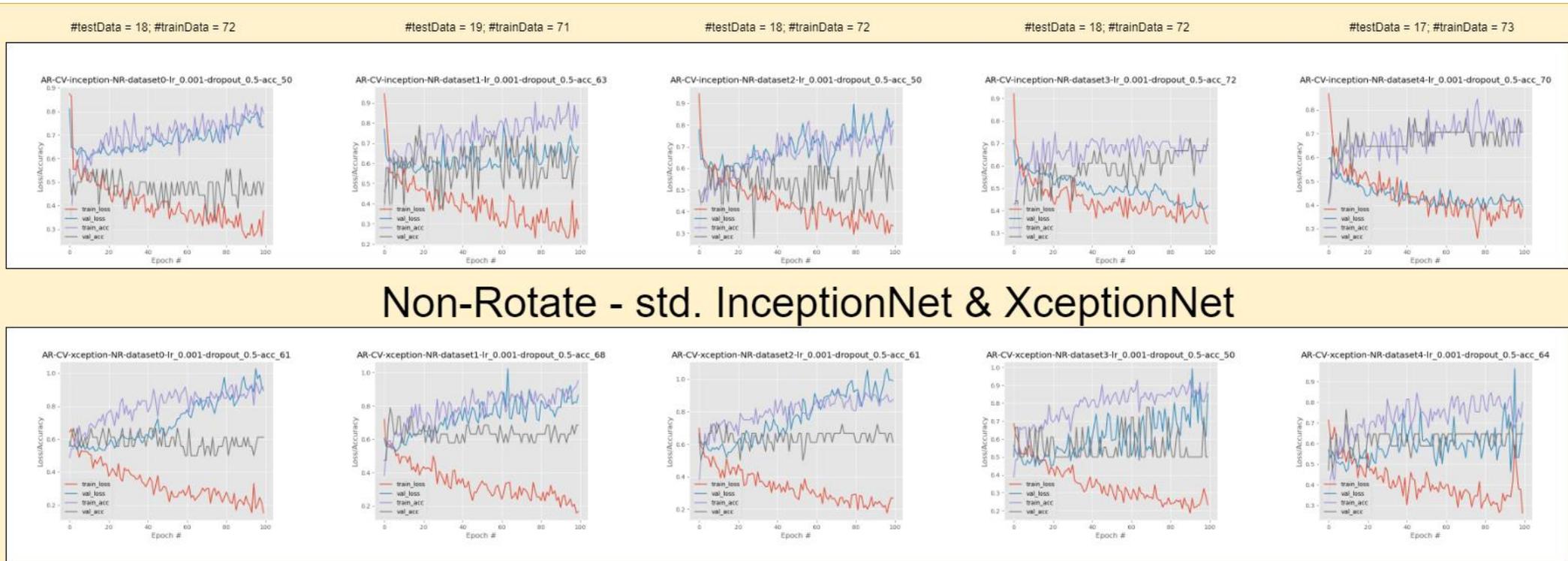
Rotated - std. InceptionNet & XceptionNet



