

Neural Graph Learning



SML PROJECT

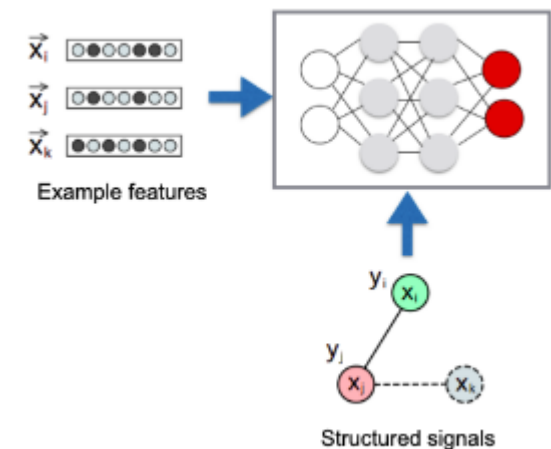
Anand Sharma(MT19059)
Ayan Raha(MT19032)

loss=supervised loss + NeighbourLoss

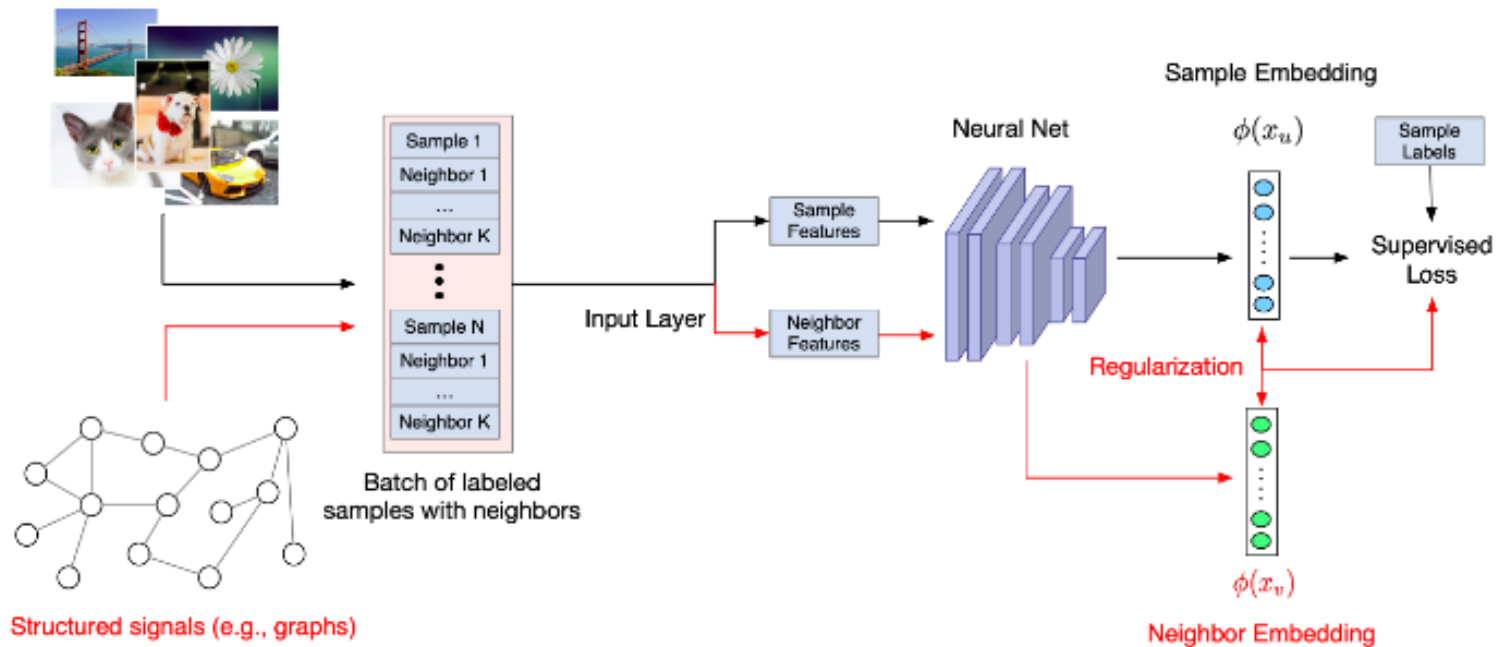
Optimize: $loss = \sum_{i=1}^B \mathcal{L}(y_i, \hat{y}_i) + \alpha \sum_{i=1}^B \mathcal{L}_{\mathcal{N}}(y_i, x_i, \mathcal{N}(x_i))$

Supervised Loss: $\sum_{i=1}^B \mathcal{E}(y_i, g_{\theta}(x_i))$

Neighbor Loss: $\sum_{x_j \in \mathcal{N}(x_i)} w_{ij} \cdot \mathcal{D}(h_{\theta}(x_i), h_{\theta}(x_j))$



