# Facial Keypoint Detection

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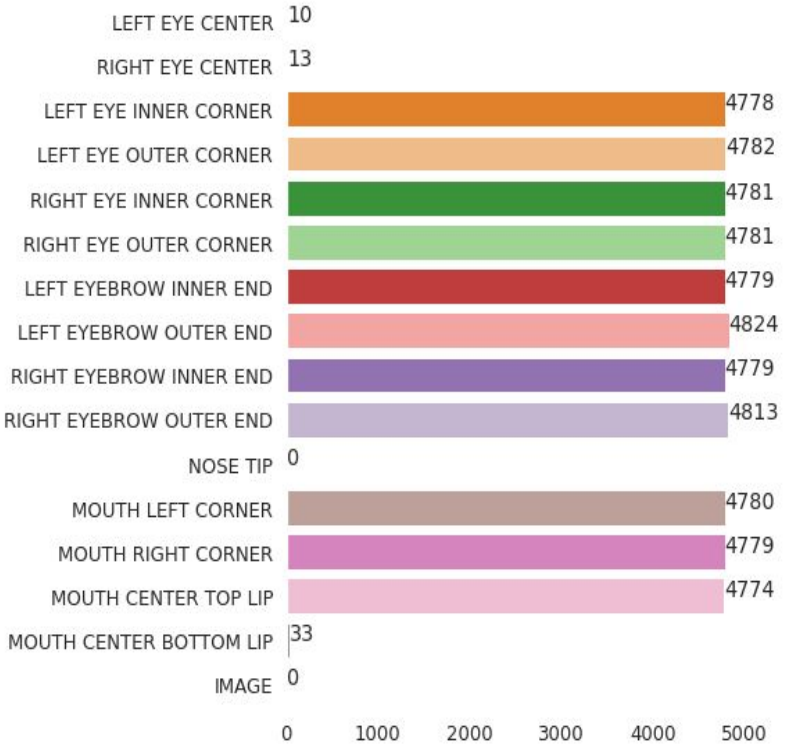
24.06.2021

# Data description

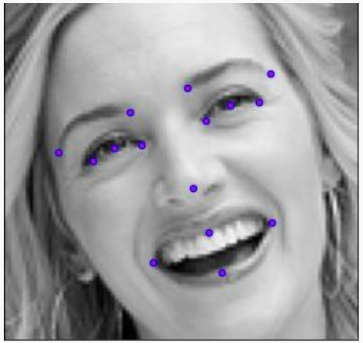
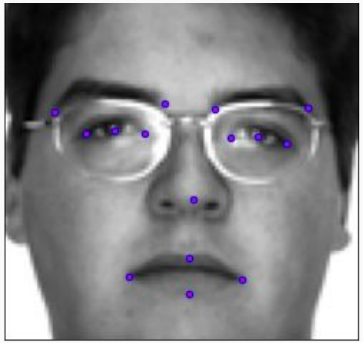
- The data is taken from kaggle competition
  - Training Set
    - 7049 Images with keypoints
  - Test Set
    - 1783 Images
  - Image
    - Grayscale images
    - Dimension: 96 * 96
  - 15 keypoints
    - Real-valued
    - x and y coordinates
    - Eye, Nose, Mouth
  - ★ Missing Lables(keypoints):
    - 2225 images: 15 keypoints
    - 4770+ images: only 4 keypoints

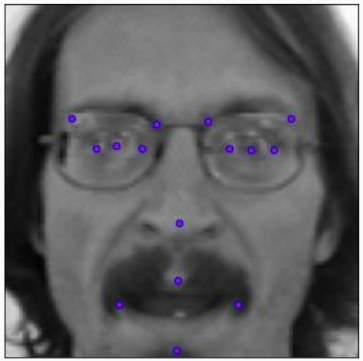
## Missing labels:



