Homework1_dhanushnd

September 8, 2021

1   ECE 4554/ ECE 5554 / Computer Vision

This file contains Problems 5 and 6 (the coding problems) for Homework 1. Your job is to implement/modify the sections within this notebook that are marked with "TO DO".

1.1   TO DO: Enter your Virginia Tech Username (PID) here: 906465121

1.2   Honor Code reminder

Once again, please review the Honor Code statement in the syllabus.

1.3   Submission guidelines for the coding problems (Google Colab)

1. Please verify that you have entered your Virginia Tech Username in all of the appropriate places.
2. After clicking Runtime->Run all, verify that all of your solutions are visible in this notebook.
3. Click File->Save near the top of the page to save the latest version of your notebook at Google Drive.
4. Verify that the last 2 cells have executed, creating a PDF version of this notebook at Google Drive. (Note: if you face difficulty with this step, please refer to https://pypi.org/project/notebook-as-pdf/)
5. Look at the PDF file and check that all of your solutions are displayed correctly there.
6. Download your notebook file and the PDF version to your laptop.
7. On your laptop, create a ZIP version of this notebook file. (Please don't include the separate data files.) Use file name Homework1_Code_USERNAME.zip, with your own Username.
8. For your PDF version, use file name Homework1_Notebook_USERNAME.pdf, with your own Username.
9. **Submit these 2 files and your PDF file for Problems 1-4 SEPARATELY to Canvas.** Do not zip them all together.

2   Environment Setup

```
[1]: # Mount your Google Drive to this notebook
     # The purpose is to allow your code to access to your files
     from google.colab import drive
     drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

[2]:
```python
# Change the directory to your own working directory
# Any files under your working directory are available to your code
# TO DO: enter the name of your directory
import os
os.chdir('/content/drive/MyDrive')
#os.chdir('/content/drive/MyDrive/Colab Notebooks')
```

[3]:
```python
# Import library modules
import sys
import cv2
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image # PIL is the Python Imaging Library
```

3 Problem 5: Working with Python and NumPy (10 points)

a) Write a brief description of the result of each of the following Python commands. Try to guess the result before running the commands interactively. If needed, check the document that is posted at Canvas (An Introduction to NumPy and SciPy) or the online API documentation at https://docs.scipy.org/doc/.

[4]:
```python
a = np.array([[1,2,3], [4,5,6], [7,8,9]])
b = a[2,:]
c = a.reshape(-1)
d = np.random.randn(5,1)
e = d[d>0]
x = np.zeros(10)+0.5
y = 0.5*np.ones(len(x))
z = x + y
f = np.arange(1,100)
g = a[::-1]
h = np.random.permutation(10)
```

TO DO: Write your descriptions here.
a:It is a 3*3 matrix from 1 through 9
b:It is the values in the 3rd row of A array 7,8,9 (segmenting)
c:It makes the Array A into one dimensional (Reshaping the 2D array to 1D)
d:it is 5 random variables between -1 and 1 (Standard normal Distribution)
e: All the variables in d who's value is greater than 0
x: Array of elements with 10 elements and 0.5 as their values
y:len(x) = 10, so Array of elements with 10 elements and 0.5 as their values
z: Array of elements with 10 elements and 1 as their values (adding 2 arrays)
f:Array of assending elements from 1 to 100 and 100 excluded
g:reading the elements in the reverse order [7,8,9], [4,5,6], [1,2,3]

2

h:randomly choose 10 values

```
[5]: # Verify your answers
     #a = np.array([[1,2,3], [4,5,6]])
     #print(np.reshape(a, -1))

     print(f'a: {a}\n\n b: {b}\n\n c: {c}\n\n d: {d}\n\n e: {e}\n\n x: {x}\n\n y:␣
      ↪{y}\n\n z: {z}\n\n f: {f}\n\n g: {g}\n\n h: {h}')
```

```
a: [[1 2 3]
 [4 5 6]
 [7 8 9]]

b: [7 8 9]

c: [1 2 3 4 5 6 7 8 9]

d: [[ 1.91295872]
 [-0.39853016]
 [-0.596042  ]
 [ 0.25807344]
 [ 1.34758415]]

e: [1.91295872 0.25807344 1.34758415]

x: [0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5]

y: [0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5]

z: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

f: [ 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72
 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
 97 98 99]

g: [[7 8 9]
 [4 5 6]
 [1 2 3]]

h: [7 4 1 0 8 5 3 9 6 2]
```

b) Write a few lines of code to do each of the following.

Let y be the vector: y = np.array([1, 2, 3, 4, 5, 6]). Use the reshape command to form a new matrix z that looks like this: [[1,2],[3,4],[5,6]]

```
[6]: y = np.array([1, 2, 3, 4, 5, 6])
     ################################
     # TO DO: write the code to create z
     z = np.reshape(y,(3,2))

     ################################
     print(f'z: {z}')
```

```
z: [[1 2]
 [3 4]
 [5 6]]
```

Use np.max and np.where to set x to the maximum value that occurs in z (from the previous part of this problem), and set r to the row location and c to the column location where that maximum value occurs. Remember that Python uses 0-indexing.

```
[7]: ################################
     # TO DO: write the code to assign values to x, r, and c
     x= np.max(z)

     q = np.where(z==x)
     r= q[0]
     c = q[1]
     ################################
     print(f'x: {x}\nr: {r}\nc: {c}')
```

```
x: 6
r: [2]
c: [1]
```

Let v be the vector: v = np.array([1, 8, 8, 2, 1, 3, 9, 8]). To a new variable x, assign the number of 1's that are present in the vector v.

```
[8]: v = np.array([1, 8, 8, 2, 1, 3, 9, 8])
     ################################
     # TO DO: write the code
     x=0
     for i in v:
       if i == 1:
         x= x +1
     ################################
     print(f'x: {x}')
```

```
x: 2
```

Use np.random.randint and create an array named u that contains the result of rolling a six-sided die over N trials. (You can pick a convenient value for N.)

```
[45]: ################################
      # TO DO: write the code
      # lower biund 1 upperbound 7 as 7 is not included and N=10
      u = np.random.randint(1,7,10)
      ################################
      print(f'dice: {u}')
```

```
dice: [3 6 6 1 5 4 1 2 5 3]
```

c) Write code to do the following things.

Create a 100 x 100 matrix named mat. Assign any convenient *integer* values to mat, without all elements being identical. (In a later step you will look at the histogram of mat, and create new matrices based on mat.)

```
[46]: ################################
      # TO DO: write the code
      # The following is a temporary assignment;
      #  try it, just for illustration of imshow(), and then replace with your code
      #mat = np.array([[1,2,3], [4,5,6]])

      mat = np.random.randint(1,225,size=(100,100))

      ################################
      # The next line should display your matrix mat as an image
      # Notice that matplotlib.pyplot may color-code the values that are displayed
      plt.imshow(mat, interpolation='none')
      print(f'shape of mat: {mat.shape}')
```
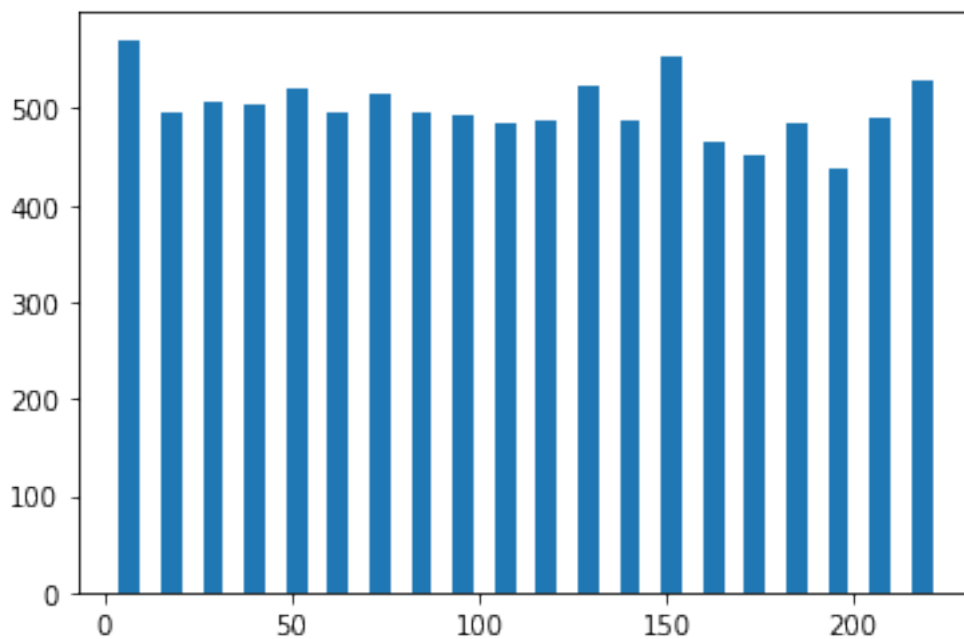
```
shape of mat: (100, 100)
```


5
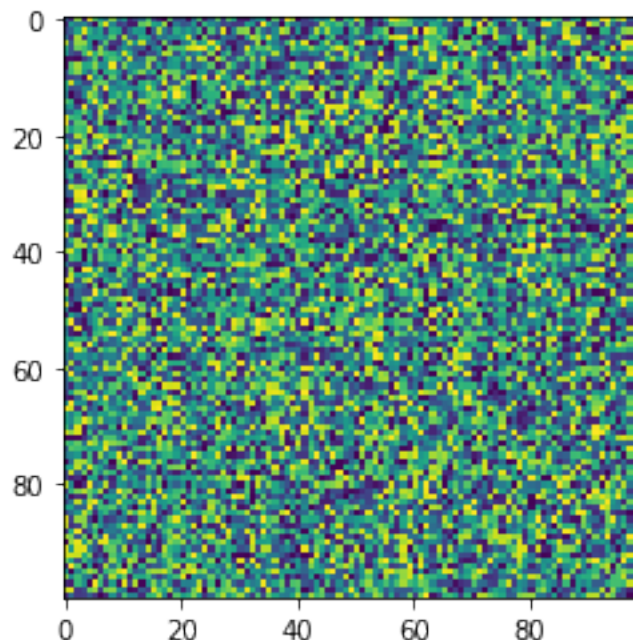
Plot a histogram of mat's intensities with 20 bins.

```
[47]:  #################################
       # TO DO: write the code
       #plt.hist(np.histogram(mat,bins=20))

       plt.hist(mat.reshape(-1),bins=20,rwidth=.5)


       #################################
```

```
[47]:  (array([571., 496., 507., 505., 521., 495., 516., 496., 493., 485., 488.,
               524., 488., 554., 466., 452., 485., 439., 490., 529.]),
        array([  1.  ,  12.15,  23.3 ,  34.45,  45.6 ,  56.75,  67.9 ,  79.05,
                90.2 , 101.35, 112.5 , 123.65, 134.8 , 145.95, 157.1 , 168.25,
               179.4 , 190.55, 201.7 , 212.85, 224.  ]),
        <a list of 20 Patch objects>)
```
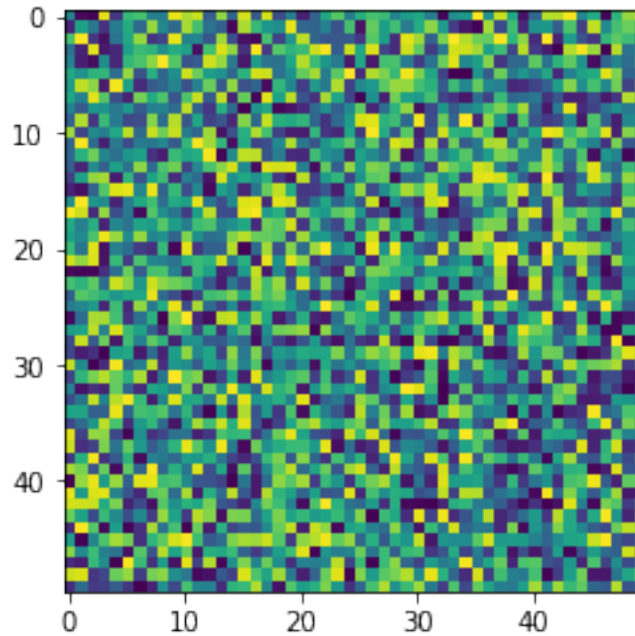

Create a new matrix mat2 that consists of the lower left quadrant of mat.

