CS551

Deep Learning

Report on Different Regularization Techniques

2011MC04

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Mathematics and Computing

Problem Statement

Building a neural network (NN) in Keras which predicts whether or not a patient has diabetes, based on certain diagnostic measurements included in the dataset. Finally analysing the accuracy, f1 score, precision and recall. Test data contains 20% of the original data.

Architecture:

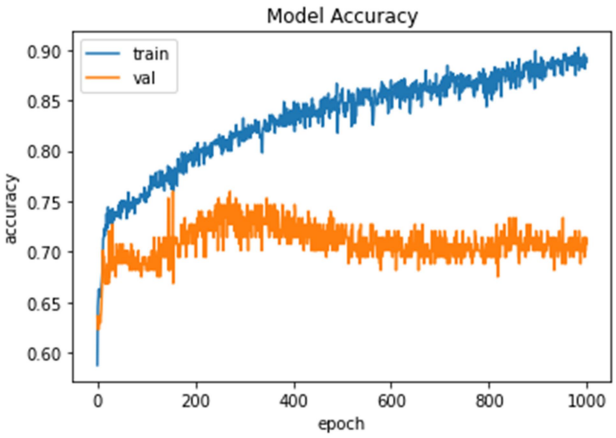
- NN contains 2 Hidden layers.
- Both the hidden layers use "sigmoid activation function".
- No of hidden units in first and second hidden layers are 500 and 100 respectively.
- The output layer uses softmax activation functions.
- Batchsize is 70 and no epochs are set to 1000

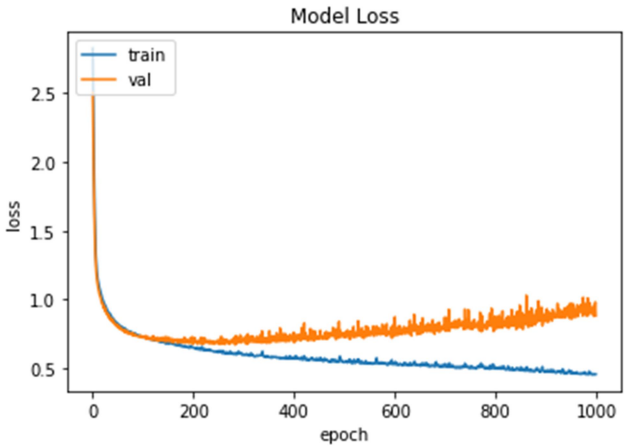
Objective:

The objective of the report is to analyse the performance of the above NN model with different Regularization techniques.

We evaluate the model on the basis of the accuracy,precision,recall and F1 Score.

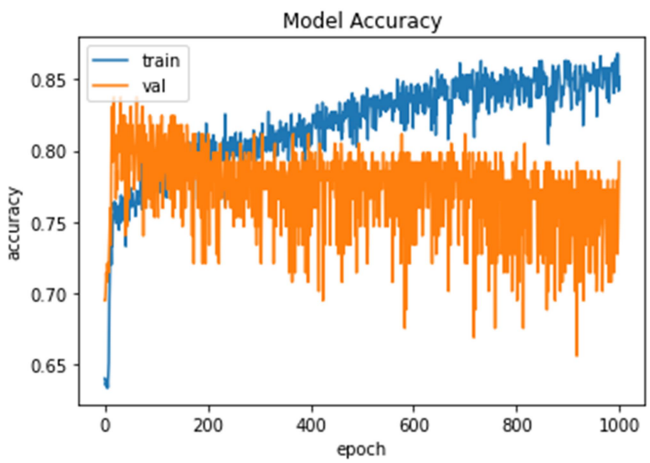
L1 Regularization:

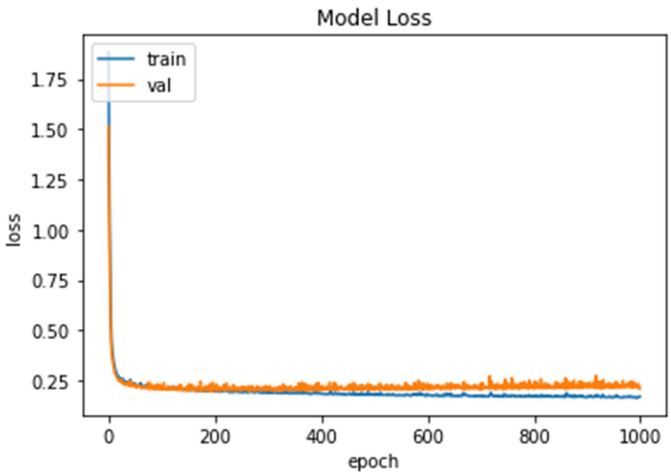




	precision	recall	f1-score	support
0	0.77	0.77	0.77	98
1	0.60	0.61	0.60	56
accuracy			0.71	154
macro avg	0.68	0.69	0.69	154
weighted avg	0.71	0.71	0.71	154