Data Comparison

Standard Model

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



Non-Rotate - std. InceptionNet & XceptionNet

Data Comparison

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

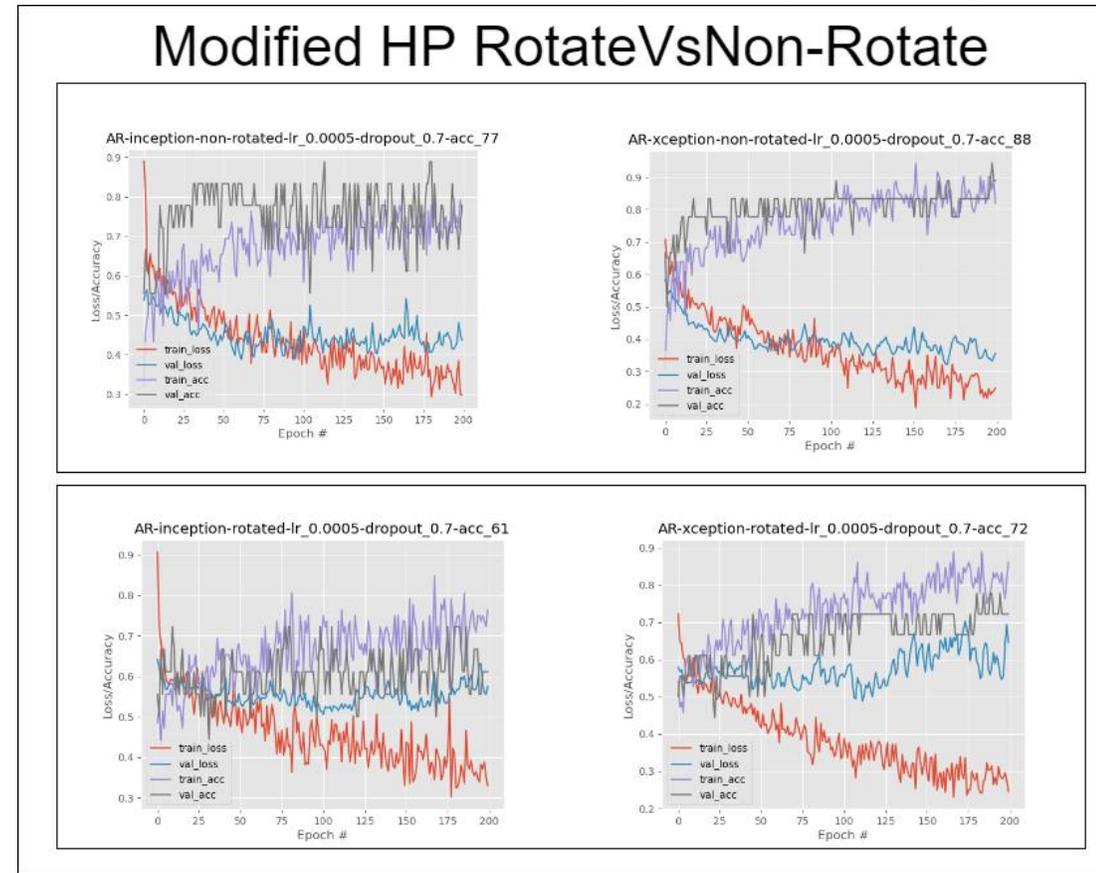
Off all the **modified hyper-parameter** combinations, the following provided better outputs,

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

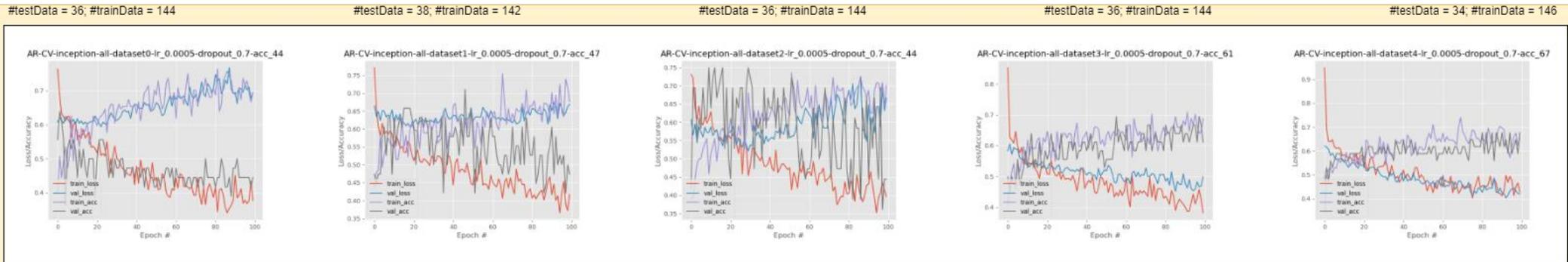
For all inputs(both aligned & non-aligned)