```
[48]:  #################################
       # TO DO: write the code
       mat2 = mat[50:100,0:50]

       plt.imshow(mat2, interpolation='none')
       print(f'shape of mat2: {mat2.shape}')
```

```
#################################
```

shape of mat2: (50, 50)

Create a new matrix mat3 that is the same as mat2, but with mat2's mean intensity subtracted from every element. Display mat3 just as the previous examples displayed mat and mat2.

```
[49]: #################################
      # TO DO: write the code
      mean2 = np.average(mat2)
      print(f'mean : {mean2}')
      mat3 = mat2-mean2

      plt.imshow(mat3, interpolation='none')
      print(f'shape of mat: {mat3.shape}')
      #################################
      print(f'array = {mat3.astype(int)}')
      #mat3 =  mat3.astype(int)
```

```
mean : 111.842
shape of mat: (50, 50)
array = [[ -10 -104 -108 ...   34   77  106]
 [ -89   16  -22 ...   45   61    3]
 [  48  111  -74 ...   56   42  -79]
 ...
 [ -82  -91   38 ...    0  -60   47]
```

```
[  94  100  -75 ...   -23   20  109]
[ -83  -33  -73 ...    86  -53    3]]
```
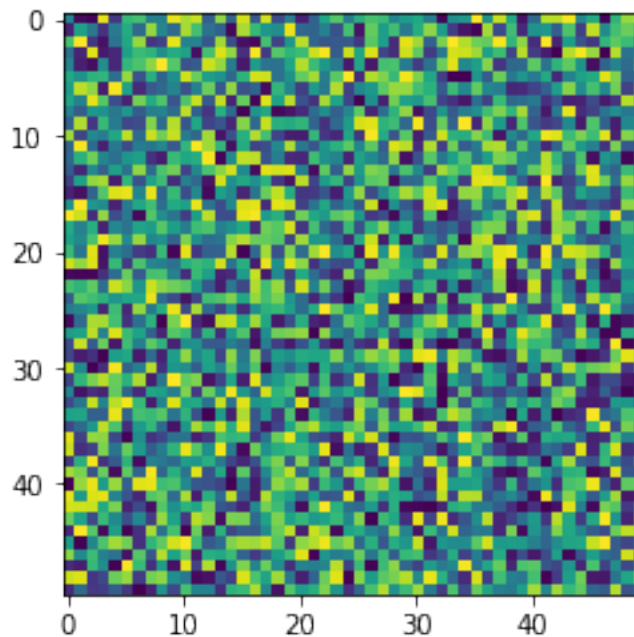

Create a new matrix mat4 that represents a color image that is the same size as mat3, but with 3 channels to represent Red, Green, and Blue values. Set the values in mat4 to be red (i.e., R = 255, G = 0, B = 0) wherever the intensity in mat3 is greater than a threshold t = the average intensity in mat2, and black everywhere else. Be careful with type-casting. Display mat4 just as was done for the previous examples.
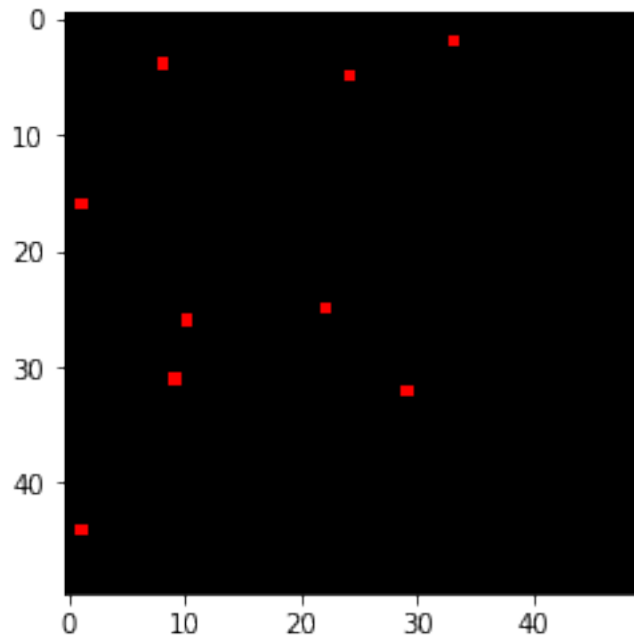
```python
[50]: ##################################
      # TO DO: write the code
      w =mat3.shape[0]
      h = mat3.shape[1]
      t = mean2
      mat4= np.zeros((w,h,3), 'uint8')
      for i in range (0,w-1):
        for j in range (0,h-1):
          mat4[i,j] = np.where(mat3[i, j] >=t, (255,0,0),(0,0,0))

      #print(f'array4 = {mat4}')
      #plt.imshow(mat4, interpolation='none')
      print(f'shape of mat: {mat4.shape}')
      plt.imshow(mat4, interpolation='none')
      ##################################
```

```
shape of mat: (50, 50, 3)
```

`<matplotlib.image.AxesImage at 0x7fa54ad670d0>`

4 Problem 6: Generating new images (10 points)

Write Python/OpenCV code that will input an image, and then create new images to simulate reduced resolution similar to Dr. Jones's example (family portrait) in the first set of lecture slides.

First, verify that you can read an image and convert it to grayscale format. (You must first upload mandrill.tif to your working directory)

[16]:
```python
# This example uses cv2_imshow to display an image
# (Note: cv2.imshow is not allowed in Colab)
from google.colab.patches import cv2_imshow

img_color = cv2.imread("Comp Vision/mandrill.tif", cv2.IMREAD_COLOR)
cv2_imshow(img_color)

print ('\n')
img_grayscale = cv2.cvtColor(img_color, cv2.COLOR_BGR2GRAY)
cv2_imshow(img_grayscale)
```
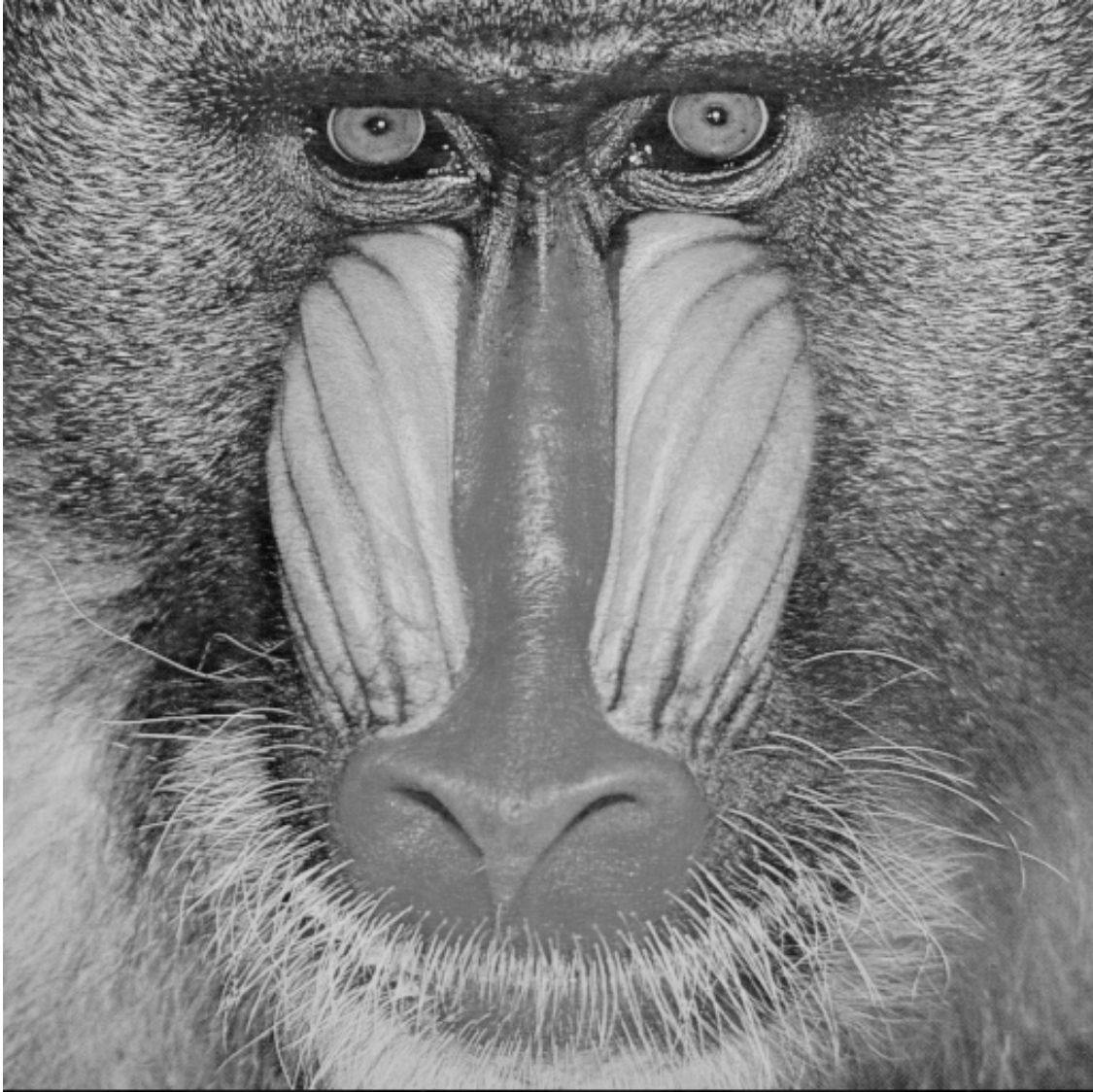
Next, write a Python function that accepts a grayscale image as input. You may assume that the input image is of size 512 x 512. The function must iteratively create and display new images *of the same size*. (All new images should be of size 512 x 512.) However, in these new images, groups of pixels appear to be "merged" to form larger pixels. Each new image *appears* to have half as many pixels in both height and width: 512x512 --> 256x256 --> 128x128 --> . . . --> 4x4 --> 2x2 --> 1x1. To go from apparent image size N x N to N/2 x N/2, your code should simply compute the average intensity from 2x2 pixel blocks in the first image, and assign that average value to all of the cooresponding pixels in the next image.

For full credit, use a loop to generate the new images.

```
[17]: def simulate_lower_resolution(img):
          '''Create new images that appear to have lower resolution.

