

RQ: Comparison of uncertainty estimation methods for Keypoint detection?

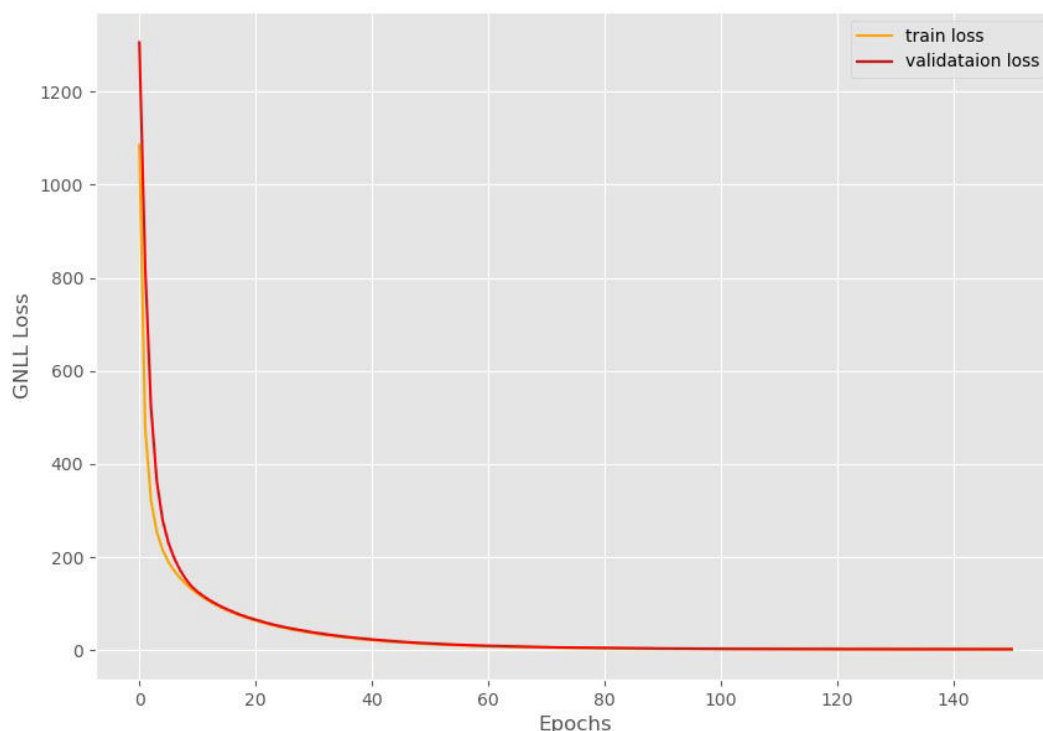
- In this sprint, I have chosen to work with Resnet 18 model for facial keypoint detection task which corresponds to my first research question of R&D.
- For this sprint, I chose Gaussian Negative Log likelihood and RMSE loss function for the analysis of the model for different loss functions.
- The hyperparameters I used for the model are:

