Assignment 4: ConvNets (Part 1)

Start Assignment

Due Tuesday by 5:59pm **Points** 6 **Submitting** a text entry box or a file upload

Question 4 (1 point)

Suppose X is a single channel input image and F is a filter (see below).

```
import numpy as np
X = np.array([[ 0.04, 0.30, 0.23, 0.21 ],
              [ 0.03, 0.34, 0.15, 0.06 ],
              [ 0.02, 0.20, 0.11, 0.07 ],
              [ 0.14, 0.22, 0.35, 0.17 ]])
F = np.array([[ 0.9, 0.8, 0.3 ],
              [ 0.6, 0.2, 0.4 ],
              [ 0.1, 0.7, 0.5 ]])
```

a) What is the convolution output (aka the feature map) if we use stride = 1 and "same" padding [i.e. expand X to a (6, 6) matrix with zeros for the first and last rows as well as the first and last columns]?

```
# Hint: what size is the output?
X_padded = np.zeros((6, 6))
X_padded[1:-1,1:-1] = X
# loop through rows using index i and columns using index j to produce output:
Y[i,j] = np.sum(X_padded[i:(i+3),j:(j+3)] * F)
```

b) What is the max pooling output for the convolution output if we use pool_size = (2, 2) and stride = (2, 2)?

Model 4 (5 points)

Please navigate to the following URL to accept the invitation for this Kaggle task:
https://www.kaggle.com/t/e11c8bab9d8f4995aeb91cf22e03d125

Activate the conda environment on your VM:

```
conda activate py37_tensorflow
```

Download the data and create tensors for the images:

```
kaggle competitions download ml530-2021-sp-cifar10
wget https://www.cross-entropy.net/ML530/cifar10-tensors.py.txt
python cifar10-tensors.py.txt
```

Download and run the sample script:

```
wget https://www.cross-entropy.net/ML530/cifar10-train.py.txt
python cifar10-train.py.txt
```

Note: This script will take around 100 minutes to complete; but consider trying res_blocks = 9 (instead of res_blocks = 3) or epochs = 200 (instead of epochs = 128). Both of these will make training take longer, but they should also improve validation accuracy. Try the simple version search, and make search you have enough hours available on the VM to complete training. Send email to **sadm_rudy514@uw.edu** if you need additional hours.

Upload your predictions to kaggle:

```
kaggle competitions submit ml530-2021-sp-cifar10 -f predictions.csv -m "CIFAR-10 submission"
kaggle competitions leaderboard ml530-2021-sp-cifar10 -s
```