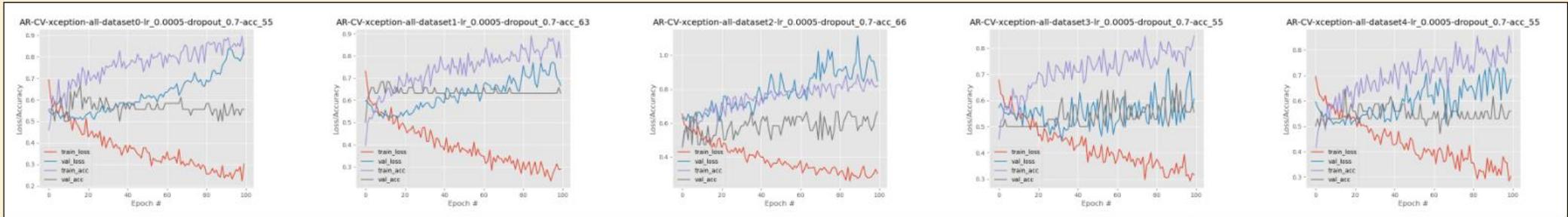
Data Comparison

Modified Model

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



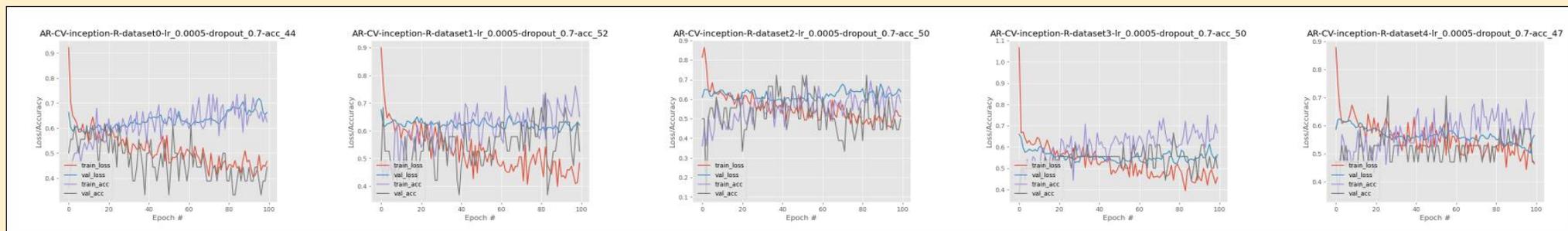
All - InceptionNet & XceptionNet with modified parameters



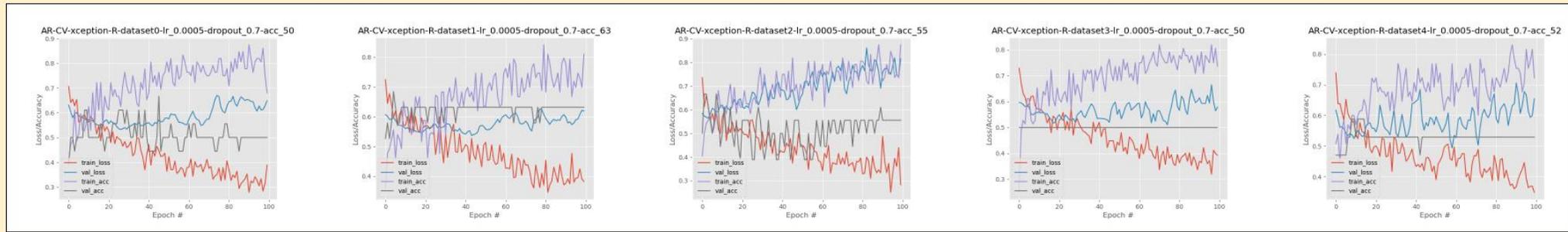
Data Comparison

Modified Model

5 Fold Cross Validation for aligned(rotated) data



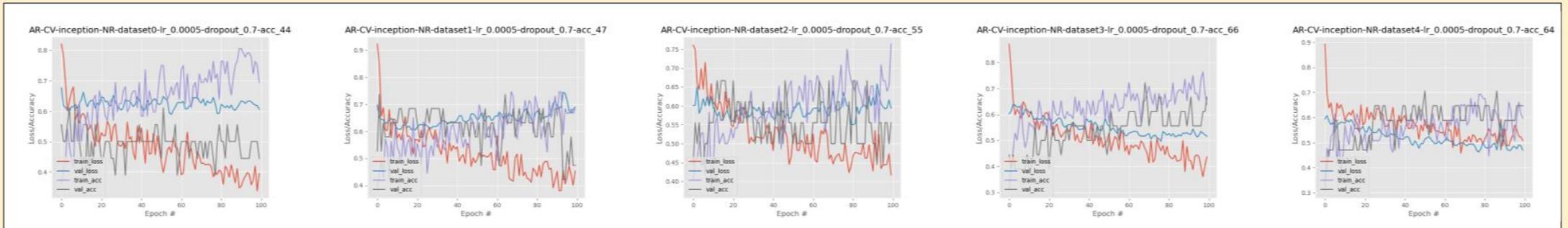
Rotated - InceptionNet & XceptionNet with modified parameters



