

# Computational Intelligence

## Project Report

### **1. *Preprocessing***

- 1.1 Prepare Train dataset from scenes' folders [saved in train\_image.npy]
- 1.2 Prepare Test data from test folder [saved in test\_image.npy].
- 1.3 Extract X, Y from train data  
X : apply Normalization  
Y: apply one hot encoding
- 1.4 Split train-test with test size 30%

### **2. *Models***

- 2.1 CNN (Delivered in Kaggle)
- 2.2 Inception ResNet-V2

### **3. *Inception ResNet-V2***

*Contains 2-Stages*

#### **Stage 1 (Train):**

1. Load an Inception Resnet-V2 Pre-trained Model:
  - 1.1. Load the model with (imagenet) pretrained weights and create base\_model without last layers.
  - 1.2. Freeze all InceptionResNetV2 layers.
2. Define the Model:
  - 2.1. Add new Layers on top.
  - 2.2. Using keras.model.Model() to link between base\_model and defined layers.

- 2.3. Compile model with optimizer 'Adam (lr = 0.0001)'.
3. Train the model using (batch\_size=128, epochs=10).

### Stage 2 (FineTuning):

1. Freeze the first 618 layers (hyperparameter to be tuned) and 'unfreeze' the rest of the layers (last block) to perform fine-tuning.
2. Recompile the model for these modifications to make effect, use Adam with a low learning rate and start training again.