          Input:
```

```
    img: a grayscale image of size 512 x 512

  Output:
    display a sequence of images, each of size 512 x 512

  TO DO: implement the function.
  '''
  print(img.shape)
  for k in range (1,10):
    for i in range(0,img.shape[0],2**k):
      for j in range(0,img.shape[1],2**k):
        img[i:i+2 ** k,j:j+2 ** k]= np.mean(img[i:i+2 ** k,j:j+2 ** k])

    cv2_imshow(img)
    print('Step Size ',2 ** k)

  return
```
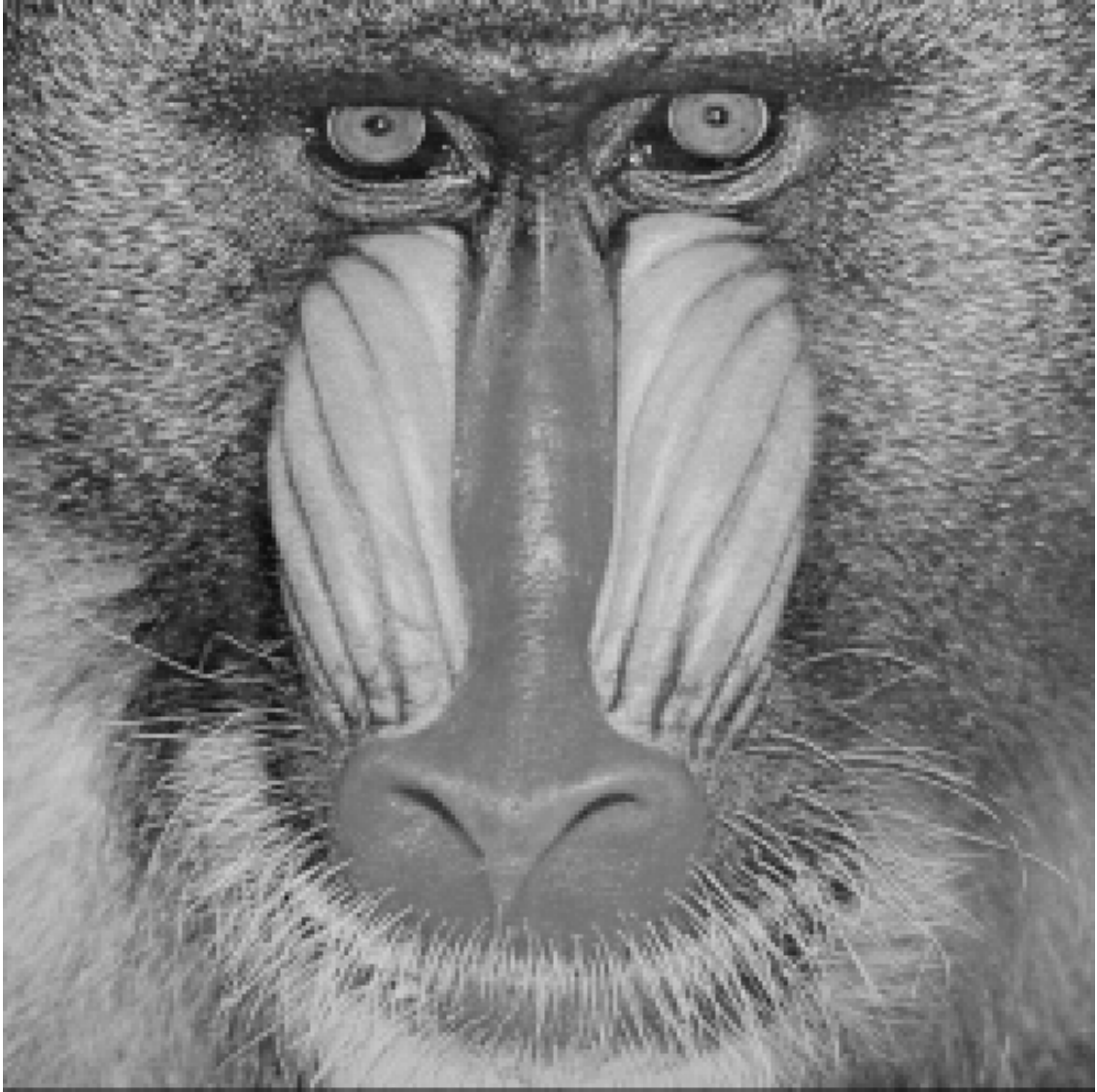
Test your function. The output should be a display of 10 images, starting with the grayscale image at full resolution, and ending with an image that appears to be a single, very large pixel (one gray value).
