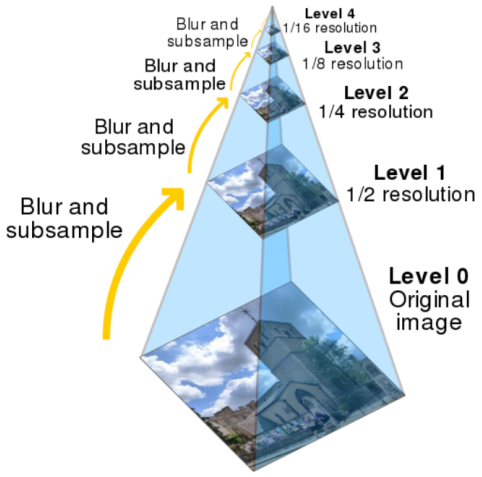
Homework 3

CSc 8530 Parallel Algorithms
Spring 2019

Due: 11:59pm, April 15th, 2019
Groups of 2 or 3

1. **(50 pts)** Write a CUDA program for creating an *image pyramid* (see Figure below). Assume that your input image is $2^k \times 2^k$ for some integer $k \geq 4$. Your program should take the image and the number of levels as input parameters and output the pyramid as a list of pointers to the different levels.
   Note: Make sure to **document your code.** You will lose points if it is not clear what your code is doing, even if produces the correct output.



https://commons.wikimedia.org/w/index.php?curid=42549151

   Extra credit: (20 pts) Write a CUDA program for doing 2D convolution on each layer of the pyramid. This program should receive as input the image pyramid and the convolution kernel and output the convolved image at each level (i.e., a processed pyramid). **Note:** You **do not** need to create an image pyramid for the kernel. You should convolve each level with the same kernel.

2. **(30 pts)** Write a CUDA program for doing *nearest-neighbor interpolation*. This program should receive as input an $n \times m$ image and the upsampling factor k (an integer). Note that the resulting image will be $kn \times km$ and should look blocky.