Number of epochs	300
Batch size	256
Learning rate	0.0001
Optimizer	Adam

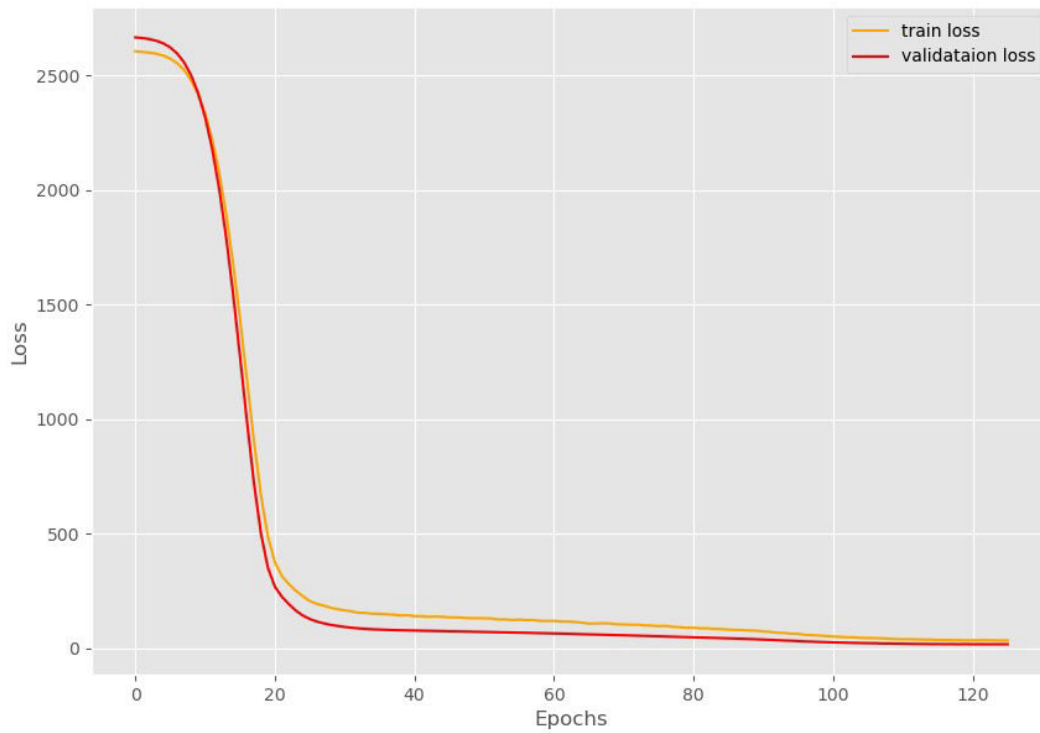
- For the Gaussian Negative Log likelihood, the model in addition to the prediction also predicts the confidence in the prediction in the form of gaussian variance.
- Along with the variance, I also calculate entropy using the formula:

$$\frac{1}{2} * (\log(2 * \pi * \text{Variance})) + \frac{1}{2}$$

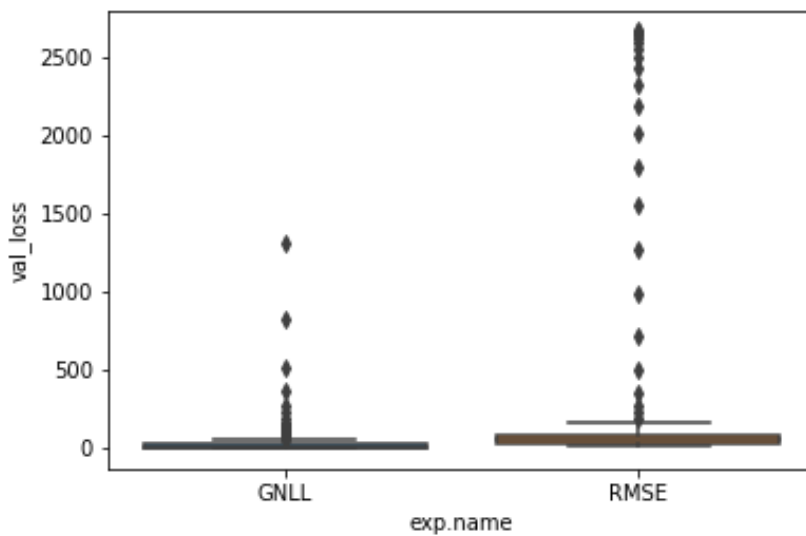
- I used early stopping, given patience, if my model does not improve for patience epoch at a stretch, it stops the training. For GNLL, the training stopped at epoch 183 as there are no further improvement in validation loss.
- The corresponding output data such as train loss, validation loss, variance, entropy and prediction is then stored in a csv file.
- The loss graph for Train loss vs validation loss for GNLL is shown below