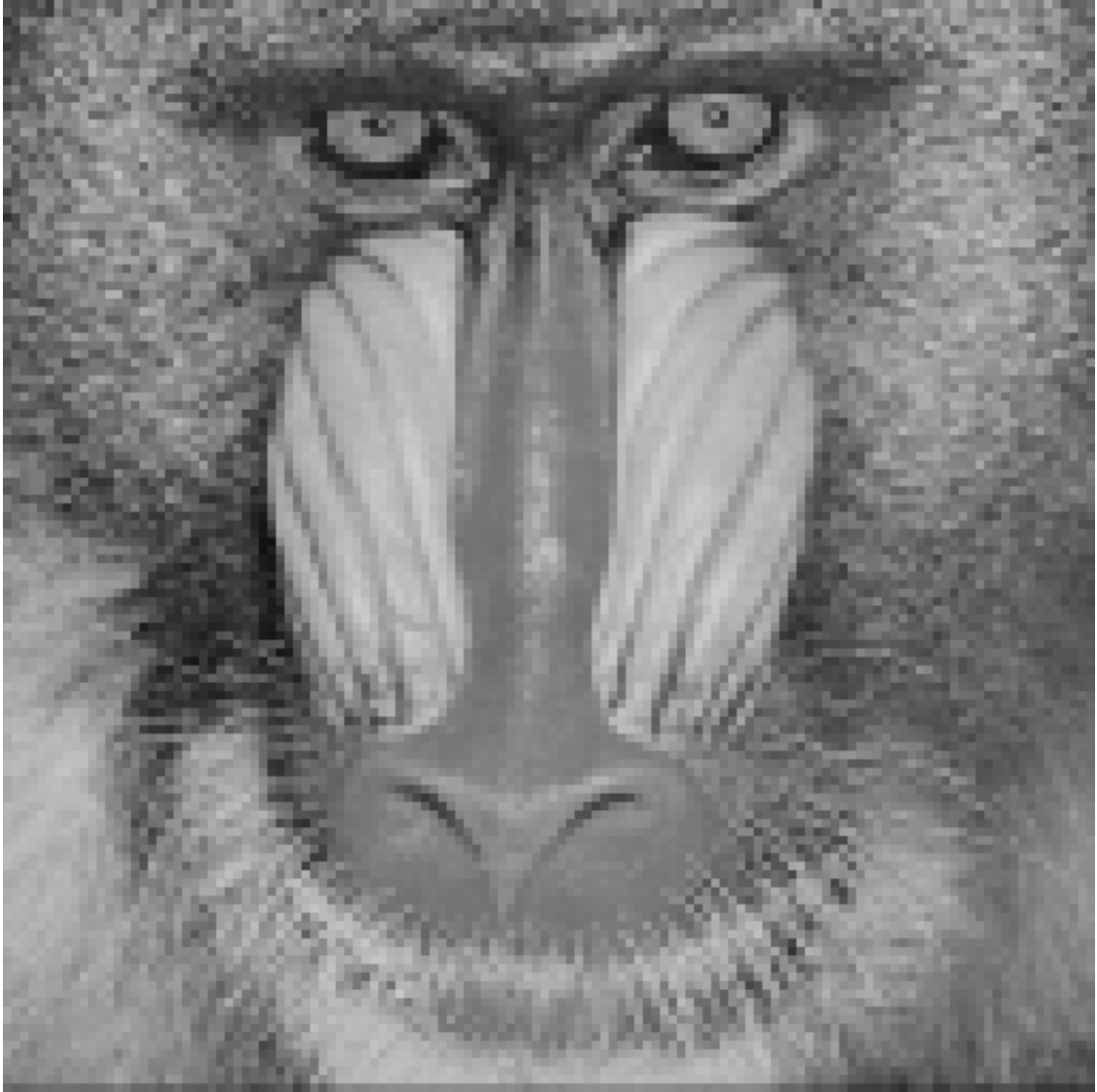
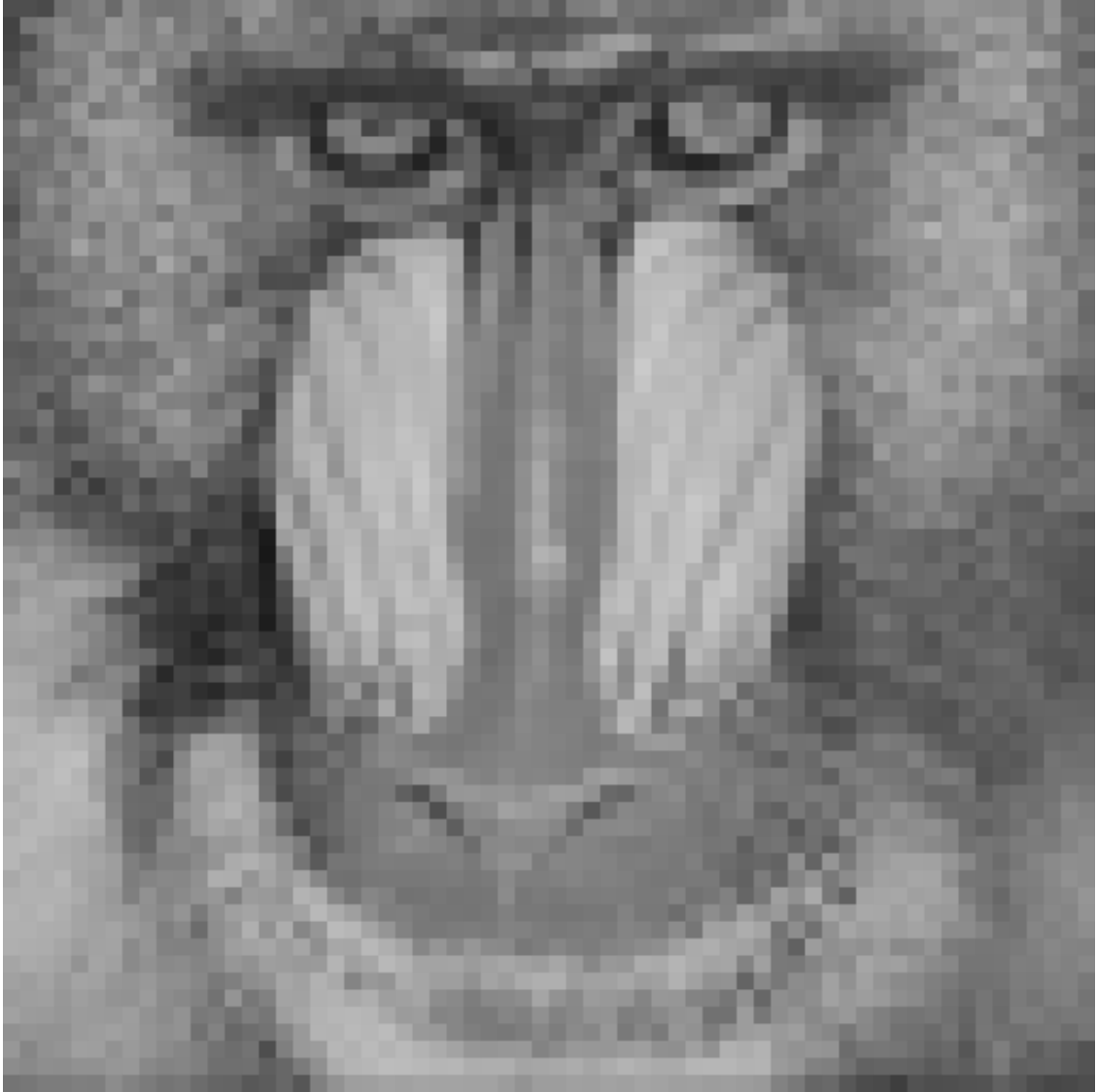[18]:
```
simulate_lower_resolution(img_grayscale)
```
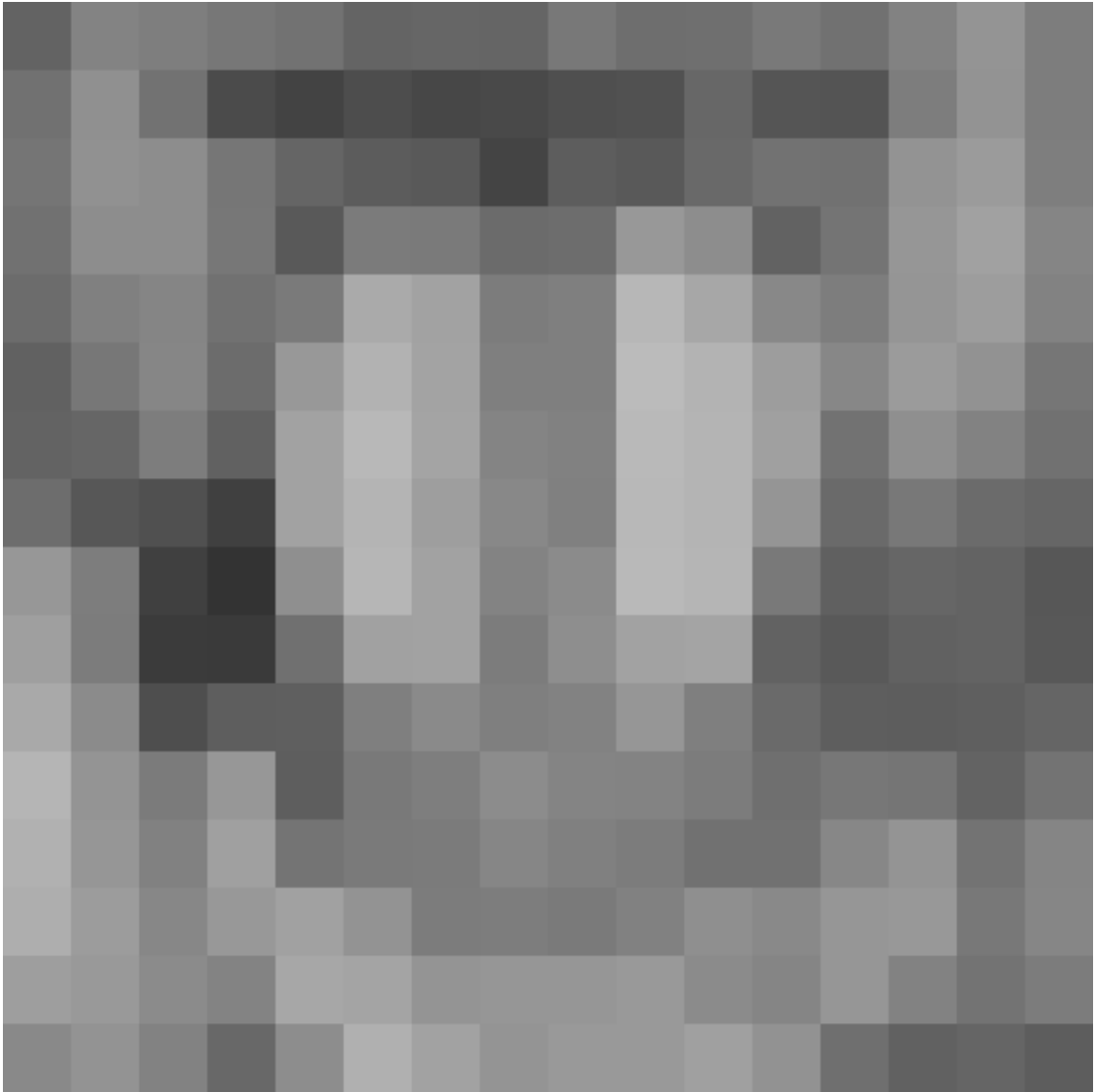
(512, 512)

Step Size 2

Step Size 4

Step Size 8

Step Size   16

Step Size 32
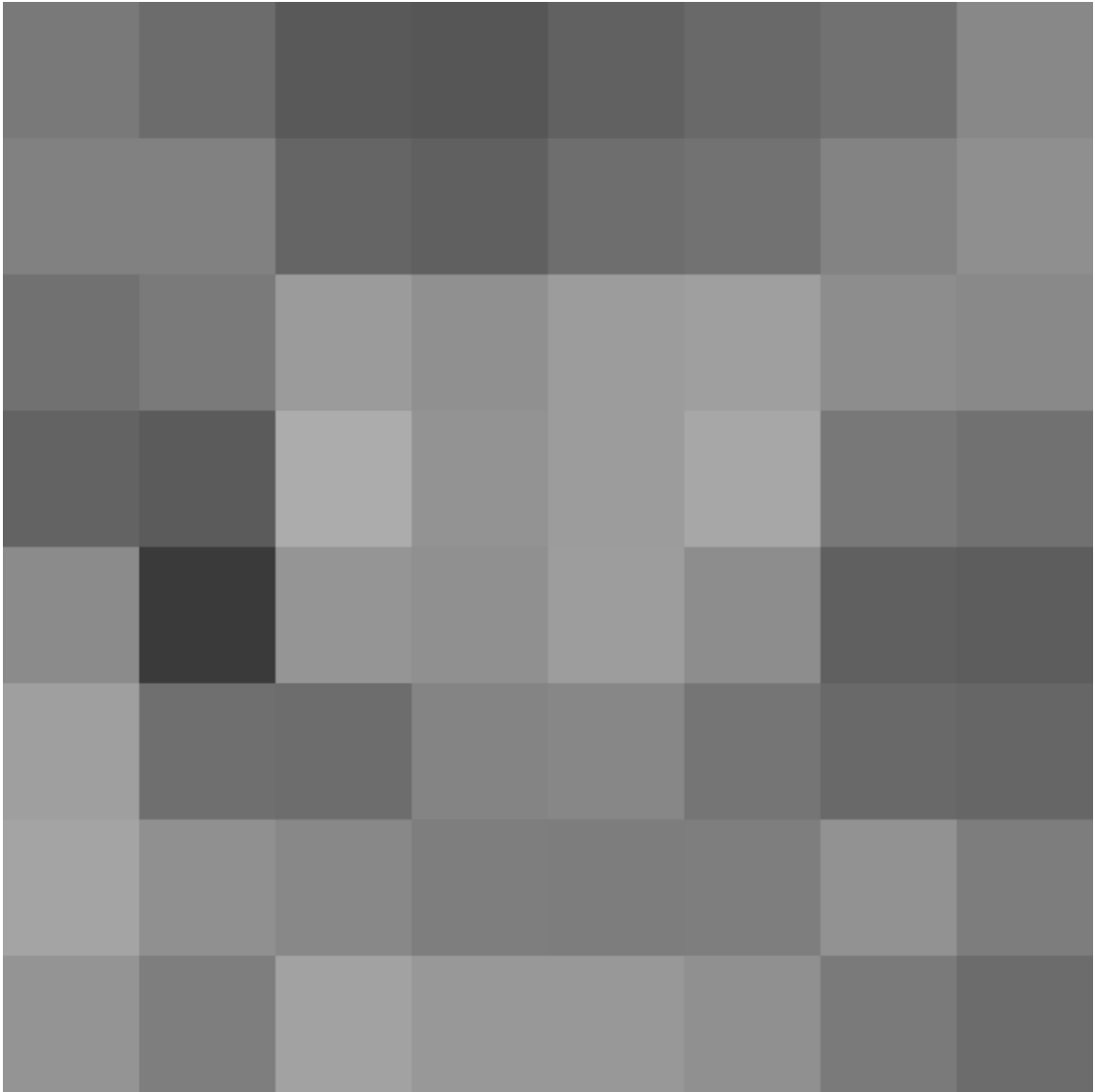
Step Size 64
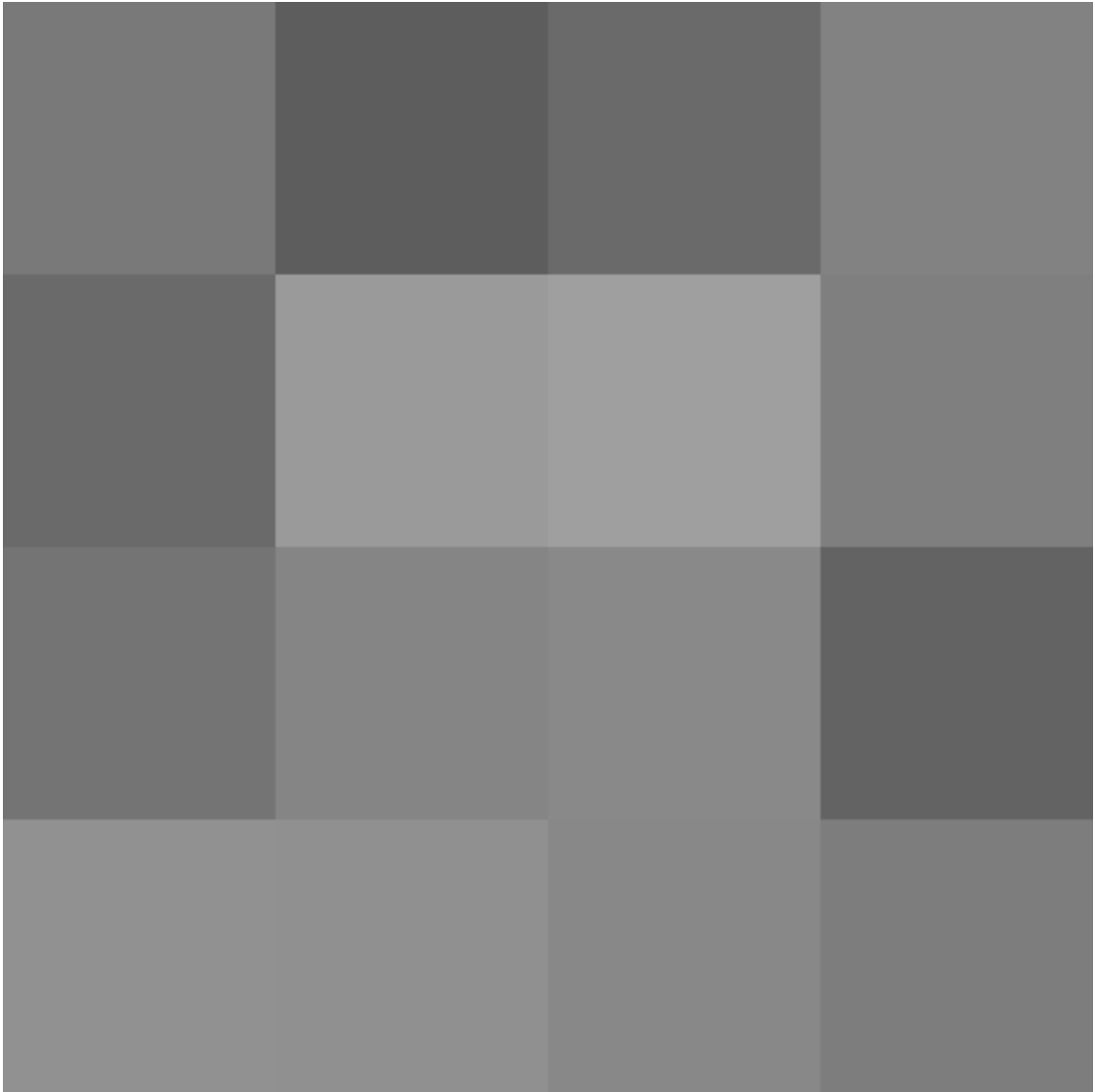
Step Size 128
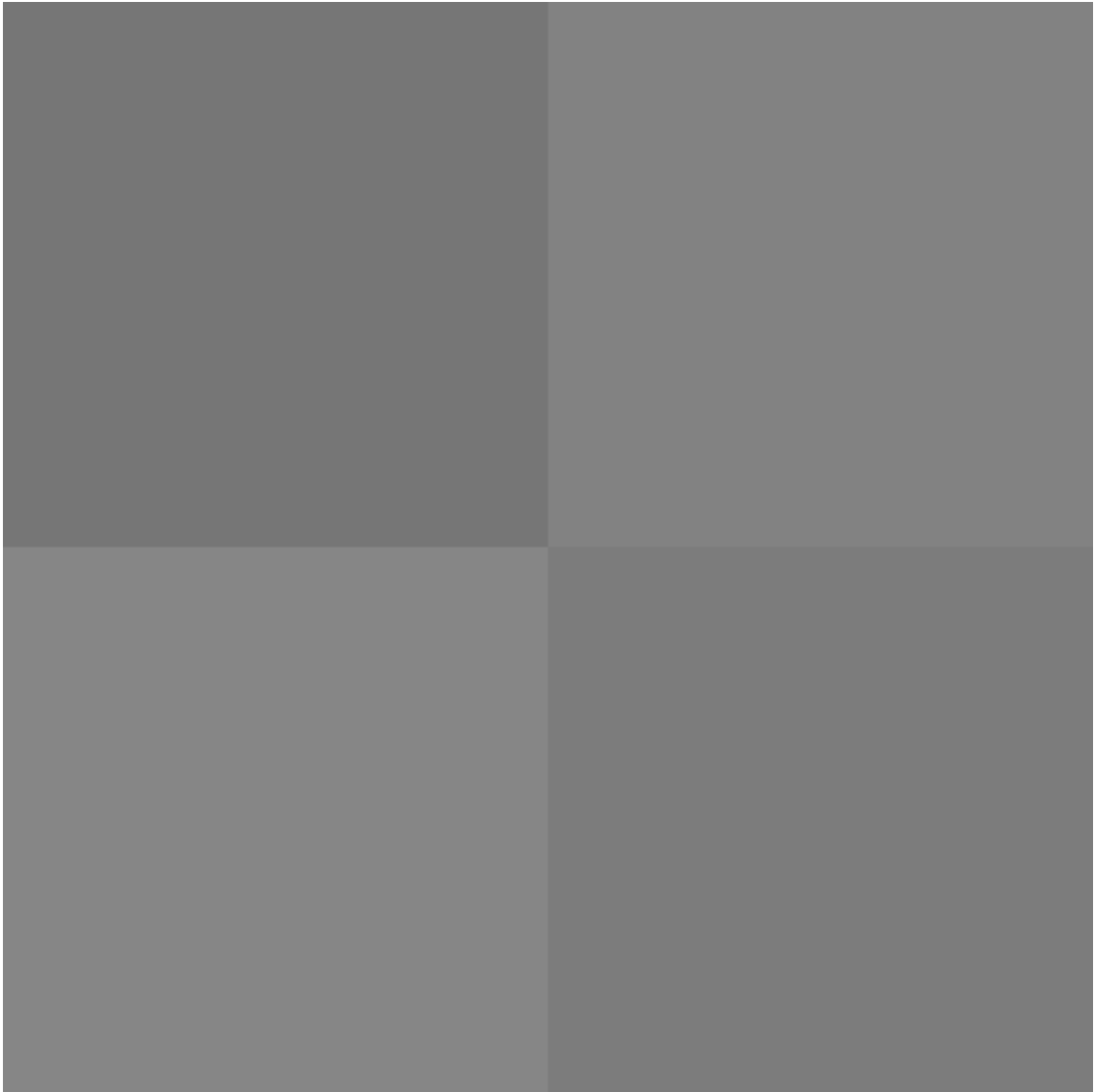
Step Size 256
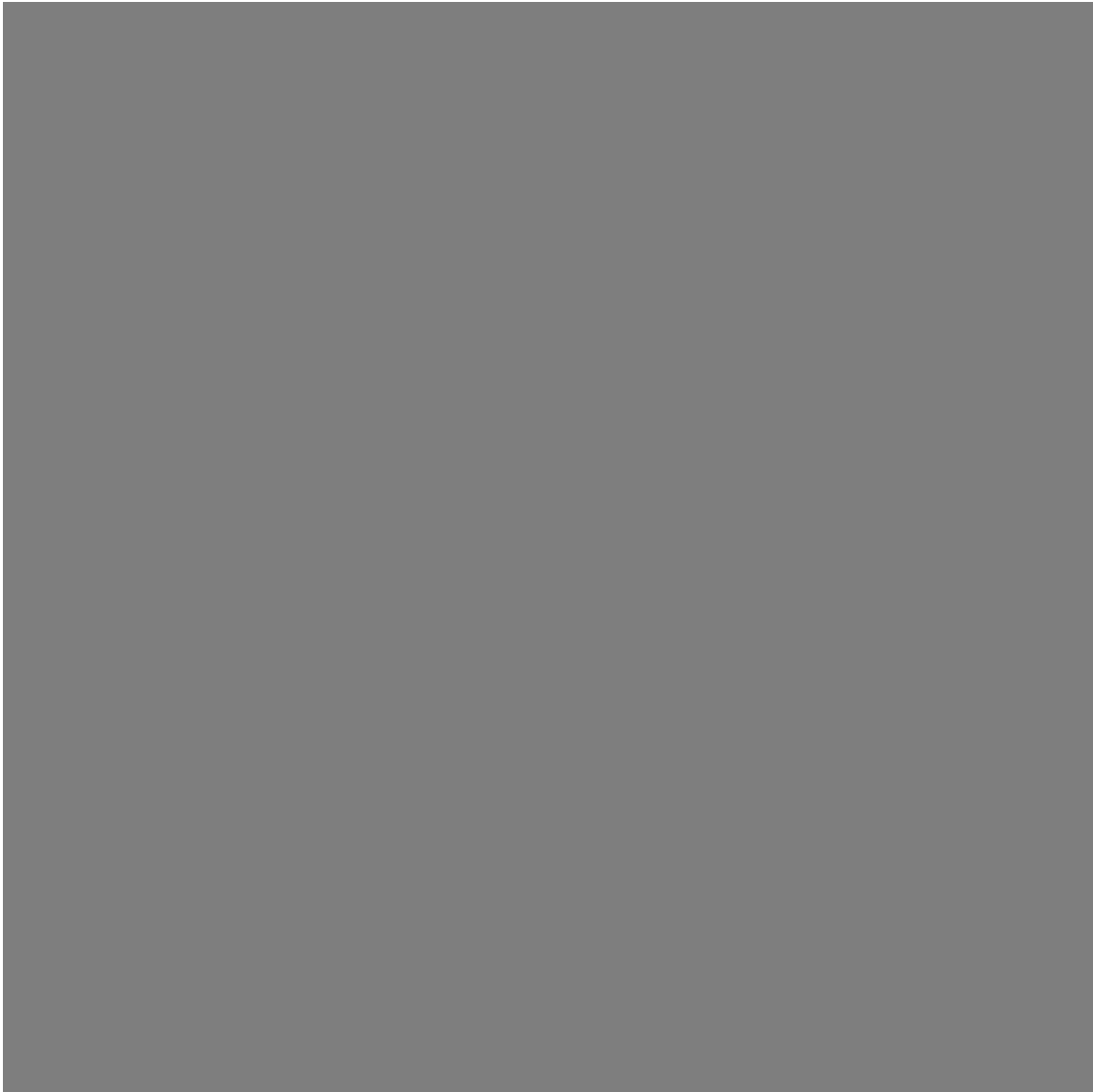
Step Size   512

---

5   Creating a PDF version of your current notebook