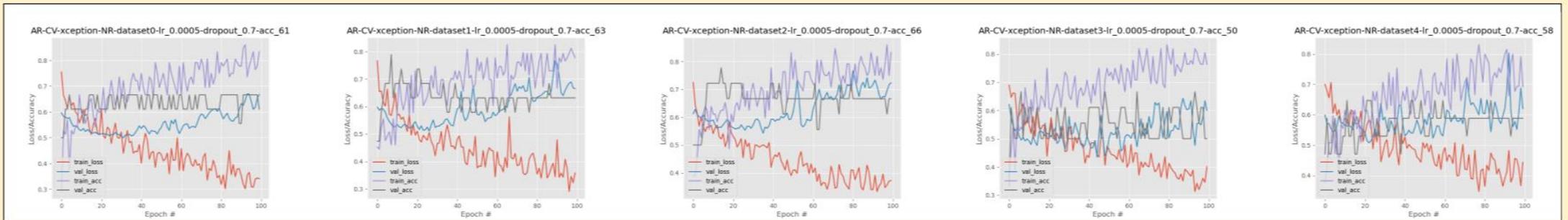
Data Comparison

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

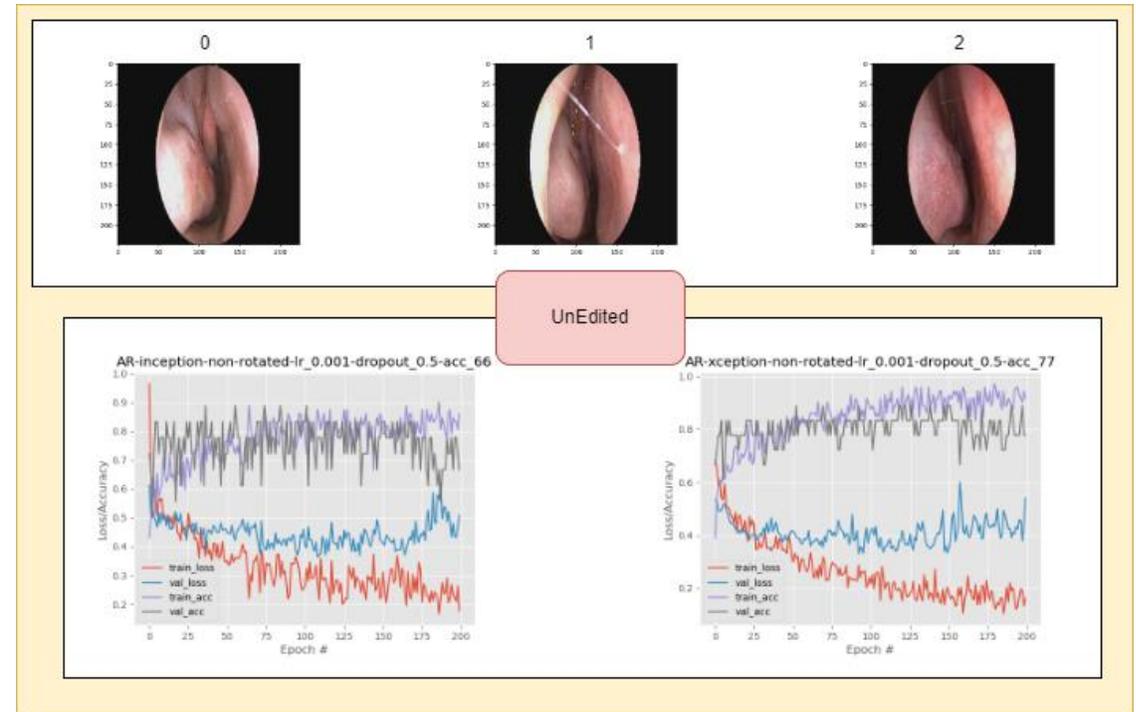


Image Preprocessing

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

