# Topics in Deep learning Assignment
# Unit 5

Name – B Pravena                                                    Section – B

SRN – PES2UG19CS076


**Google collab link -:**

https://colab.research.google.com/drive/13HnmOjxACS_QAJNTm9bfc4AQkY8
6J45Q?usp=sharing


**Paper Name - :**

SEMI-SUPERVISED CLASSIFICATION WITH GRAPH CONVOLUTIONAL NETWORKS


**Dataset -:** cora

Uploaded dataset link – :

https://drive.google.com/drive/u/0/folders/1Ma3myhsQfB94ecoiq7-
4Auh9l6hy9mRM


**Outputs -:**

1) Data Parsing

```
X shape:  (2708, 1433)

Number of nodes (N):  2708

Number of features (F) of each node:  1433

Categories:  {'Reinforcement_Learning', 'Case_Based', 'Neural_Networks', 'Genetic_Algorithms', 'Probabilistic_Methods', 'Rule_Learning', 'Theory'}

Number of classes:  7
```

2)

```
[11]  model.summary()
```

Model: "functional_1"

| Layer (type) | Output Shape | Param # | Connected to |
|---|---|---|---|
| input_1 (InputLayer) | [(None, 1433)] | 0 | |
| dropout (Dropout) | (None, 1433) | 0 | input_1[0][0] |
| input_2 (InputLayer) | [(None, 2708)] | 0 | |
| graph_conv (GraphConv) | (None, 16) | 22928 | dropout[0][0] input_2[0][0] |
| dropout_1 (Dropout) | (None, 16) | 0 | graph_conv[0][0] |
| graph_conv_1 (GraphConv) | (None, 7) | 112 | dropout_1[0][0] input_2[0][0] |

Total params: 23,040
Trainable params: 23,040
Non-trainable params: 0

3)

```
[12]  # Train model
      validation_data = ([X, A], labels_encoded, val_mask)
      model.fit([X, A],
              labels_encoded,
              sample_weight=train_mask,
              epochs=epochs,
              batch_size=N,
              validation_data=validation_data,
              shuffle=False,
              callbacks=[
                  EarlyStopping(patience=es_patience,  restore_best_weights=True),
              ])
```

```
1/1 [==============================] - 0s 176ms/step - loss: 0.0367 - acc: 0.9786 - val_loss: 0.1648 - val_acc: 0.7940
Epoch 59/100
1/1 [==============================] - 0s 131ms/step - loss: 0.0381 - acc: 0.9571 - val_loss: 0.1647 - val_acc: 0.7900
Epoch 60/100
1/1 [==============================] - 0s 216ms/step - loss: 0.0380 - acc: 0.9429 - val_loss: 0.1663 - val_acc: 0.7820
Epoch 61/100
1/1 [==============================] - 0s 160ms/step - loss: 0.0346 - acc: 0.9643 - val_loss: 0.1671 - val_acc: 0.7760
Epoch 62/100
1/1 [==============================] - 0s 120ms/step - loss: 0.0368 - acc: 0.9643 - val_loss: 0.1682 - val_acc: 0.7700
Epoch 63/100
```

4)

## Model Evaluation

```
[13] X_te = X[test_mask]
     A_te = A[test_mask,:][:,test_mask]
     y_te = labels_encoded[test_mask]

     y_pred = model.predict([X_te, A_te], batch_size=N)
     report = classification_report(np.argmax(y_te,axis=1), np.argmax(y_pred,axis=1), target_names=classes)
     print('GCN Classification Report: \n {}'.format(report))
```

```
GCN Classification Report:
                         precision    recall  f1-score   support

            Case_Based       0.67      0.78      0.72       114
      Genetic_Algorithms     0.86      0.86      0.86       156
        Neural_Networks     0.81      0.70      0.75       290
   Probabilistic_Methods    0.80      0.73      0.77       172
 Reinforcement_Learning    0.70      0.79      0.74        85
          Rule_Learning     0.58      0.78      0.67        60
                Theory     0.60      0.62      0.61       123

              accuracy                           0.74      1000
             macro avg      0.72      0.75      0.73      1000
          weighted avg      0.75      0.74      0.74      1000
```