**IEEE CIS/SMC Challenge**

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**Motivation**

I have selected artificial neural network to solve the multi-label and multiclass classification challenge, the selection was due to the requirement of the Challenge and the nature of the dataset.

**Algorithm**

The algorithm employed in the solution is a artificial neural network with multiple hidden layers and a softmax output layer as the first label is a 10-class label.

**Architecture**

Label1

7 56000

6 40000

4 33393

5 18184

3 12264

8 10491

1 2000

2 1746

9 1133

10 130

Name: Label1, dtype: int64

Label2

1 119341

0 56000

Name: Label2, dtype: int64

Label

-7 56000

6 40000

4 33393

5 18184

3 12264

8 10491

1 2000

2 1746

9 1133

10 130

Name: Label, dtype: int64

Evaluation:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | Exact Match Loss | Exact Match Accuracy | Hamming Loss | Hamming Accuracy |
| 1 | 0.580 | 76.06% | 0.179 | 82.08% |
| 2 | 0.556 | 75.49% | 0.188 | 81.19% |
| 3 | 0.588 | 76.68% | 0.176 | 82.41% |
| 4 | 0.561 | 77.24% | 0.170 | 83.03% |
| 5 | 0.604 | 75.85% | 0.184 | 81.64% |
| 6 | 0.560 | 76.84% | 0.174 | 82.64% |
| 7 | 0.579 | 76.27% | 0.178 | 82.24% |
| 8 | 0.549 | 78.52% | 0.160 | 84.03% |
| 9 | 0.572 | 74.56% | 0.196 | 80.36% |
| 10 | 0.665 | 73.89% | 0.202 | 79.79% |
| Average | 0.581 | 76.14% | 0.181 | 81.94% |
| Standard derivation | 3.19% | 1.25% | 1.20% | 1.19% |

[(0.5420660972595215, 0.7747412919998169, 0.16810596123014143, 0.8318940387698586), (0.5634239912033081, 0.7619273066520691, 0.17819924209298932, 0.8218007579070107), (0.5672074556350708, 0.7433197498321533, 0.198173249769227, 0.801826750230773), (0.5503278374671936, 0.7708181738853455, 0.17175581790798233, 0.8282441820920177), (0.532231867313385, 0.7806563377380371, 0.15996210464946803, 0.840037895350532), (0.5560332536697388, 0.7639435529708862, 0.17740368265073114, 0.8225963173492689), (0.5343391299247742, 0.7803284525871277, 0.1616443181266093, 0.8383556818733907), (0.5301542282104492, 0.7749113440513611, 0.16847033960064128, 0.8315296603993587), (0.5608804821968079, 0.7506073117256165, 0.19102536073458676, 0.8089746392654132), (0.538071870803833, 0.7735509872436523, 0.16930233687994944, 0.8306976631200506)]

std\_variation [0.01314313 0.01185915 0.01159284 0.01159284]

mean [0.54747362 0.76748045 0.17440424 0.82559576]

The hyperparameter search is complete.

num\_layers 4.

first\_layer\_units 66.

learning\_rate is 0.001.

from\_logits 1

dropout\_rate 0.0

48 tanh

48 relu

64 relu

64 tanh Text

Description automatically generated with medium confidence