```
[56]: #The following two installation steps are needed to generate a PDF version of␣
      ↪the notebook
      #(These lines are needed within Google Colab, but are not needed within a local␣
      ↪version of Jupyter notebook)
      !apt-get -qq install texlive texlive-xetex texlive-latex-extra pandoc inkscape
      !pip install --quiet pypandoc
```

```
Extracting templates from packages: 100%
Preconfiguring packages ...
(Reading database ... 148492 files and directories currently installed.)
Preparing to unpack .../libperl5.26_5.26.1-6ubuntu0.5_amd64.deb ...
Unpacking libperl5.26:amd64 (5.26.1-6ubuntu0.5) over (5.26.1-6ubuntu0.3) ...
Preparing to unpack .../perl_5.26.1-6ubuntu0.5_amd64.deb ...
Unpacking perl (5.26.1-6ubuntu0.5) over (5.26.1-6ubuntu0.3) ...
Preparing to unpack .../perl-base_5.26.1-6ubuntu0.5_amd64.deb ...
Unpacking perl-base (5.26.1-6ubuntu0.5) over (5.26.1-6ubuntu0.3) ...
Setting up perl-base (5.26.1-6ubuntu0.5) ...
(Reading database ... 148492 files and directories currently installed.)
Preparing to unpack .../perl-modules-5.26_5.26.1-6ubuntu0.5_all.deb ...
Unpacking perl-modules-5.26 (5.26.1-6ubuntu0.5) over (5.26.1-6ubuntu0.3) ...
Selecting previously unselected package fonts-droid-fallback.
Preparing to unpack .../fonts-droid-fallback_1%3a6.0.1r16-1.1_all.deb ...
Unpacking fonts-droid-fallback (1:6.0.1r16-1.1) ...
Selecting previously unselected package fonts-lato.
Preparing to unpack .../fonts-lato_2.0-2_all.deb ...
Unpacking fonts-lato (2.0-2) ...
Selecting previously unselected package libsigsegv2:amd64.
Preparing to unpack .../libsigsegv2_2.12-1_amd64.deb ...
Unpacking libsigsegv2:amd64 (2.12-1) ...
Setting up libsigsegv2:amd64 (2.12-1) ...
Selecting previously unselected package gawk.
(Reading database ... 148537 files and directories currently installed.)
Preparing to unpack .../000-gawk_1%3a4.1.4+dfsg-1build1_amd64.deb ...
Unpacking gawk (1:4.1.4+dfsg-1build1) ...
Selecting previously unselected package imagemagick-6-common.
Preparing to unpack .../001-imagemagick-6-common_8%3a6.9.7.4+dfsg-
16ubuntu6.11_all.deb ...
Unpacking imagemagick-6-common (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package liblqr-1-0:amd64.
Preparing to unpack .../002-liblqr-1-0_0.4.2-2.1_amd64.deb ...
Unpacking liblqr-1-0:amd64 (0.4.2-2.1) ...
Selecting previously unselected package libmagickcore-6.q16-3:amd64.
Preparing to unpack .../003-libmagickcore-6.q16-3_8%3a6.9.7.4+dfsg-
16ubuntu6.11_amd64.deb ...
Unpacking libmagickcore-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package libimage-magick-q16-perl.
Preparing to unpack .../004-libimage-magick-q16-perl_8%3a6.9.7.4+dfsg-
16ubuntu6.11_amd64.deb ...
Unpacking libimage-magick-q16-perl (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package libimage-magick-perl.
Preparing to unpack .../005-libimage-magick-perl_8%3a6.9.7.4+dfsg-
16ubuntu6.11_all.deb ...
Unpacking libimage-magick-perl (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package libmagickwand-6.q16-3:amd64.
Preparing to unpack .../006-libmagickwand-6.q16-3_8%3a6.9.7.4+dfsg-
```