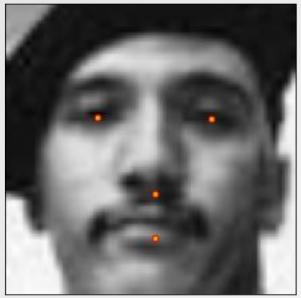
# Data visualization

## Random images with keypoints

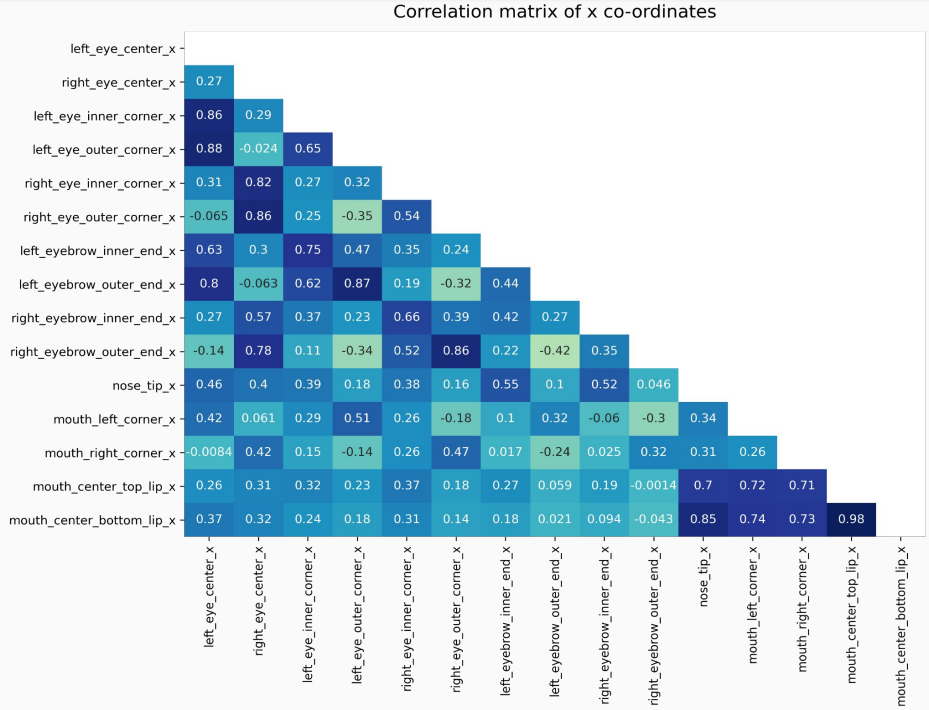



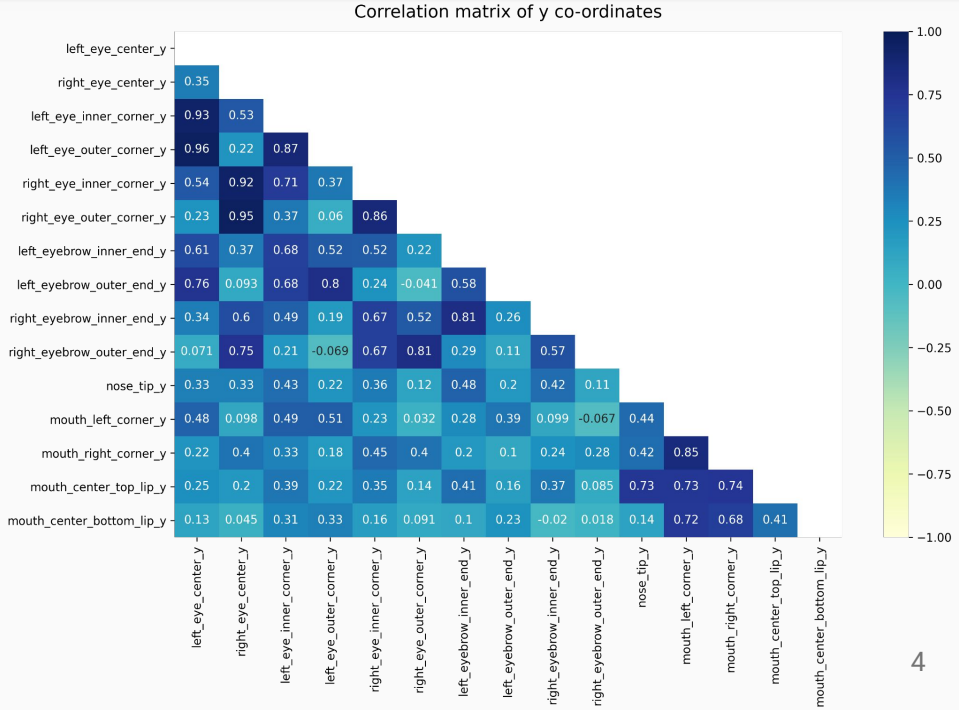


- Inter relation among 15 keypoint positions
  - Nose is likely to fall on the perpendicular bisector of the line-segment connecting two eyes with good probability.

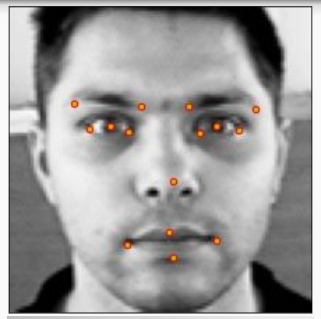




- x coordinates of one side are highly correlated with each other on that side (i.e., left, right and centre)
- Correlation of y coordinates are almost non-negative and same property as x coordinates