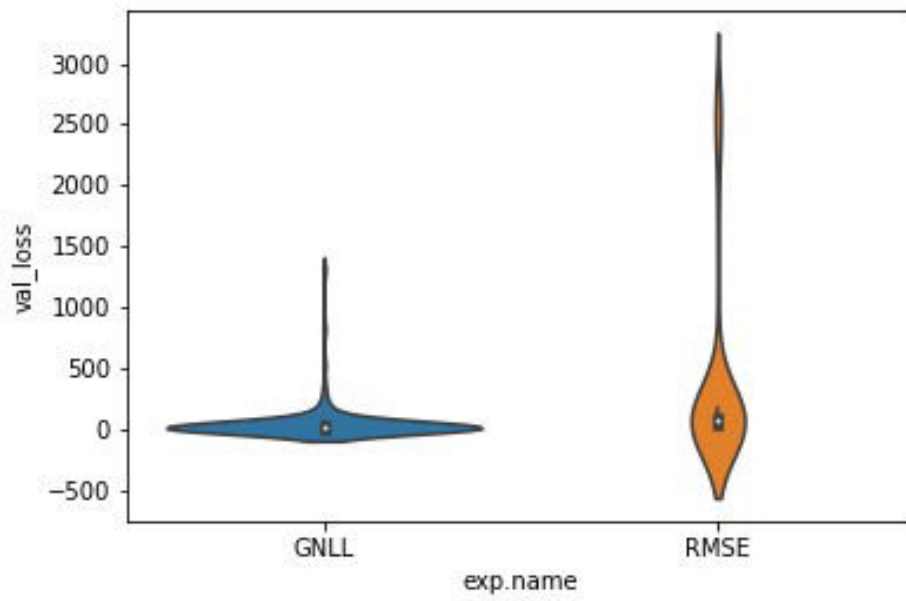
- Similar to the GNLL, for RMSE output data such as train loss, validation loss, and prediction is stored in a csv file.
- The loss graph for Train loss vs validation loss for RMSE is shown below



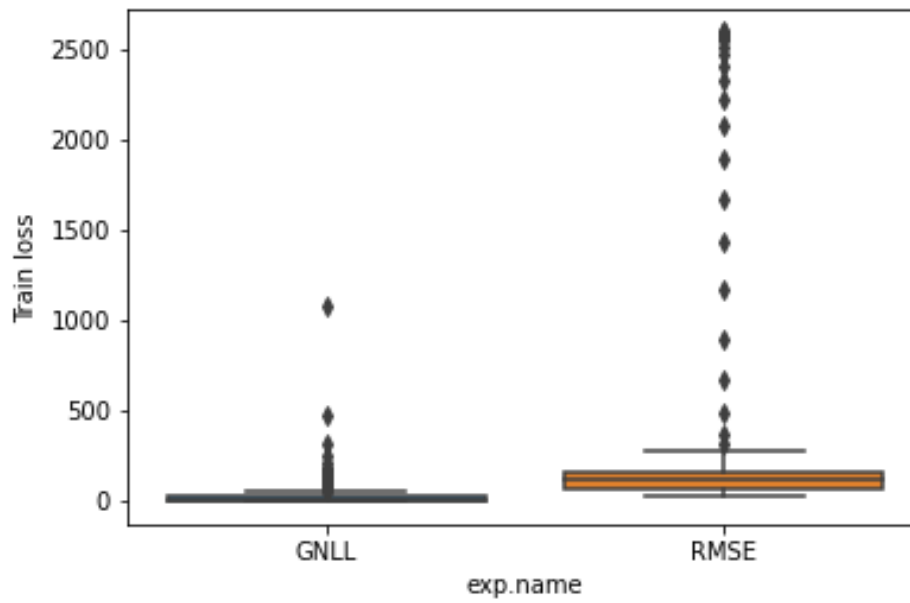
- From the overall output , I have plotted a comparison plot for GNLL vs RMSE using seaborn boxplot and violint plot for both validation loss and train loss.
- GNLL val loss vs RMSE val loss – Box plot



- GNLL val loss vs RMSE val loss – Violin plot



- GNLL train loss vs RMSE train loss – Box plot



- GNLL train loss vs RMSE train loss – Violin plot