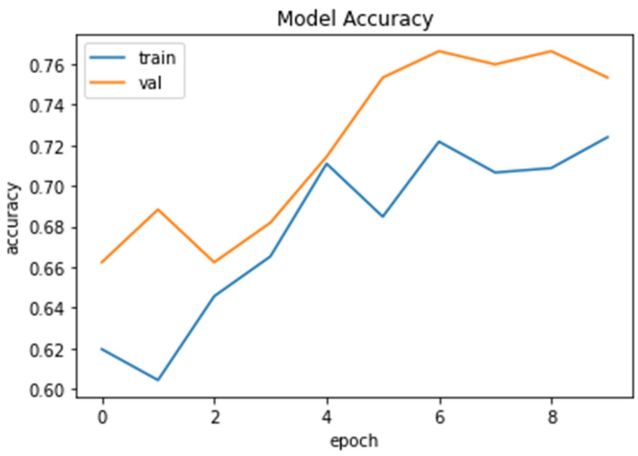
L2 Regularization:

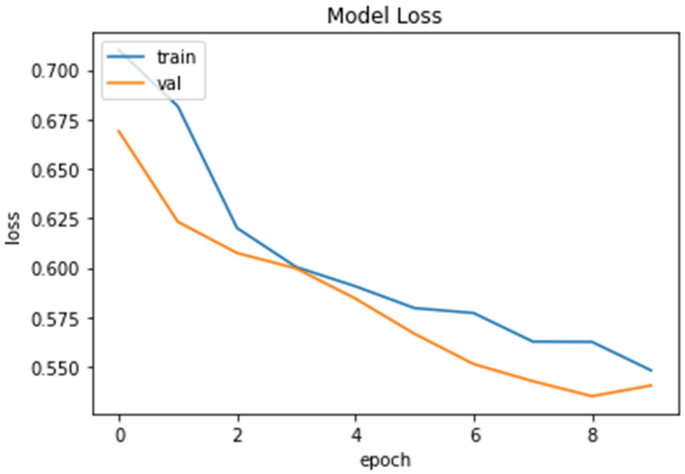




	precision	recall	f1-score	support
0	0.82	0.90	0.86	107
1	0.70	0.55	0.62	47
accuracy			0.79	154
macro avg	0.76	0.73	0.74	154
weighted avg	0.78	0.79	0.78	154

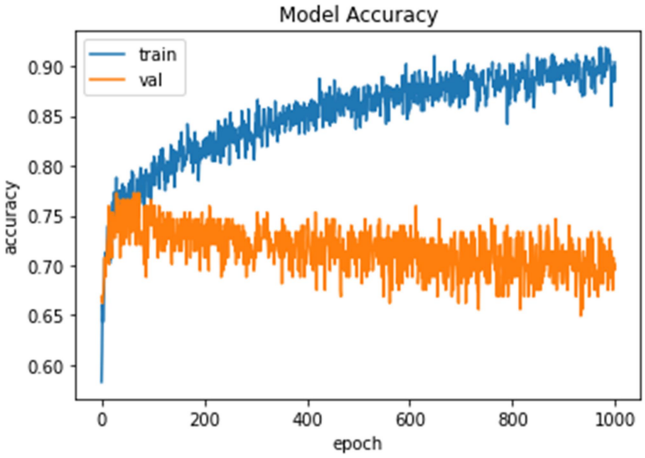
Early Stopping:

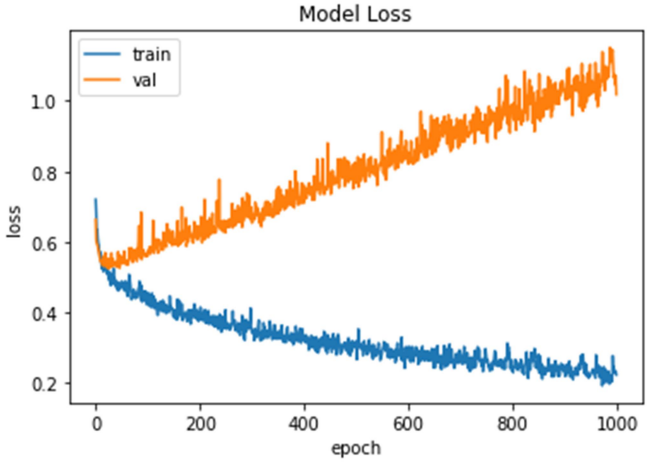




	precision	recall	f1-score	support
0	0.70	0.96	0.81	99
1	0.79	0.27	0.41	55
accuracy			0.71	154
macro avg	0.75	0.62	0.61	154
weighted avg	0.73	0.71	0.67	154