# Our Goal



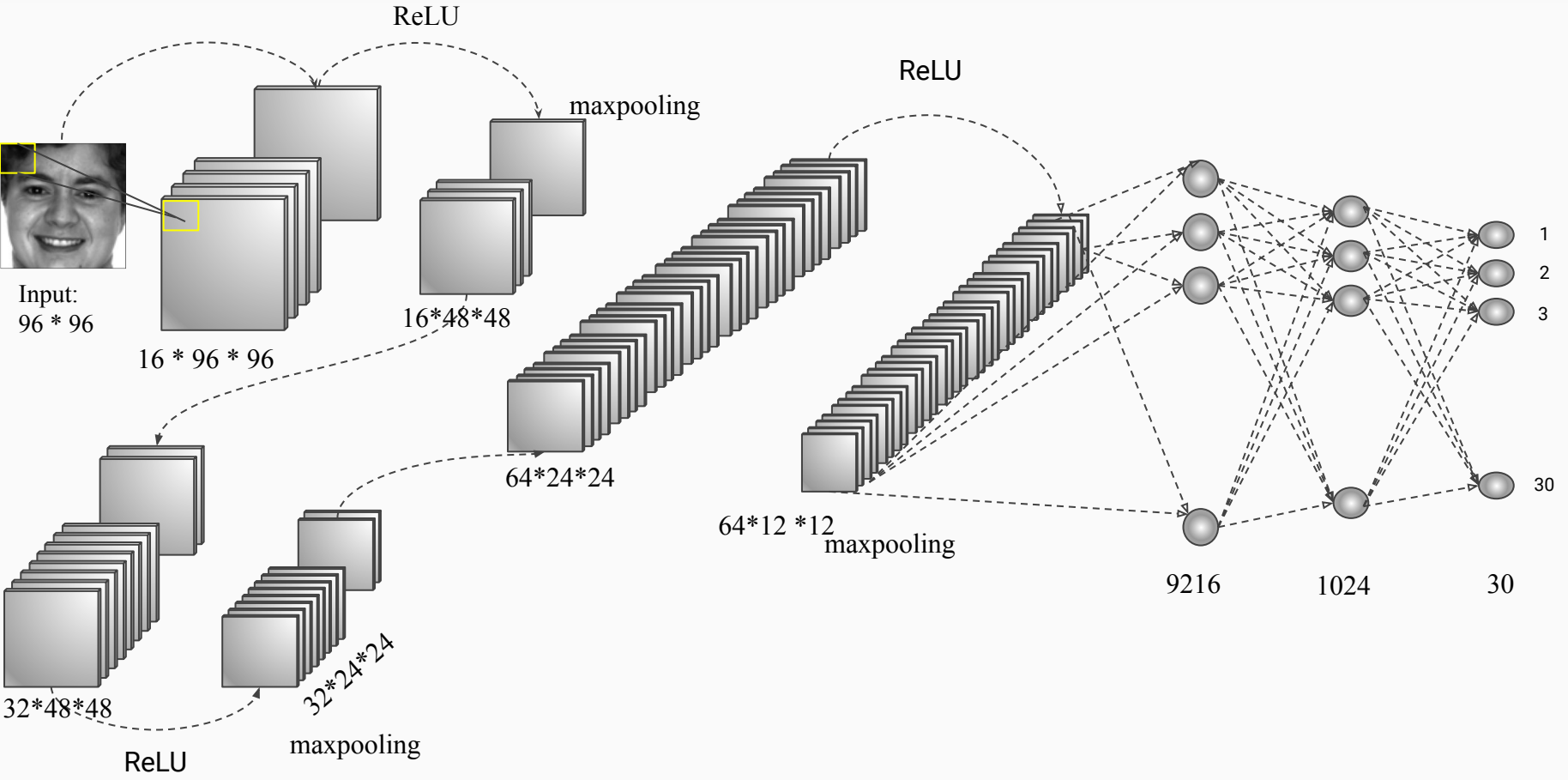
Ground Truth

Training

Model

Predicted

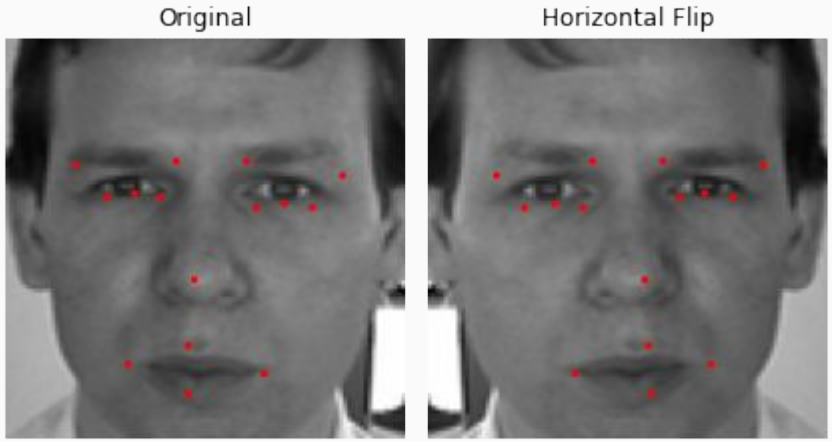
# CNN architecture



# Data augmentation:

Image faces are mostly in center, so Horizontal Flip is a good idea to add some randomness to the data.