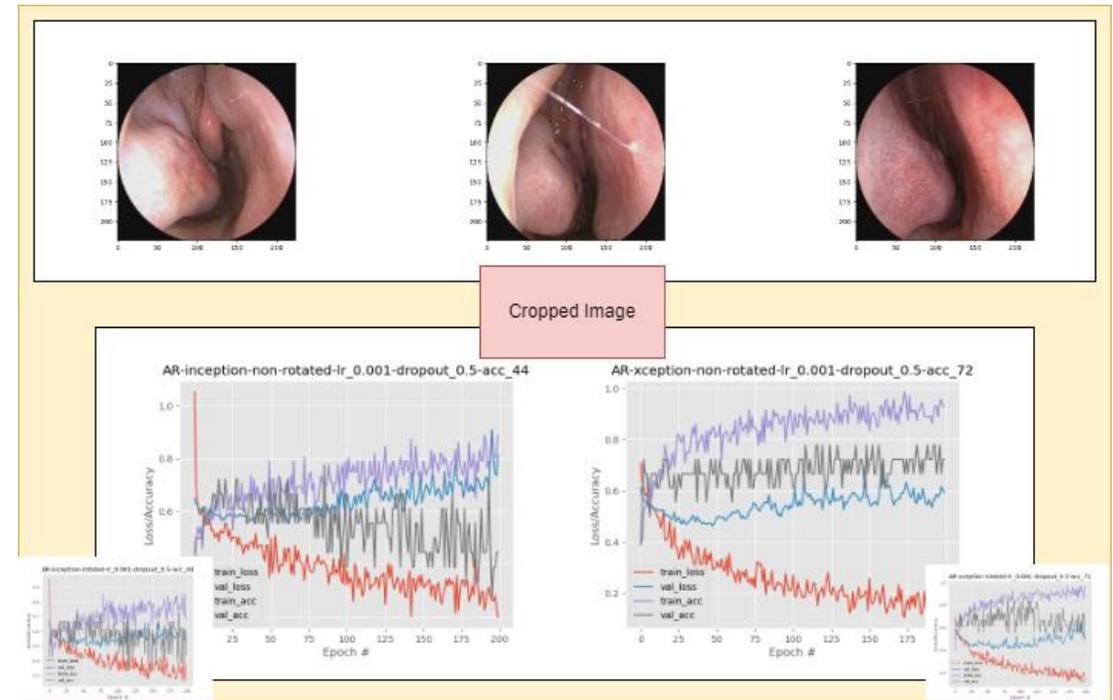


Image Preprocessing

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

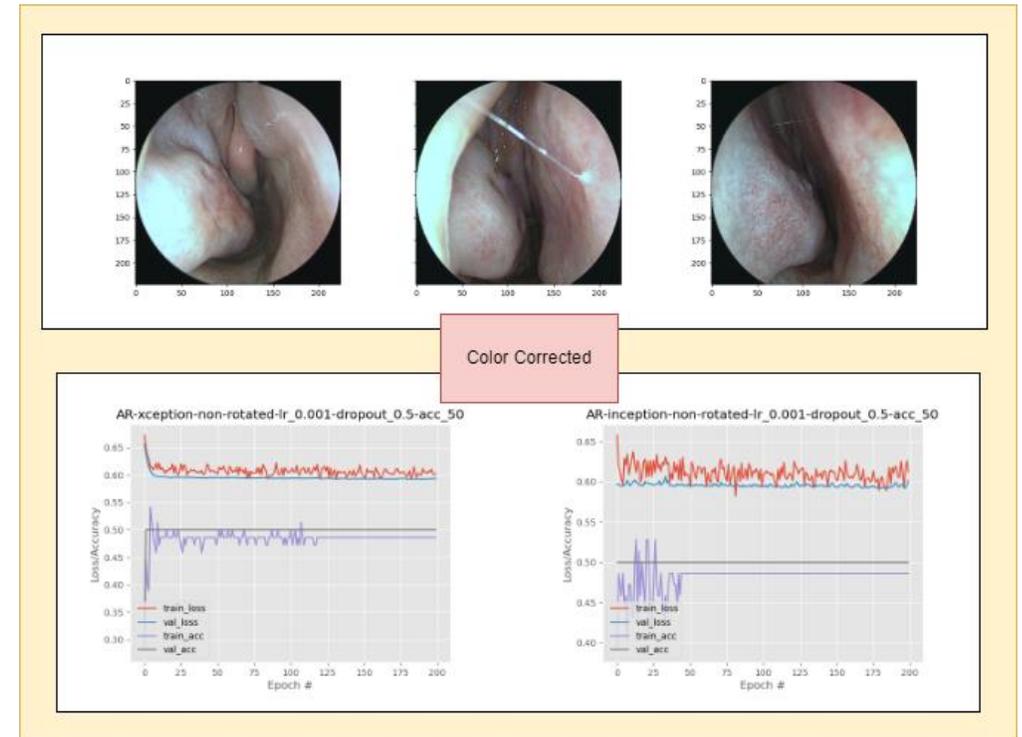
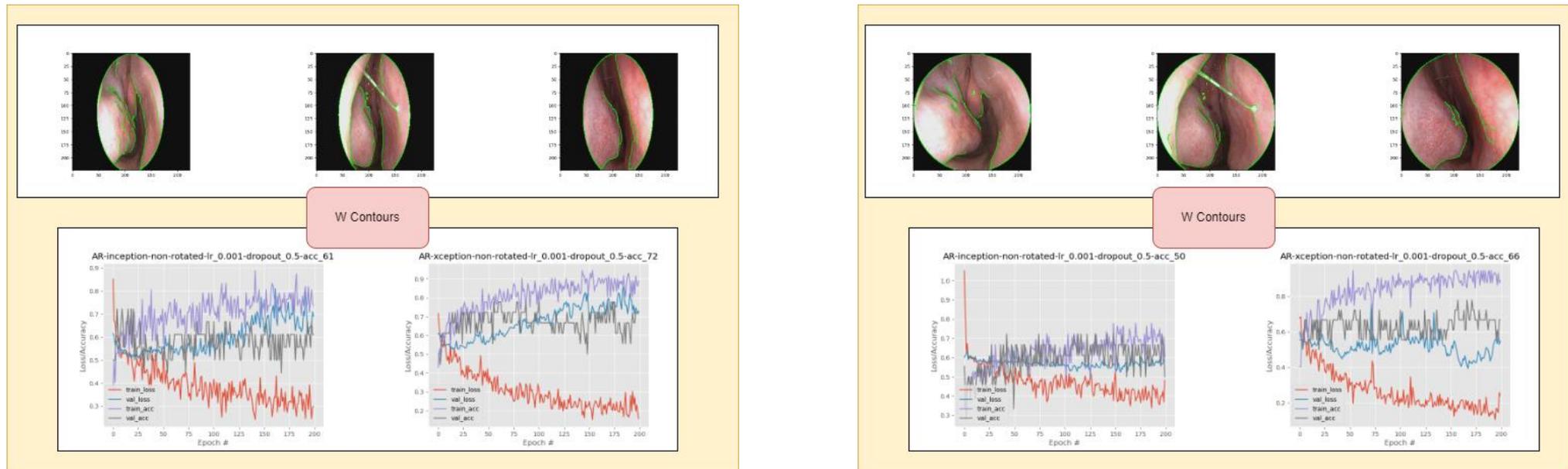


Image Preprocessing

Addition for Contour Information in the Image