Dropout Technique :

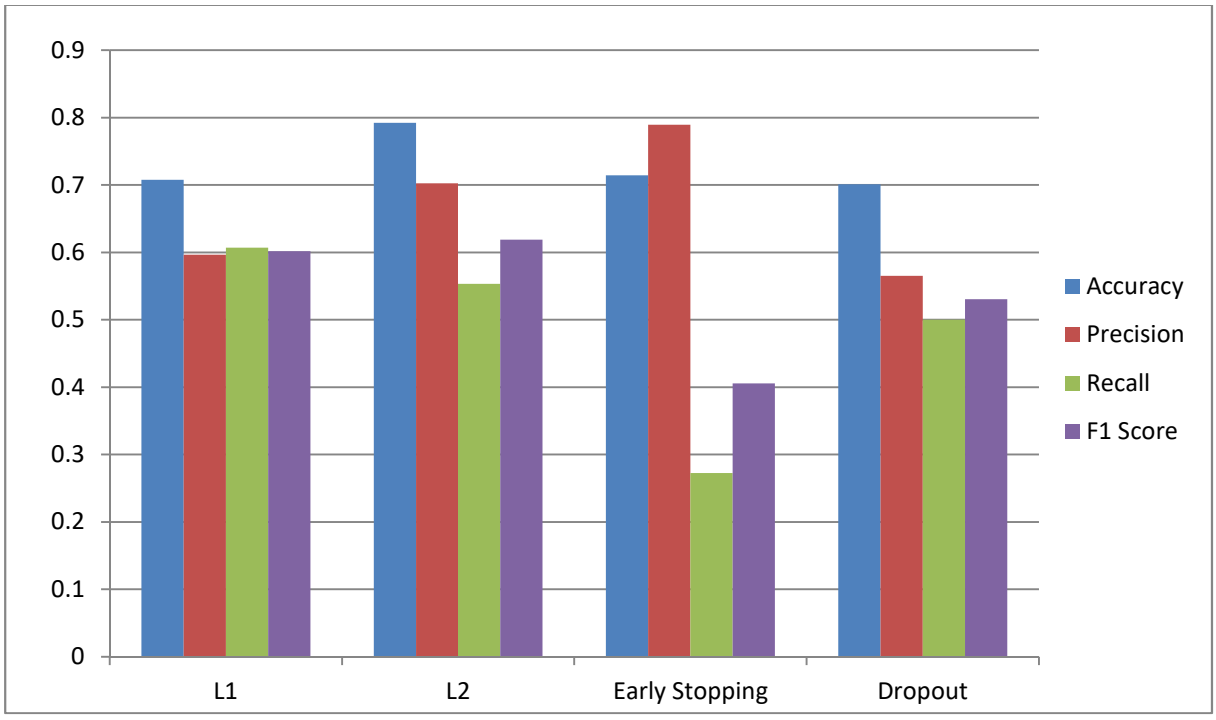




	precision	recall	f1-score	support
0	0.76	0.80	0.78	102
1	0.57	0.50	0.53	52
accuracy			0.70	154
macro avg	0.66	0.65	0.66	154
weighted avg	0.69	0.70	0.70	154

Comparison Table:

Metric	L1	L2	Early Stopping	Dropout
Accuracy	0.707792	0.792207	0.714285	0.701299
Precision	0.596491	0.702703	0.789474	0.565217
Recall	0.607143	0.553191	0.272727	0.500000
F1 Score	0.601770	0.619048	0.405405	0.530612



Conclusion

At the beginning of this report it is stated that the aim of the report is to analyse the performance of the four regularization methods L1, L2, Early stopping and Dropout. This was done by testing and evaluating the four methods L1, L2, Early stopping and Dropout with a focus on the "Pima Indians Diabetes Dataset".

The four methods were then evaluated by comparing their performances on the same architecture.

It was found that L2 Regularization had performed better than the other models in terms of accuracy.

The other regularization techniques performed almost similar to each other but their accuracy was lower than that of L2.

The Report is totally based on the Pima Indian's Dataset and the results are not generalised comparisons of the four regularization techniques.

Therefore, one ought to be cautious when it comes to extrapolating these findings outside this dataset and the values used for the specific regularization methods. More analysis is needed in order to better understand how different hyperparameter values change the behavior of the specific regularization methods.