Facial Expression Recognition Model

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Introduction:

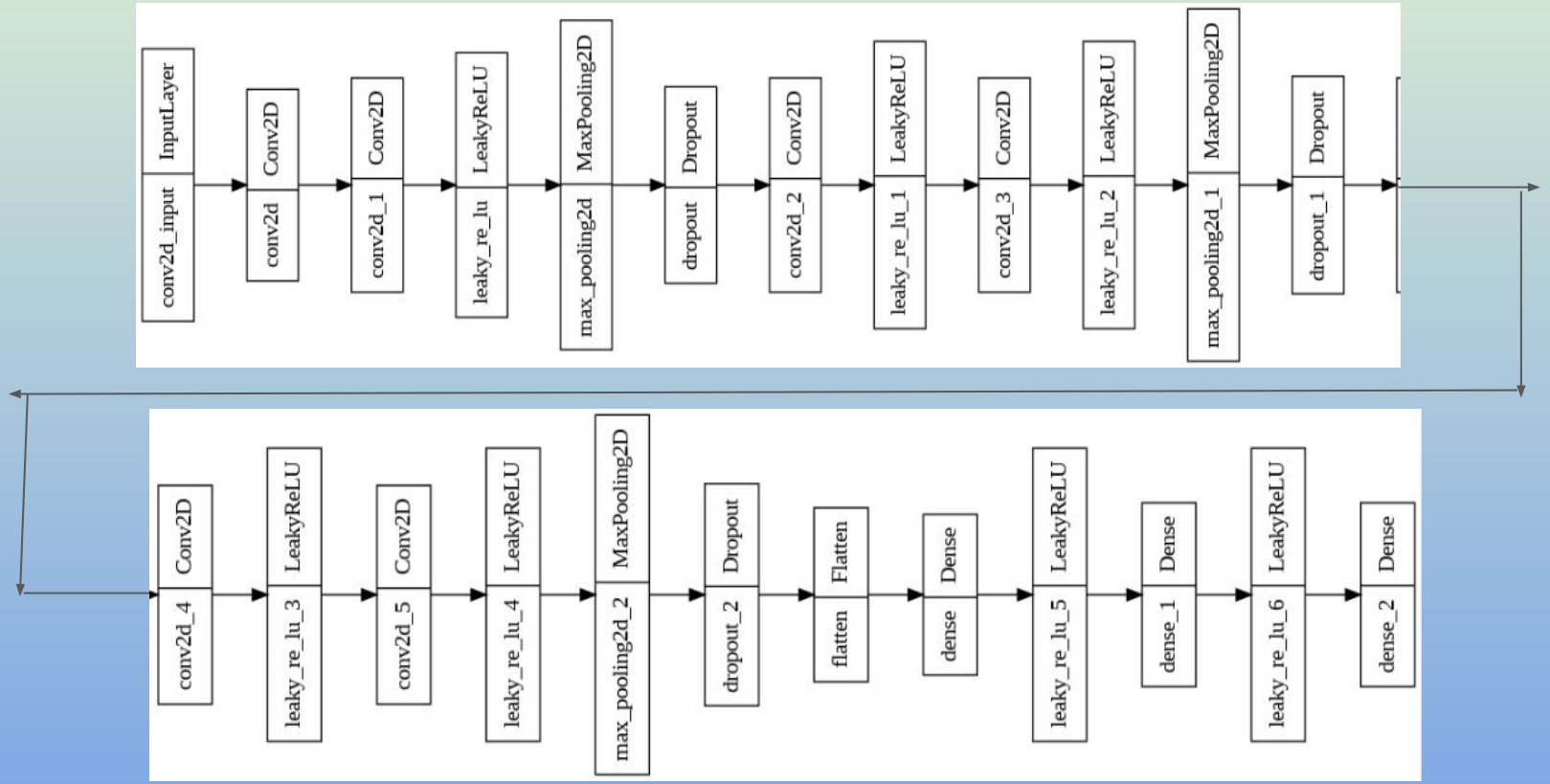
This project started with a goal to build a classification model which can differentiate between different human facial expressions. To achieve this, many investigative and comparative studies were performed to select the best approach to solve the problem.