```
16ubuntu6.11_amd64.deb ...
Unpacking libmagickwand-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package poppler-data.
Preparing to unpack .../007-poppler-data_0.4.8-2_all.deb ...
Unpacking poppler-data (0.4.8-2) ...
Selecting previously unselected package tex-common.
Preparing to unpack .../008-tex-common_6.09_all.deb ...
Unpacking tex-common (6.09) ...
Selecting previously unselected package libtext-iconv-perl.
Preparing to unpack .../009-libtext-iconv-perl_1.7-5build6_amd64.deb ...
Unpacking libtext-iconv-perl (1.7-5build6) ...
Selecting previously unselected package libaspell15:amd64.
Preparing to unpack .../010-libaspell15_0.60.7~20110707-4ubuntu0.2_amd64.deb ...
Unpacking libaspell15:amd64 (0.60.7~20110707-4ubuntu0.2) ...
Selecting previously unselected package emacsen-common.
Preparing to unpack .../011-emacsen-common_2.0.8_all.deb ...
Unpacking emacsen-common (2.0.8) ...
Selecting previously unselected package dictionaries-common.
Preparing to unpack .../012-dictionaries-common_1.27.2_all.deb ...
Adding 'diversion of /usr/share/dict/words to /usr/share/dict/words.pre-
dictionaries-common by dictionaries-common'
Unpacking dictionaries-common (1.27.2) ...
Selecting previously unselected package aspell.
Preparing to unpack .../013-aspell_0.60.7~20110707-4ubuntu0.2_amd64.deb ...
Unpacking aspell (0.60.7~20110707-4ubuntu0.2) ...
Selecting previously unselected package aspell-en.
Preparing to unpack .../014-aspell-en_2017.08.24-0-0.1_all.deb ...
Unpacking aspell-en (2017.08.24-0-0.1) ...
Selecting previously unselected package hunspell-en-us.
Preparing to unpack .../015-hunspell-en-us_1%3a2017.08.24_all.deb ...
Unpacking hunspell-en-us (1:2017.08.24) ...
Selecting previously unselected package libhunspell-1.6-0:amd64.
Preparing to unpack .../016-libhunspell-1.6-0_1.6.2-1_amd64.deb ...
Unpacking libhunspell-1.6-0:amd64 (1.6.2-1) ...
Selecting previously unselected package libenchant1c2a:amd64.
Preparing to unpack .../017-libenchant1c2a_1.6.0-11.1_amd64.deb ...
Unpacking libenchant1c2a:amd64 (1.6.0-11.1) ...
Selecting previously unselected package enchant.
Preparing to unpack .../018-enchant_1.6.0-11.1_amd64.deb ...
Unpacking enchant (1.6.0-11.1) ...
Selecting previously unselected package fig2dev.
Preparing to unpack .../019-fig2dev_1%3a3.2.6a-6ubuntu1_amd64.deb ...
Unpacking fig2dev (1:3.2.6a-6ubuntu1) ...
Selecting previously unselected package fonts-lmodern.
Preparing to unpack .../020-fonts-lmodern_2.004.5-3_all.deb ...
Unpacking fonts-lmodern (2.004.5-3) ...
Selecting previously unselected package fonts-noto-mono.
Preparing to unpack .../021-fonts-noto-mono_20171026-2_all.deb ...
```