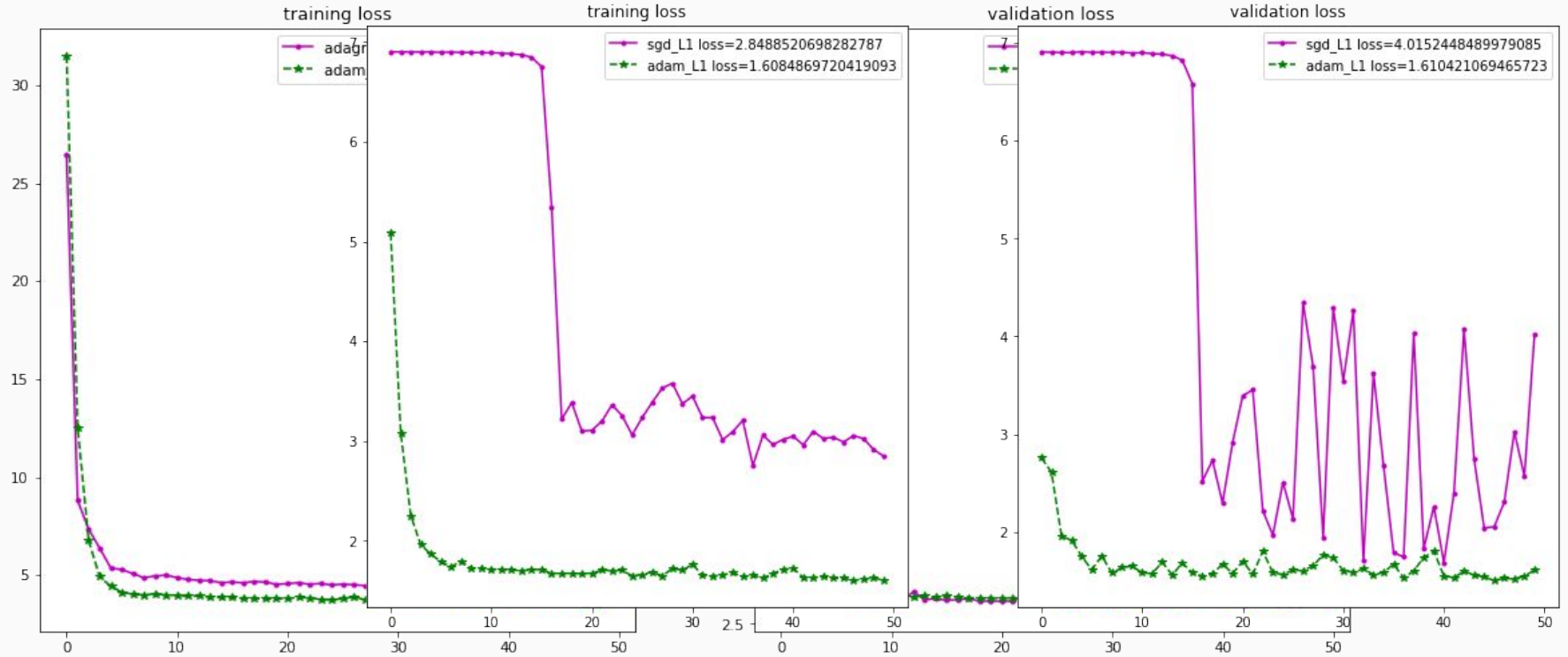
Augmentation has been done on