For all non-aligned(non-rotated) Inputs

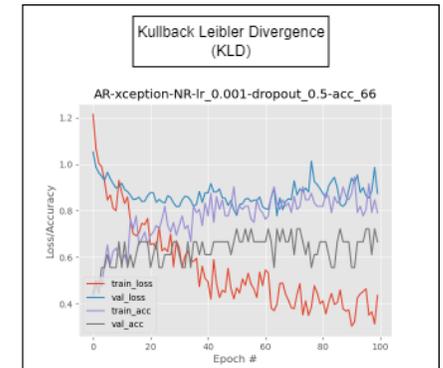
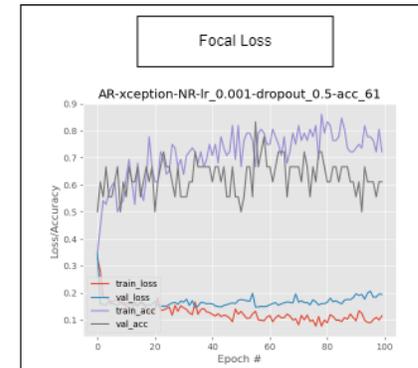
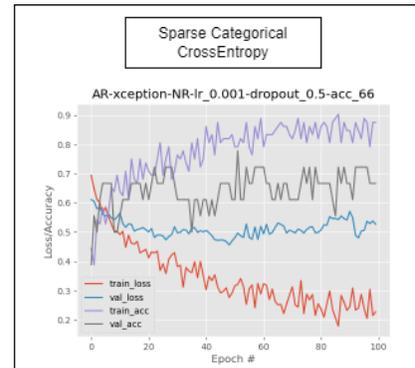
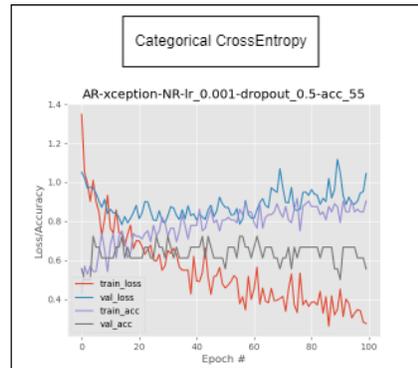
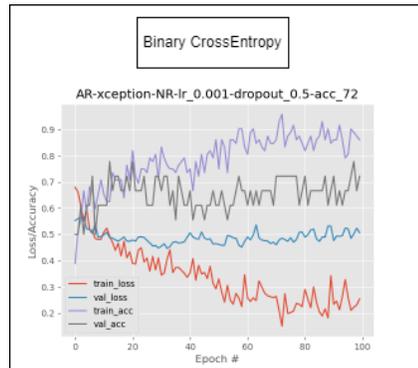