```
Unpacking fonts-noto-mono (20171026-2) ...
Selecting previously unselected package fonts-texgyre.
Preparing to unpack .../022-fonts-texgyre_20160520-1_all.deb ...
Unpacking fonts-texgyre (20160520-1) ...
Selecting previously unselected package libcupsimage2:amd64.
Preparing to unpack .../023-libcupsimage2_2.2.7-1ubuntu2.8_amd64.deb ...
Unpacking libcupsimage2:amd64 (2.2.7-1ubuntu2.8) ...
Selecting previously unselected package libijs-0.35:amd64.
Preparing to unpack .../024-libijs-0.35_0.35-13_amd64.deb ...
Unpacking libijs-0.35:amd64 (0.35-13) ...
Selecting previously unselected package libjbig2dec0:amd64.
Preparing to unpack .../025-libjbig2dec0_0.13-6_amd64.deb ...
Unpacking libjbig2dec0:amd64 (0.13-6) ...
Selecting previously unselected package libgs9-common.
Preparing to unpack .../026-libgs9-common_9.26~dfsg+0-0ubuntu0.18.04.14_all.deb
...
Unpacking libgs9-common (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Selecting previously unselected package libgs9:amd64.
Preparing to unpack .../027-libgs9_9.26~dfsg+0-0ubuntu0.18.04.14_amd64.deb ...
Unpacking libgs9:amd64 (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Selecting previously unselected package ghostscript.
Preparing to unpack .../028-ghostscript_9.26~dfsg+0-0ubuntu0.18.04.14_amd64.deb
...
Unpacking ghostscript (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Selecting previously unselected package gsfonts.
Preparing to unpack .../029-gsfonts_1%3a8.11+urwcyr1.0.7~pre44-4.4_all.deb ...
Unpacking gsfonts (1:8.11+urwcyr1.0.7~pre44-4.4) ...
Selecting previously unselected package imagemagick-6.q16.
Preparing to unpack .../030-imagemagick-6.q16_8%3a6.9.7.4+dfsg-
16ubuntu6.11_amd64.deb ...
Unpacking imagemagick-6.q16 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package imagemagick.
Preparing to unpack .../031-imagemagick_8%3a6.9.7.4+dfsg-16ubuntu6.11_amd64.deb
...
Unpacking imagemagick (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package libsigc++-2.0-0v5:amd64.
Preparing to unpack .../032-libsigc++-2.0-0v5_2.10.0-2_amd64.deb ...
Unpacking libsigc++-2.0-0v5:amd64 (2.10.0-2) ...
Selecting previously unselected package libglibmm-2.4-1v5:amd64.
Preparing to unpack .../033-libglibmm-2.4-1v5_2.56.0-1_amd64.deb ...
Unpacking libglibmm-2.4-1v5:amd64 (2.56.0-1) ...
Selecting previously unselected package libatkmm-1.6-1v5:amd64.
Preparing to unpack .../034-libatkmm-1.6-1v5_2.24.2-3_amd64.deb ...
Unpacking libatkmm-1.6-1v5:amd64 (2.24.2-3) ...
Selecting previously unselected package libcairomm-1.0-1v5:amd64.
Preparing to unpack .../035-libcairomm-1.0-1v5_1.12.2-3_amd64.deb ...
Unpacking libcairomm-1.0-1v5:amd64 (1.12.2-3) ...
Selecting previously unselected package librevenge-0.0-0:amd64.
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Preparing to unpack .../036-librevenge-0.0-0_0.0.4-6ubuntu2_amd64.deb ...
Unpacking librevenge-0.0-0:amd64 (0.0.4-6ubuntu2) ...
Selecting previously unselected package libcdr-0.1-1:amd64.
Preparing to unpack .../037-libcdr-0.1-1_0.1.4-1build1_amd64.deb ...
Unpacking libcdr-0.1-1:amd64 (0.1.4-1build1) ...
Selecting previously unselected package libdbus-glib-1-2:amd64.
Preparing to unpack .../038-libdbus-glib-1-2_0.110-2_amd64.deb ...
Unpacking libdbus-glib-1-2:amd64 (0.110-2) ...
Selecting previously unselected package libgslcblas0:amd64.
Preparing to unpack .../039-libgslcblas0_2.4+dfsg-6_amd64.deb ...
Unpacking libgslcblas0:amd64 (2.4+dfsg-6) ...
Selecting previously unselected package libgsl23:amd64.
Preparing to unpack .../040-libgsl23_2.4+dfsg-6_amd64.deb ...
Unpacking libgsl23:amd64 (2.4+dfsg-6) ...
Selecting previously unselected package libgtk2.0-common.
Preparing to unpack .../041-libgtk2.0-common_2.24.32-1ubuntu1_all.deb ...
Unpacking libgtk2.0-common (2.24.32-1ubuntu1) ...
Selecting previously unselected package libgtk2.0-0:amd64.
Preparing to unpack .../042-libgtk2.0-0_2.24.32-1ubuntu1_amd64.deb ...
Unpacking libgtk2.0-0:amd64 (2.24.32-1ubuntu1) ...
Selecting previously unselected package libpangomm-1.4-1v5:amd64.
Preparing to unpack .../043-libpangomm-1.4-1v5_2.40.1-4_amd64.deb ...
Unpacking libpangomm-1.4-1v5:amd64 (2.40.1-4) ...
Selecting previously unselected package libgtkmm-2.4-1v5:amd64.
Preparing to unpack .../044-libgtkmm-2.4-1v5_1%3a2.24.5-2_amd64.deb ...
Unpacking libgtkmm-2.4-1v5:amd64 (1:2.24.5-2) ...
Selecting previously unselected package libgtkspell0:amd64.
Preparing to unpack .../045-libgtkspell0_2.0.16-1.2_amd64.deb ...
Unpacking libgtkspell0:amd64 (2.0.16-1.2) ...
Selecting previously unselected package libmagick++-6.q16-7:amd64.
Preparing to unpack .../046-libmagick++-6.q16-7_8%3a6.9.7.4+dfsg-
16ubuntu6.11_amd64.deb ...
Unpacking libmagick++-6.q16-7:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package libpoppler-glib8:amd64.
Preparing to unpack .../047-libpoppler-glib8_0.62.0-2ubuntu2.12_amd64.deb ...
Unpacking libpoppler-glib8:amd64 (0.62.0-2ubuntu2.12) ...
Selecting previously unselected package libpotrace0.
Preparing to unpack .../048-libpotrace0_1.14-2_amd64.deb ...
Unpacking libpotrace0 (1.14-2) ...
Selecting previously unselected package libvisio-0.1-1:amd64.
Preparing to unpack .../049-libvisio-0.1-1_0.1.6-1build1_amd64.deb ...
Unpacking libvisio-0.1-1:amd64 (0.1.6-1build1) ...
Selecting previously unselected package libwpd-0.10-10:amd64.
Preparing to unpack .../050-libwpd-0.10-10_0.10.2-2_amd64.deb ...
Unpacking libwpd-0.10-10:amd64 (0.10.2-2) ...
Selecting previously unselected package libwpg-0.3-3:amd64.
Preparing to unpack .../051-libwpg-0.3-3_0.3.1-3_amd64.deb ...
Unpacking libwpg-0.3-3:amd64 (0.3.1-3) ...
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Selecting previously unselected package inkscape.
Preparing to unpack .../052-inkscape_0.92.3-1_amd64.deb ...
Unpacking inkscape (0.92.3-1) ...
Selecting previously unselected package javascript-common.
Preparing to unpack .../053-javascript-common_11_all.deb ...
Unpacking javascript-common (11) ...
Selecting previously unselected package libcupsfilters1:amd64.
Preparing to unpack .../054-libcupsfilters1_1.20.2-0ubuntu3.1_amd64.deb ...
Unpacking libcupsfilters1:amd64 (1.20.2-0ubuntu3.1) ...
Selecting previously unselected package libdjvulibre-text.
Preparing to unpack .../055-libdjvulibre-text_3.5.27.1-8ubuntu0.4_all.deb ...
Unpacking libdjvulibre-text (3.5.27.1-8ubuntu0.4) ...
Selecting previously unselected package libdjvulibre21:amd64.
Preparing to unpack .../056-libdjvulibre21_3.5.27.1-8ubuntu0.4_amd64.deb ...
Unpacking libdjvulibre21:amd64 (3.5.27.1-8ubuntu0.4) ...
Selecting previously unselected package libgail18:amd64.
Preparing to unpack .../057-libgail18_2.24.32-1ubuntu1_amd64.deb ...
Unpacking libgail18:amd64 (2.24.32-1ubuntu1) ...
Selecting previously unselected package libgail-common:amd64.
Preparing to unpack .../058-libgail-common_2.24.32-1ubuntu1_amd64.deb ...
Unpacking libgail-common:amd64 (2.24.32-1ubuntu1) ...
Selecting previously unselected package libgtk2.0-bin.
Preparing to unpack .../059-libgtk2.0-bin_2.24.32-1ubuntu1_amd64.deb ...
Unpacking libgtk2.0-bin (2.24.32-1ubuntu1) ...
Selecting previously unselected package libjs-jquery.
Preparing to unpack .../060-libjs-jquery_3.2.1-1_all.deb ...
Unpacking libjs-jquery (3.2.1-1) ...
Selecting previously unselected package libkpathsea6:amd64.
Preparing to unpack
.../061-libkpathsea6_2017.20170613.44572-8ubuntu0.1_amd64.deb ...
Unpacking libkpathsea6:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libwmf0.2-7:amd64.
Preparing to unpack .../062-libwmf0.2-7_0.2.8.4-12_amd64.deb ...
Unpacking libwmf0.2-7:amd64 (0.2.8.4-12) ...
Selecting previously unselected package libmagickcore-6.q16-3-extra:amd64.
Preparing to unpack .../063-libmagickcore-6.q16-3-extra_8%3a6.9.7.4+dfsg-
16ubuntu6.11_amd64.deb ...
Unpacking libmagickcore-6.q16-3-extra:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Selecting previously unselected package libnetpbm10.
Preparing to unpack .../064-libnetpbm10_2%3a10.0-15.3build1_amd64.deb ...
Unpacking libnetpbm10 (2:10.0-15.3build1) ...
Selecting previously unselected package libptexenc1:amd64.
Preparing to unpack .../065-libptexenc1_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libptexenc1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package rubygems-integration.
Preparing to unpack .../066-rubygems-integration_1.11_all.deb ...
Unpacking rubygems-integration (1.11) ...
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Selecting previously unselected package ruby2.5.
Preparing to unpack .../067-ruby2.5_2.5.1-1ubuntu1.10_amd64.deb ...
Unpacking ruby2.5 (2.5.1-1ubuntu1.10) ...
Selecting previously unselected package ruby.
Preparing to unpack .../068-ruby_1%3a2.5.1_amd64.deb ...
Unpacking ruby (1:2.5.1) ...
Selecting previously unselected package rake.
Preparing to unpack .../069-rake_12.3.1-1ubuntu0.1_all.deb ...
Unpacking rake (12.3.1-1ubuntu0.1) ...
Selecting previously unselected package ruby-did-you-mean.
Preparing to unpack .../070-ruby-did-you-mean_1.2.0-2_all.deb ...
Unpacking ruby-did-you-mean (1.2.0-2) ...
Selecting previously unselected package ruby-minitest.
Preparing to unpack .../071-ruby-minitest_5.10.3-1_all.deb ...
Unpacking ruby-minitest (5.10.3-1) ...
Selecting previously unselected package ruby-net-telnet.
Preparing to unpack .../072-ruby-net-telnet_0.1.1-2_all.deb ...
Unpacking ruby-net-telnet (0.1.1-2) ...
Selecting previously unselected package ruby-power-assert.
Preparing to unpack .../073-ruby-power-assert_0.3.0-1_all.deb ...
Unpacking ruby-power-assert (0.3.0-1) ...
Selecting previously unselected package ruby-test-unit.
Preparing to unpack .../074-ruby-test-unit_3.2.5-1_all.deb ...
Unpacking ruby-test-unit (3.2.5-1) ...
Selecting previously unselected package libruby2.5:amd64.
Preparing to unpack .../075-libruby2.5_2.5.1-1ubuntu1.10_amd64.deb ...
Unpacking libruby2.5:amd64 (2.5.1-1ubuntu1.10) ...
Selecting previously unselected package libsynctex1:amd64.
Preparing to unpack .../076-libsynctex1_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libsynctex1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libtexlua52:amd64.
Preparing to unpack .../077-libtexlua52_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libtexlua52:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libtexluajit2:amd64.
Preparing to unpack
.../078-libtexluajit2_2017.20170613.44572-8ubuntu0.1_amd64.deb ...
Unpacking libtexluajit2:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libwmf-bin.
Preparing to unpack .../079-libwmf-bin_0.2.8.4-12_amd64.deb ...
Unpacking libwmf-bin (0.2.8.4-12) ...
Selecting previously unselected package libzzip-0-13:amd64.
Preparing to unpack .../080-libzzip-0-13_0.13.62-3.1ubuntu0.18.04.1_amd64.deb
...
Unpacking libzzip-0-13:amd64 (0.13.62-3.1ubuntu0.18.04.1) ...
Selecting previously unselected package lmodern.
Preparing to unpack .../081-lmodern_2.004.5-3_all.deb ...
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Unpacking lmodern (2.004.5-3) ...
Selecting previously unselected package netpbm.
Preparing to unpack .../082-netpbm_2%3a10.0-15.3build1_amd64.deb ...
Unpacking netpbm (2:10.0-15.3build1) ...
Selecting previously unselected package preview-latex-style.
Preparing to unpack .../083-preview-latex-style_11.91-1ubuntu1_all.deb ...
Unpacking preview-latex-style (11.91-1ubuntu1) ...
Selecting previously unselected package python-bs4.
Preparing to unpack .../084-python-bs4_4.6.0-1_all.deb ...
Unpacking python-bs4 (4.6.0-1) ...
Selecting previously unselected package python-pkg-resources.
Preparing to unpack .../085-python-pkg-resources_39.0.1-2_all.deb ...
Unpacking python-pkg-resources (39.0.1-2) ...
Selecting previously unselected package python-chardet.
Preparing to unpack .../086-python-chardet_3.0.4-1_all.deb ...
Unpacking python-chardet (3.0.4-1) ...
Selecting previously unselected package python-six.
Preparing to unpack .../087-python-six_1.11.0-2_all.deb ...
Unpacking python-six (1.11.0-2) ...
Selecting previously unselected package python-webencodings.
Preparing to unpack .../088-python-webencodings_0.5-2_all.deb ...
Unpacking python-webencodings (0.5-2) ...
Selecting previously unselected package python-html5lib.
Preparing to unpack .../089-python-html5lib_0.999999999-1_all.deb ...
Unpacking python-html5lib (0.999999999-1) ...
Selecting previously unselected package python-lxml:amd64.
Preparing to unpack .../090-python-lxml_4.2.1-1ubuntu0.4_amd64.deb ...
Unpacking python-lxml:amd64 (4.2.1-1ubuntu0.4) ...
Selecting previously unselected package python3-six.
Preparing to unpack .../091-python3-six_1.11.0-2_all.deb ...
Unpacking python3-six (1.11.0-2) ...
Selecting previously unselected package python3-pkg-resources.
Preparing to unpack .../092-python3-pkg-resources_39.0.1-2_all.deb ...
Unpacking python3-pkg-resources (39.0.1-2) ...
Selecting previously unselected package python3-scour.
Preparing to unpack .../093-python3-scour_0.36-2_all.deb ...
Unpacking python3-scour (0.36-2) ...
Selecting previously unselected package scour.
Preparing to unpack .../094-scour_0.36-2_all.deb ...
Unpacking scour (0.36-2) ...
Selecting previously unselected package python-scour.
Preparing to unpack .../095-python-scour_0.36-2_all.deb ...
Unpacking python-scour (0.36-2) ...
Selecting previously unselected package t1utils.
Preparing to unpack .../096-t1utils_1.41-2_amd64.deb ...
Unpacking t1utils (1.41-2) ...
Selecting previously unselected package tex-gyre.
Preparing to unpack .../097-tex-gyre_20160520-1_all.deb ...
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Unpacking tex-gyre (20160520-1) ...
Selecting previously unselected package texlive-binaries.
Preparing to unpack .../098-texlive-
binaries_2017.20170613.44572-8ubuntu0.1_amd64.deb ...
Unpacking texlive-binaries (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package texlive-base.
Preparing to unpack .../099-texlive-base_2017.20180305-1_all.deb ...
Unpacking texlive-base (2017.20180305-1) ...
Selecting previously unselected package texlive-fonts-recommended.
Preparing to unpack .../100-texlive-fonts-recommended_2017.20180305-1_all.deb
...
Unpacking texlive-fonts-recommended (2017.20180305-1) ...
Selecting previously unselected package texlive-latex-base.
Preparing to unpack .../101-texlive-latex-base_2017.20180305-1_all.deb ...
Unpacking texlive-latex-base (2017.20180305-1) ...
Selecting previously unselected package texlive-latex-recommended.
Preparing to unpack .../102-texlive-latex-recommended_2017.20180305-1_all.deb
...
Unpacking texlive-latex-recommended (2017.20180305-1) ...
Selecting previously unselected package texlive.
Preparing to unpack .../103-texlive_2017.20180305-1_all.deb ...
Unpacking texlive (2017.20180305-1) ...
Selecting previously unselected package texlive-pictures.
Preparing to unpack .../104-texlive-pictures_2017.20180305-1_all.deb ...
Unpacking texlive-pictures (2017.20180305-1) ...
Selecting previously unselected package texlive-latex-extra.
Preparing to unpack .../105-texlive-latex-extra_2017.20180305-2_all.deb ...
Unpacking texlive-latex-extra (2017.20180305-2) ...
Selecting previously unselected package texlive-plain-generic.
Preparing to unpack .../106-texlive-plain-generic_2017.20180305-2_all.deb ...
Unpacking texlive-plain-generic (2017.20180305-2) ...
Selecting previously unselected package tipa.
Preparing to unpack .../107-tipa_2%3a1.3-20_all.deb ...
Unpacking tipa (2:1.3-20) ...
Selecting previously unselected package texlive-xetex.
Preparing to unpack .../108-texlive-xetex_2017.20180305-1_all.deb ...
Unpacking texlive-xetex (2017.20180305-1) ...
Selecting previously unselected package transfig.
Preparing to unpack .../109-transfig_1%3a3.2.6a-6ubuntu1_all.deb ...
Unpacking transfig (1:3.2.6a-6ubuntu1) ...
Setting up libgs9-common (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Setting up libkpathsea6:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up libjs-jquery (3.2.1-1) ...
Setting up libtexlua52:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up imagemagick-6-common (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up libpoppler-glib8:amd64 (0.62.0-2ubuntu2.12) ...
Setting up fonts-droid-fallback (1:6.0.1r16-1.1) ...
Setting up libgtk2.0-common (2.24.32-1ubuntu1) ...
```

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Setting up libsynctex1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up libptexenc1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up tex-common (6.09) ...
update-language: texlive-base not installed and configured, doing nothing!
Setting up gsfonts (1:8.11+urwcyr1.0.7~pre44-4.4) ...
Setting up libhunspell-1.6-0:amd64 (1.6.2-1) ...
Setting up libaspell15:amd64 (0.60.7~20110707-4ubuntu0.2) ...
Setting up poppler-data (0.4.8-2) ...
Setting up libdjvulibre-text (3.5.27.1-8ubuntu0.4) ...
Setting up libdbus-glib-1-2:amd64 (0.110-2) ...
Setting up libnetpbm10 (2:10.0-15.3build1) ...
Setting up emacsen-common (2.0.8) ...
Setting up python3-six (1.11.0-2) ...
Setting up tex-gyre (20160520-1) ...
Setting up preview-latex-style (11.91-1ubuntu1) ...
Setting up fonts-texgyre (20160520-1) ...
Setting up perl-modules-5.26 (5.26.1-6ubuntu0.5) ...
Setting up python3-pkg-resources (39.0.1-2) ...
Setting up python-pkg-resources (39.0.1-2) ...
Setting up librevenge-0.0-0:amd64 (0.0.4-6ubuntu2) ...
Setting up gawk (1:4.1.4+dfsg-1build1) ...
Setting up fonts-noto-mono (20171026-2) ...
Setting up fonts-lato (2.0-2) ...
Setting up libcupsfilters1:amd64 (1.20.2-0ubuntu3.1) ...
Setting up libcupsimage2:amd64 (2.2.7-1ubuntu2.8) ...
Setting up liblqr-1-0:amd64 (0.4.2-2.1) ...
Setting up libjbig2dec0:amd64 (0.13-6) ...
Setting up ruby-did-you-mean (1.2.0-2) ...
Setting up python-six (1.11.0-2) ...
Setting up python-bs4 (4.6.0-1) ...
Setting up libperl5.26:amd64 (5.26.1-6ubuntu0.5) ...
Setting up t1utils (1.41-2) ...
Setting up libtext-iconv-perl (1.7-5build6) ...
Setting up python-lxml:amd64 (4.2.1-1ubuntu0.4) ...
Setting up libcdr-0.1-1:amd64 (0.1.4-1build1) ...
Setting up ruby-net-telnet (0.1.1-2) ...
Setting up libijs-0.35:amd64 (0.35-13) ...
Setting up netpbm (2:10.0-15.3build1) ...
Setting up rubygems-integration (1.11) ...
Setting up libpotrace0 (1.14-2) ...
Setting up javascript-common (11) ...
Setting up ruby-minitest (5.10.3-1) ...
Setting up libzzip-0-13:amd64 (0.13.62-3.1ubuntu0.18.04.1) ...
Setting up libgslcblas0:amd64 (2.4+dfsg-6) ...
Setting up libgs9:amd64 (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Setting up libwmf0.2-7:amd64 (0.2.8.4-12) ...
Setting up libsigc++-2.0-0v5:amd64 (2.10.0-2) ...
Setting up libtexluajit2:amd64 (2017.20170613.44572-8ubuntu0.1) ...
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Setting up python-webencodings (0.5-2) ...
Setting up fonts-lmodern (2.004.5-3) ...
Setting up ruby-power-assert (0.3.0-1) ...
Setting up libcairomm-1.0-1v5:amd64 (1.12.2-3) ...
Setting up libgtk2.0-0:amd64 (2.24.32-1ubuntu1) ...
Setting up python-chardet (3.0.4-1) ...
Setting up libmagickcore-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up libgail18:amd64 (2.24.32-1ubuntu1) ...
Setting up libgsl23:amd64 (2.4+dfsg-6) ...
Setting up libdjvulibre21:amd64 (3.5.27.1-8ubuntu0.4) ...
Setting up dictionaries-common (1.27.2) ...
Setting up libvisio-0.1-1:amd64 (0.1.6-1build1) ...
Setting up libwpd-0.10-10:amd64 (0.10.2-2) ...
Setting up fig2dev (1:3.2.6a-6ubuntu1) ...
Setting up python3-scour (0.36-2) ...
Setting up scour (0.36-2) ...
Setting up libgail-common:amd64 (2.24.32-1ubuntu1) ...
Setting up ghostscript (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Setting up libwmf-bin (0.2.8.4-12) ...
Setting up perl (5.26.1-6ubuntu0.5) ...
Setting up transfig (1:3.2.6a-6ubuntu1) ...
Setting up python-scour (0.36-2) ...
Setting up libmagickwand-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up libglibmm-2.4-1v5:amd64 (2.56.0-1) ...
Setting up libwpg-0.3-3:amd64 (0.3.1-3) ...
Setting up python-html5lib (0.999999999-1) ...
Setting up aspell (0.60.7~20110707-4ubuntu0.2) ...
Setting up lmodern (2.004.5-3) ...
Setting up hunspell-en-us (1:2017.08.24) ...
Setting up libatkmm-1.6-1v5:amd64 (2.24.2-3) ...
Setting up libgtk2.0-bin (2.24.32-1ubuntu1) ...
Setting up libenchant1c2a:amd64 (1.6.0-11.1) ...
Setting up libimage-magick-q16-perl (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up imagemagick-6.q16 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
update-alternatives: using /usr/bin/compare-im6.q16 to provide /usr/bin/compare
(compare) in auto mode
update-alternatives: using /usr/bin/compare-im6.q16 to provide /usr/bin/compare-
im6 (compare-im6) in auto mode
update-alternatives: using /usr/bin/animate-im6.q16 to provide /usr/bin/animate
(animate) in auto mode
update-alternatives: using /usr/bin/animate-im6.q16 to provide /usr/bin/animate-
im6 (animate-im6) in auto mode
update-alternatives: using /usr/bin/convert-im6.q16 to provide /usr/bin/convert
(convert) in auto mode
update-alternatives: using /usr/bin/convert-im6.q16 to provide /usr/bin/convert-
im6 (convert-im6) in auto mode
update-alternatives: using /usr/bin/composite-im6.q16 to provide
/usr/bin/composite (composite) in auto mode
```