non-null keypoints.



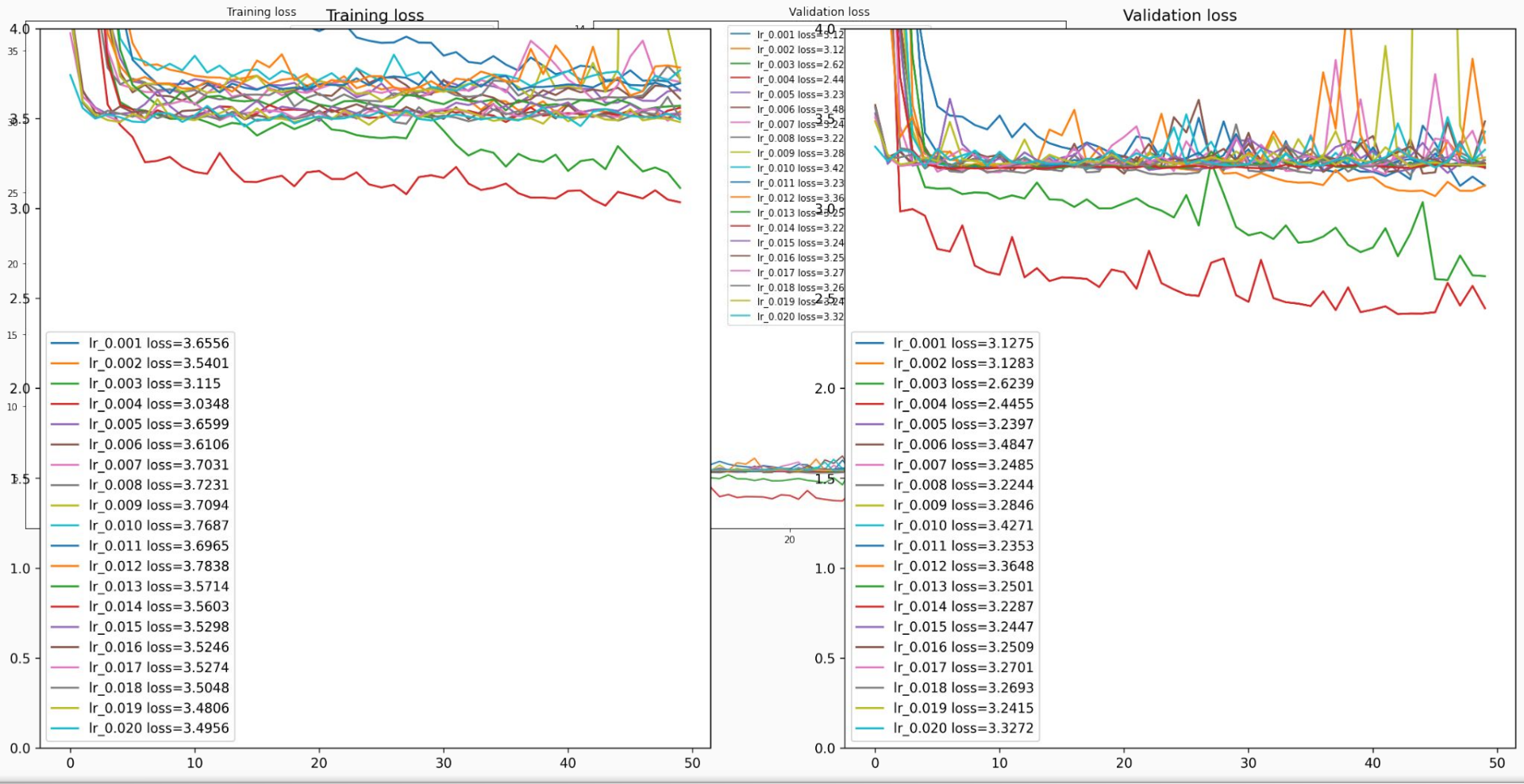
# Evaluation:

- Error metric used to evaluate training and validation data is Root Mean Squared Error(RMSE) and L1 loss with different optimizer.

L1 loss with learning rate =0.003



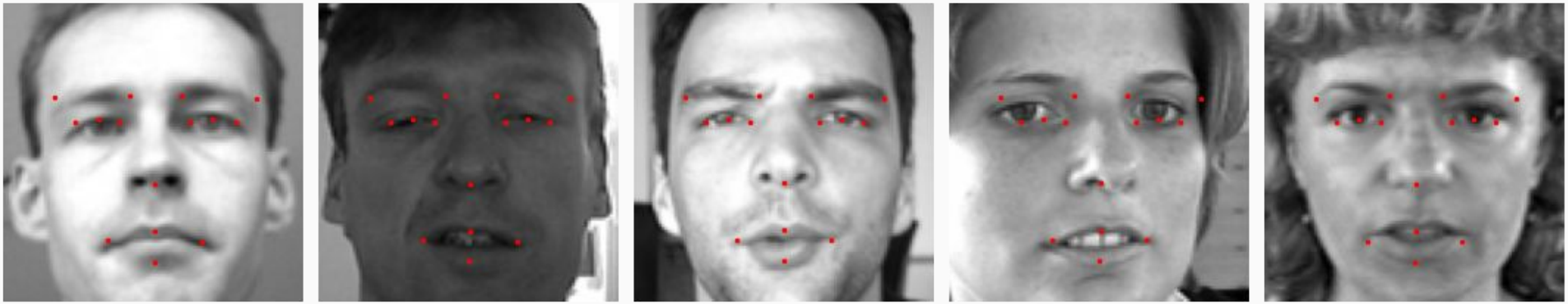

RMSE with learning rate =0.003




Different learning rates for adam optimizer on RMSE loss function

# Results:

## Model applied to predict the keypoints



# References:


1. Facial Key Points Detection using Deep Convolutional Neural Network - NaimishNet, Naimish Agarwal, IIIT-Allahabad (irm2013013@iiita.ac.in) Artus Krohn-Grimberghe, University of Paderborn (artus@aisbi.de) Ranjana Vyas, IIIT-Allahabad (ranjana@iiita.ac.in)

2. Facial Keypoints Detection, Shenghao Shi

# THANK YOU