Training samples with labels





- HOG ,SIFT,SURF,Color Histogram is used as feature selection Techniques and Random Forest is applied as base model
 - CNN model with 3 different architectures 2 convolutions layers with maxpooling and 1 Dense layer 4 convolutions with maxpooling and 1 Dense layer and 6 Convolutions with max pooling and 1 dense layer act as base model
 - Neural Graph Learning is applied in all 3 CNN models to improve validation accuracy
 - Maximum accuracy is achieved by making dropout in 3 Block CNN with NGM
- 1)Using Neural Graph Learning makes our model Robust against adversarial perturbations designed for misleading a model's prediction or classification and Higher accuracy Reached
 - 2) Neural Graph Learning method performs well on semi-supervised learning as less label data is required for training the model .
 - 3)NSL allows the network to train using labeled data as in the supervised setting, and at the same time drives the network to learn similar hidden representations for the neighboring samples that may or may not have labels

RESULTS AND VISUALIZATIONS



Classifiers	Feature Selection	Testing Accuracy
Random Forest	Color Histogram	10
Random Forest	HOG	50.93
Random Forest	SIFT	22.59
Random Forest	SURF	23.13
Random Forest	NO	47.42

Cifar-10 dataset

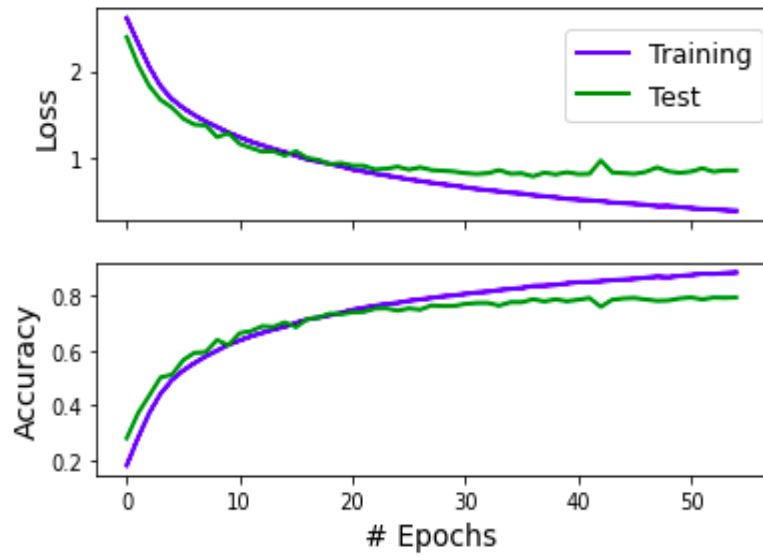
Classifiers	Epochs	Training Accuracy	Testing Accuracy	Precision	Recall	F-score
CNN Block1	41	100	65.850	0.6345	0.6689	0.6430
CNN Block1+NGM	41	98.24	70.090	0.7014	0.6723	0.6820
CNN Block2	34	96.69	71.80	0.7010	0.6881	0.6920
CNN Block2+NGM	32	96.99	72.280	0.6810	0.655	0.655
CNN Block3	32	95.11	68.750	0.6678	0.6789	0.654
CNN Block3+NGM	34	99.22	70.570	0.7014	0.6723	0.6820
CNN Block3+Dropout9	55	86.01	79.060	0.7723	0.7644	0.7618
CNN Block3+Dropout9+NGM	55	88.50	80.15	0.7974	0.7938	0.805

Cifar-10 dataset

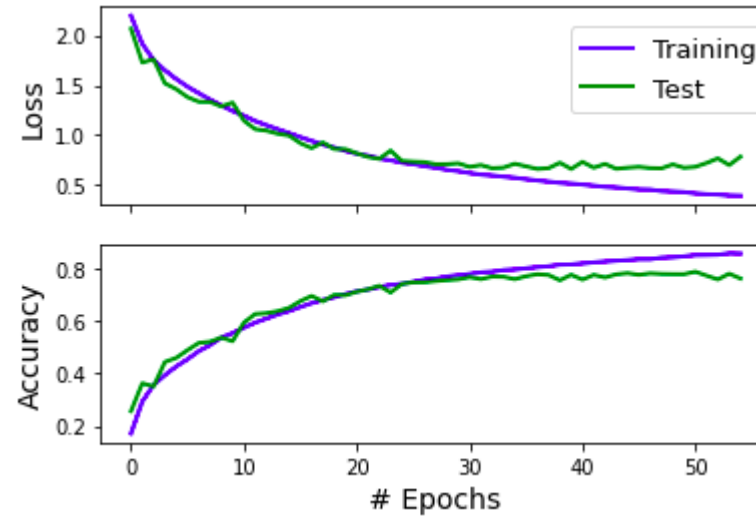
Results:

With the MNIST data and an FFNN, the accuracy results I got with and without the Neural graph machine is given here

No of epochs	Without graph function	With graph function
5	96.05	96.72%
10	97.01	97.45%



CNN model



CNN model with NGM



THANKS