### Accuracy:

1. Training in stage 1 led to these results (with imagenet weights):

Validation accuracy: 87.13%

2. Training with 11 epochs in Stage 2, results were as follows:

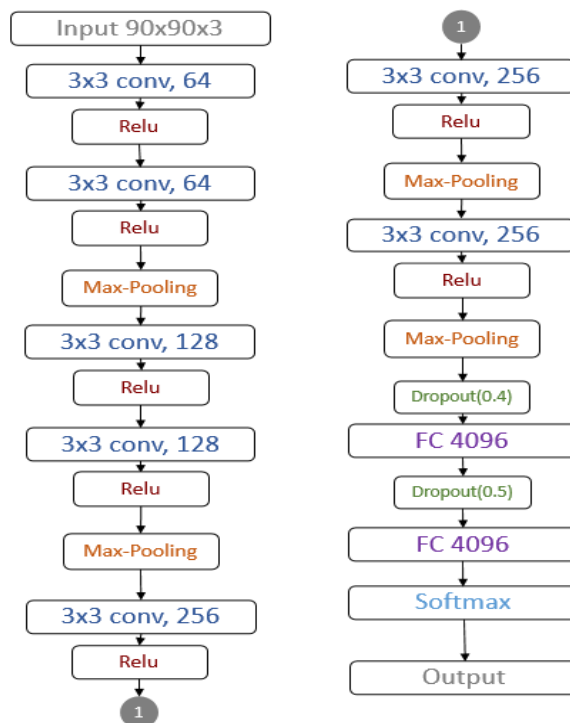
Validation accuracy: 88.96%

Train accuracy: 98.85%

## 4. CNN

*Here, we have 5 trials (Results differ with each run)*

### Trial 1

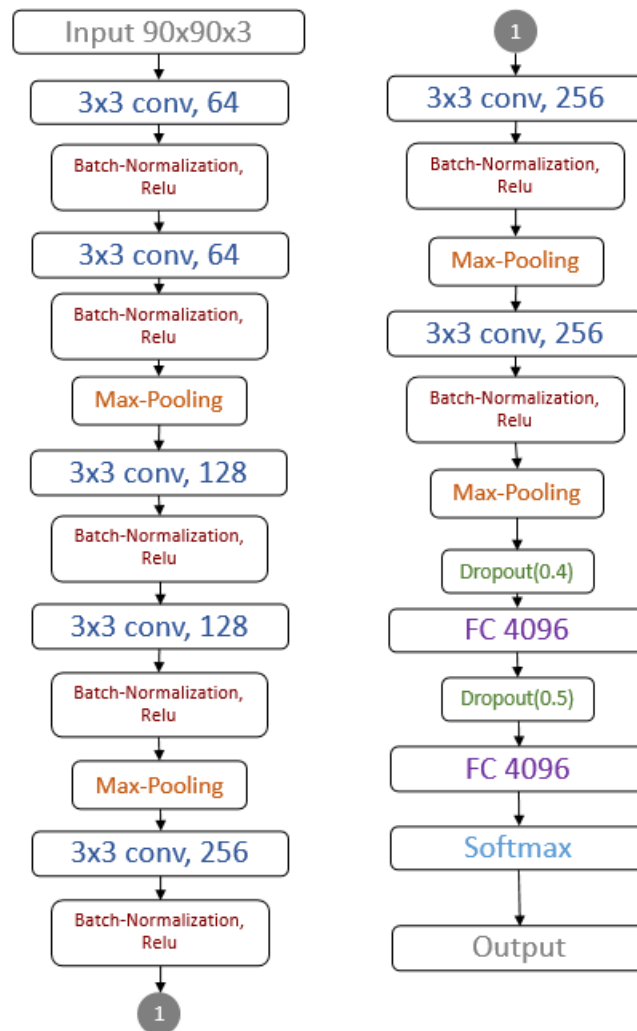


Consists of 7 Convolution, 4 Max-Pooling.

Number of epochs: 40

Validation Accuracy: 85.73%

## Trial 2

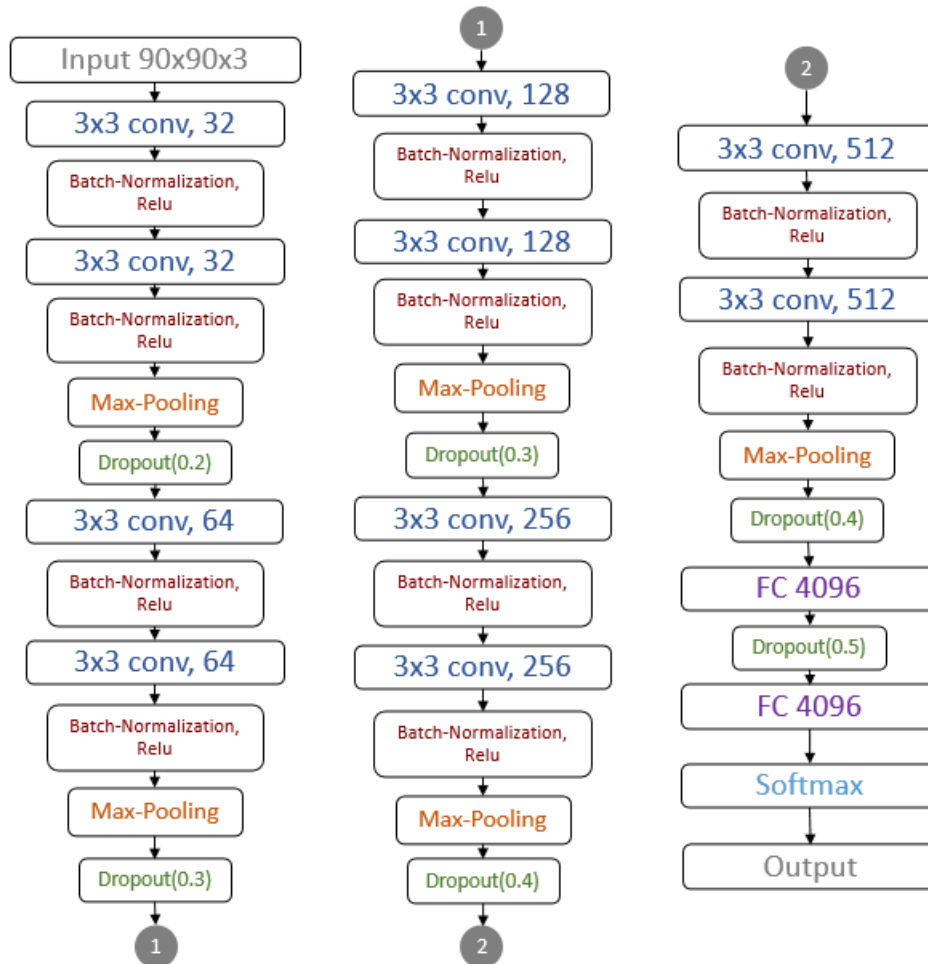


Same as Trial 1, but with (Batch Normalization) after each **conv** layer.