	UnEdited	Cropped	ColorCorr	UnEdit+C	Crop+C
InceptionNet	66	44	50	61	50
XceptionNet	77	72	50	72	66

Loss Functions

Comparing various Loss functions

For all non-aligned(non-rotated) Inputs



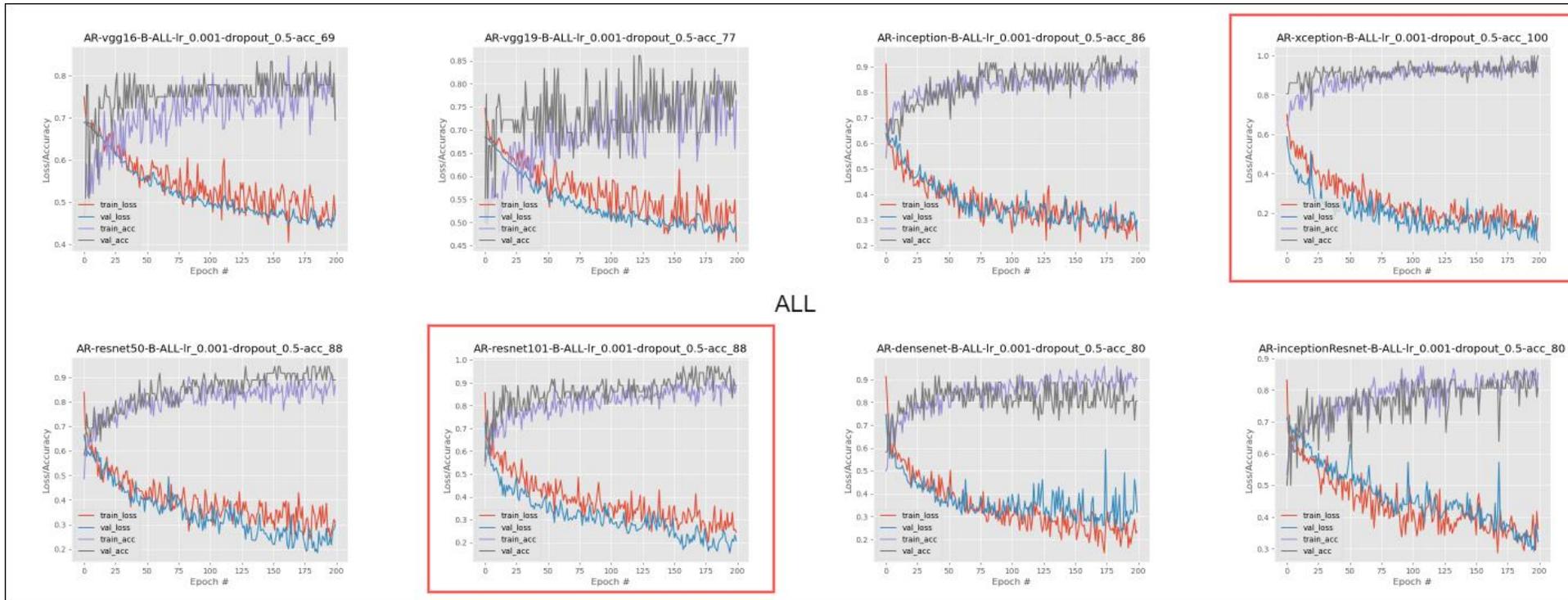
The results were obtained from standard model and the output accuracies are as follows -

	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