Dataset was provided with four types of expressions: 'happy', 'sad', 'neutral' and 'surprised'. Exploratory analysis suggested that data is equally distributed. Following are the points which were concluded after investigation during Milestone-1 and 2:

- Using grayscale images, not RGB
- Building model with CNN, not ANN
- Developing complex neural network architecture, instead of using pretrained classification model(s)

Using above findings, CNN model was built. In coming slides, we will talk about the architecture and its performance.

Architecture:



Note: number of layers, number of hidden nodes, hyperparameter values etc. were selected after performing multiple tests with different values and the values producing better result were chosen.

Model Performance:

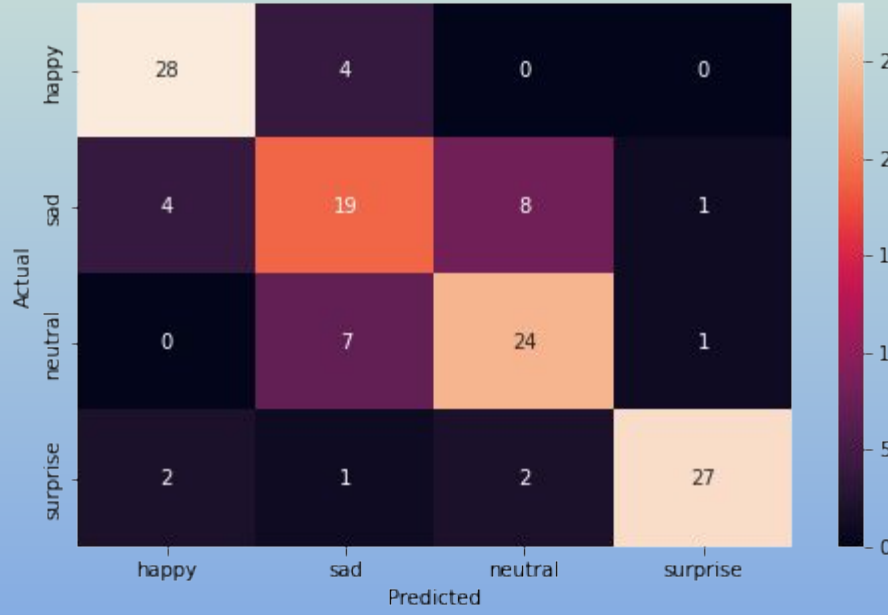
This model gave 78.9% of accuracy on test data. Result is **below the desired level.**

Confusion matrix is providing us more information about the model's classification capability. Below conclusions can be drawn with the help of this matrix:

- Model is struggling more in distinguishing between 'sad' and 'neutral' expressions.

- It is making very few errors in distinguishing 'happy' and 'neutral' expressions from 'surprise' expression.

As a human, sometimes it is difficult for us as well to distinguish between some expressions like 'sad' and 'neutral' however it is very easy to differentiate between 'happy' and 'sad' or 'neutral' expressions. Confusion matrix shows that many 'happy' expressions were wrongly classified, or other expressions were classified as 'happy'. This **leads us to new investigation.**



Model Performance continued…….

One more observation which needs to be investigated is that when images are passed as batch vs images passed individually for prediction. It was observed that when individual images were predicted, model's performance was very high, it was making very few mistakes whereas incase of batches it was producing more erroneous result.

Correct results were also plotted in python notebook and it was evident that model was doing very good job though it is not the best model to be used.

Conclusion:

Distinguishing between human facial expression is tad crucial compared to differentiating between completely different objects. Here, we need to extract very low level of features from the images, combine them and output the desired result.

Our model achieved approx. 78% of accuracy, it is predicting many images correctly however some images are clearly misclassified. So, model has certainly learned some parameters but not enough to be implemented in real life scenario.

It is not a bad model, it has full potential to be converted into a very good classification model. We need to put more effort and time to investigate the problem area where it is failing and improve on that.

Recommendation:

Model is not recommended for practical use. More study and investigation need to be done for sound architecture and better performance.

Thank You !