Number of epochs: 50

Validation Accuracy: 86.51%

### Trial 3

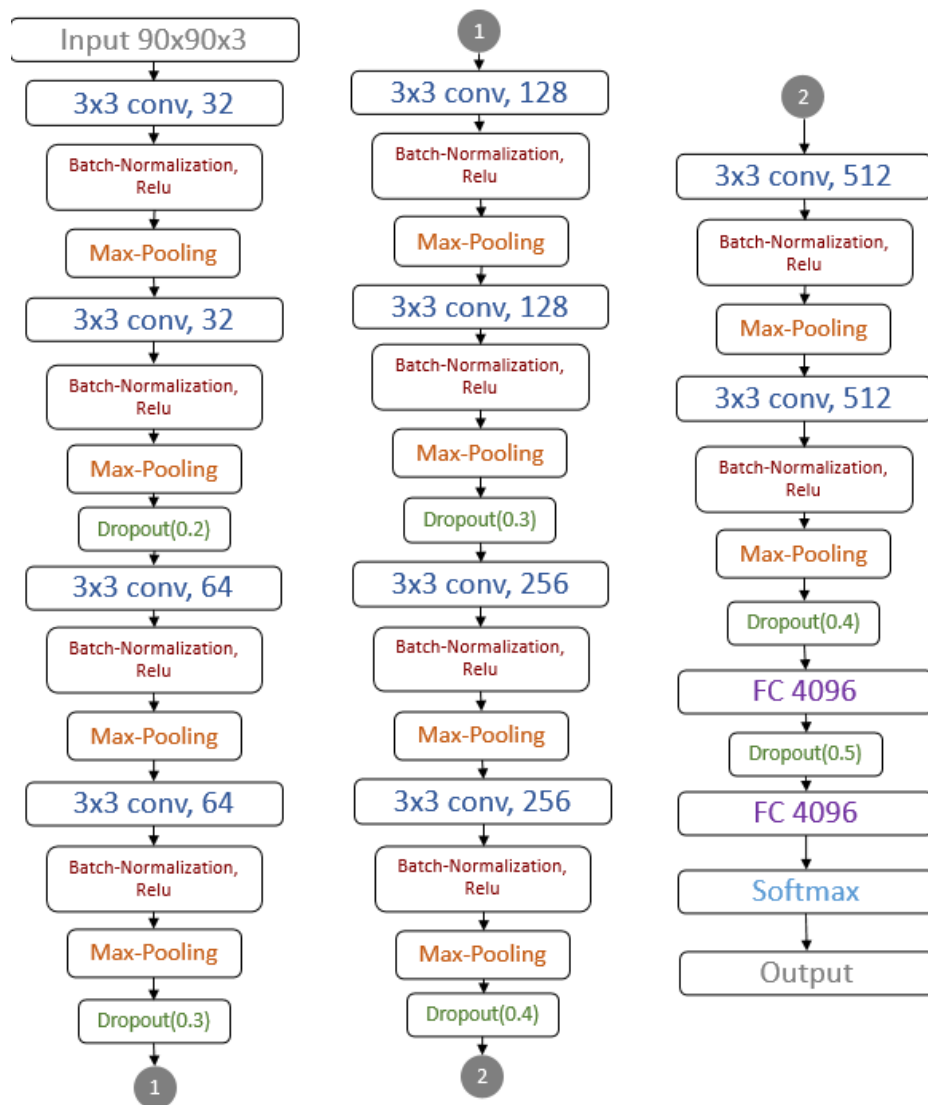


Consists of 10 conv, 5 Max-Pooling, Dropout after each Pooling [0.2, 0.3, 0.4, 0.5] and Batch Normalization after each conv.

Number of epochs: 45

Validation Accuracy: 87.51%

## Trial 4



Same as Trial 3, but Pooling is after each **Relu**.

Number of epochs: 39

Validation Accuracy: 85.25%

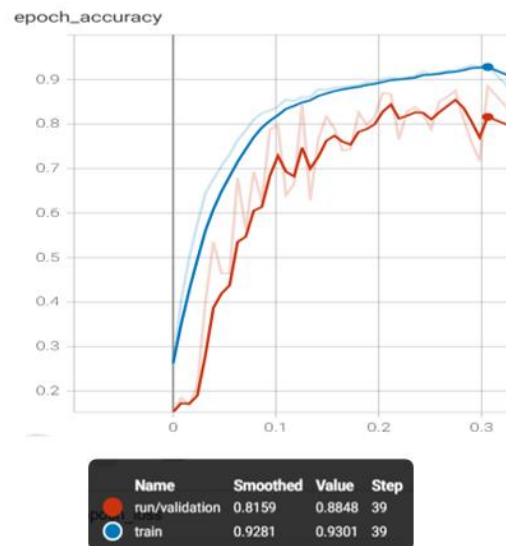
### Trial 5 (Submitted in Kaggle)



Consists of 13 conv, each one followed by Batch Normalization and Relu, Max-pooling after each 2 conv except conv layer number 13, and Dropout after each Pooling with different ratios [0.2, 0.3, 0.4, 0.5].

Number of epochs: 40

Validation Accuracy: 88.48%



## 5. Conclusion:

- The model in Trial 5 in CNN has the highest accuracy among other trials.
- Inception ResNet-V2 has a high accuracy, but it varies more with each run.
- Batch normalization is used to keep data stable.

## Team 19

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