Team 3
Topic: Use the sk-learn’s grid search api to change multiple parameters

The Sequential Keras models can be used as part of Scikit-Learn workflow with the help of the wrappers found at keras.wrappers.scikit_learn.py.

**Arguments**
**build_fn**: callable function or class instance
**sk_params**: model parameters & fitting parameters

Steps:

1. Create a function to create a neural network model

```
# Create function returning a compiled network
def create_network(optimizer='rmsprop'):

  # Start neural network
  network = models.Sequential()

  # Add fully connected layer
    network.add(layers)

  # Compile neural network
  network.compile()

  # Return compiled network
  return network
```

2. Wrap Function in KerasClassifier - Wrap Keras model so it can be used by scikit-learn

```
# Wrap Keras model so it can be used by scikit-learn
neural_network = KerasClassifier(build_fn=create_network, verbose=0)
```

3. Create Hyperparameter Search Space

```
# Create hyperparameter space
epochs = [50, 100]
batches = [5, 10, 100]
optimizers = ['rmsprop', 'adam']

# Create hyperparameter options
hyperparameters = dict(optimizer=optimizers, epochs=epochs, batch_size=batches)
```

4. Conduct Grid Search

```
# Create grid search
grid = GridSearchCV(estimator=neural_network, param_grid=hyperparameters)
# Fit grid search
grid_result = grid.fit(features, target)
```

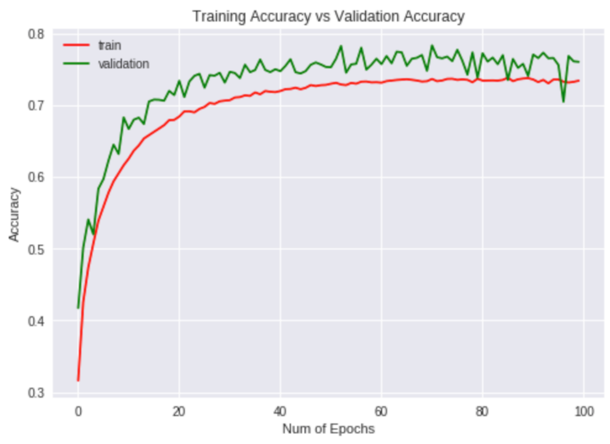
5. Find Best Model's Hyperparameters

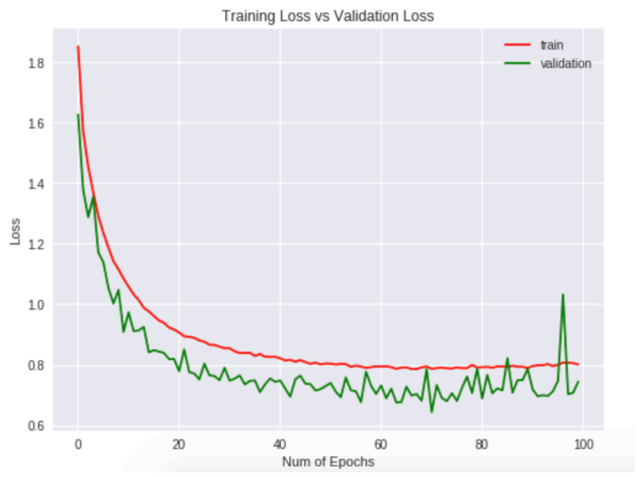
```
# View hyperparameters of best neural network
grid_result.best_params_
```

Results:

Grid search allows us to optimize our model by providing the best values of hyperparameters among the given set of parameters. Using sklearn's grid search has provided us with following results on our CNN model for cifar-10 where used Keras as our modeling platform:

Epochs = 60 (avoid overfitted model)
Test loss: 0.7433605306148529
Test accuracy: 0.7601


Training Accuracy vs Validation Accuracy
train
validation
Accuracy
Num of Epochs


Training Loss vs Validation Loss
train
validation
Loss
Num of Epochs