DigitSignLanguage

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Problem statement

- My head of department has placed me in the development team to help label and classify sign language images.
- As my first task, I am only assigned the sign language images for the digits 0 to 9 and the task is to correctly classify the images according to their digits.
- I have been asked to develop a bottom-up AI application using Artificial neural networks to classify the sign language digits.

Goals/Aims Of The Project

- I will need to present to your team leader the following:
- A baseline model using multinomial logistic regression. Report the accuracy found by this baseline model
- A neural network model built using TensorFlow/Keras. Justify all hyperparameters tuning performed for the model
- Evaluate the neural network model built and the accuracy. Does the accuracy improve compared to the baseline model? Explain.

The Methods Used To Develop The Project

- Multinomial Logistic Regression Baseline Model
- TensorFlow / Keras - Neural Network Model
- model.summary()

The Performance Measure Of My Model

```
(413,)
```

In [66]:
```
softmax_reg = LogisticRegression(multi_class="multinomial",solver="lbfgs", max_iter=4100)
softmax_reg.fit(x_train, y_train)
```

Out[66]:
```
LogisticRegression(max_iter=4100, multi_class='multinomial')
```

In [67]:
```
print( softmax_reg.score(x_test, y_test) )
print( softmax_reg.score(x_train, y_train) )
```

```
0.738498789346247
1.0
```

In [68]:
```
from sklearn.metrics import accuracy_score
y_pred = softmax_reg.predict(x_test)
accVal = accuracy_score(y_test, y_pred)
print(accVal)
```

```
0.738498789346247
```

```
Epoch 25/30
46/46 [==============================] - 0s 2ms/step - loss: 0.9528 - accuracy: 0.7131
Epoch 26/30
46/46 [==============================] - 0s 2ms/step - loss: 0.8554 - accuracy: 0.7200
Epoch 27/30
46/46 [==============================] - 0s 2ms/step - loss: 0.7629 - accuracy: 0.7595
Epoch 28/30
46/46 [==============================] - 0s 2ms/step - loss: 0.8172 - accuracy: 0.7450
Epoch 29/30
46/46 [==============================] - 0s 2ms/step - loss: 0.7168 - accuracy: 0.7817
Epoch 30/30
46/46 [==============================] - 0s 2ms/step - loss: 0.7242 - accuracy: 0.7519
```

- We can improve the performance of our model by increasing the number of epochs. As we can see here I've 30 epochs with 0.7519 accuracy.
- As long as the epochs increases the accuracy would increase
- Also the max iterations in the logistic as long as it's increased the the accuracy would increase.

Discussing the accuracy for each sign language digit

	precision	recall	f1-score	support
0	0.86	0.75	0.80	67
1	0.97	0.48	0.65	64
2	0.53	0.36	0.43	66
3	0.97	0.61	0.75	59
4	0.52	0.81	0.63	62
5	0.57	0.93	0.71	59
6	0.51	0.78	0.61	63
7	0.64	0.75	0.69	68
8	0.69	0.73	0.71	56
9	1.00	0.33	0.49	55
accuracy			0.65	619
macro avg	0.73	0.65	0.65	619
weighted avg	0.72	0.65	0.65	619

- the accuracy for each digit may change for sure because it depends on lots of factors. As shown we've the f1-score and the precision.
- The number 3 had the highest classification accuracy it had 0.97 precision & 0.75 f1-score.
- The number 6 had the lowest it had 0.51 precision & 0.61 f1-score
- there are differences in accuracy because it depends on many factors.

Main Conclusions

- In an overall view, I think that the Digit sign model performed very good.

- In my perspective, the model I’ve built for sure it’s ready to go to the next stage in the model development pipeline.

Future Work

- For me, the data pre-processing, data quality, data size was cleaned and very good, there was no N/A values and data size is manageable I didn’t have any obstacles when analyzing it.

- As a future work we may try to use and try many other types of models, so we can have a different results and decide which is better for our projects.