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update-alternatives: using /usr/bin/composite-im6.q16 to provide /usr/bin
/composite-im6 (composite-im6) in auto mode
update-alternatives: using /usr/bin/conjure-im6.q16 to provide /usr/bin/conjure
(conjure) in auto mode
update-alternatives: using /usr/bin/conjure-im6.q16 to provide /usr/bin/conjure-
im6 (conjure-im6) in auto mode
update-alternatives: using /usr/bin/import-im6.q16 to provide /usr/bin/import
(import) in auto mode
update-alternatives: using /usr/bin/import-im6.q16 to provide /usr/bin/import-
im6 (import-im6) in auto mode
update-alternatives: using /usr/bin/identify-im6.q16 to provide
/usr/bin/identify (identify) in auto mode
update-alternatives: using /usr/bin/identify-im6.q16 to provide /usr/bin
/identify-im6 (identify-im6) in auto mode
update-alternatives: using /usr/bin/stream-im6.q16 to provide /usr/bin/stream
(stream) in auto mode
update-alternatives: using /usr/bin/stream-im6.q16 to provide /usr/bin/stream-
im6 (stream-im6) in auto mode
update-alternatives: using /usr/bin/display-im6.q16 to provide /usr/bin/display
(display) in auto mode
update-alternatives: using /usr/bin/display-im6.q16 to provide /usr/bin/display-
im6 (display-im6) in auto mode
update-alternatives: using /usr/bin/montage-im6.q16 to provide /usr/bin/montage
(montage) in auto mode
update-alternatives: using /usr/bin/montage-im6.q16 to provide /usr/bin/montage-
im6 (montage-im6) in auto mode
update-alternatives: using /usr/bin/mogrify-im6.q16 to provide /usr/bin/mogrify
(mogrify) in auto mode
update-alternatives: using /usr/bin/mogrify-im6.q16 to provide /usr/bin/mogrify-
im6 (mogrify-im6) in auto mode
Setting up texlive-binaries (2017.20170613.44572-8ubuntu0.1) ...
update-alternatives: using /usr/bin/xdvi-xaw to provide /usr/bin/xdvi.bin
(xdvi.bin) in auto mode
update-alternatives: using /usr/bin/bibtex.original to provide /usr/bin/bibtex
(bibtex) in auto mode
Setting up libpangomm-1.4-1v5:amd64 (2.40.1-4) ...
Setting up libgtkmm-2.4-1v5:amd64 (1:2.24.5-2) ...
Setting up libgtkspell0:amd64 (2.0.16-1.2) ...
Setting up libmagick++-6.q16-7:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up libmagickcore-6.q16-3-extra:amd64 (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up aspell-en (2017.08.24-0-0.1) ...
Setting up imagemagick (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up texlive-base (2017.20180305-1) ...
mktexlsr: Updating /var/lib/texmf/ls-R-TEXLIVEDIST...
mktexlsr: Updating /var/lib/texmf/ls-R-TEXMFMAIN...
mktexlsr: Updating /var/lib/texmf/ls-R...
mktexlsr: Done.
tl-paper: setting paper size for dvips to a4: /var/lib/texmf/dvips/config
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/config-paper.ps
tl-paper: setting paper size for dvipdfmx to a4: /var/lib/texmf/dvipdfmx
/dvipdfmx-paper.cfg
tl-paper: setting paper size for xdvi to a4: /var/lib/texmf/xdvi/XDvi-paper
tl-paper: setting paper size for pdftex to a4:
/var/lib/texmf/tex/generic/config/pdftexconfig.tex
Setting up enchant (1.6.0-11.1) ...
Setting up texlive-fonts-recommended (2017.20180305-1) ...
Setting up texlive-plain-generic (2017.20180305-2) ...
Setting up texlive-latex-base (2017.20180305-1) ...
Setting up inkscape (0.92.3-1) ...
Setting up texlive-latex-recommended (2017.20180305-1) ...
Setting up libimage-magick-perl (8:6.9.7.4+dfsg-16ubuntu6.11) ...
Setting up texlive-pictures (2017.20180305-1) ...
Setting up tipa (2:1.3-20) ...
Regenerating '/var/lib/texmf/fmtutil.cnf-DEBIAN'... done.
Regenerating '/var/lib/texmf/fmtutil.cnf-TEXLIVEDIST'... done.
update-fmtutil has updated the following file(s):
        /var/lib/texmf/fmtutil.cnf-DEBIAN
        /var/lib/texmf/fmtutil.cnf-TEXLIVEDIST
If you want to activate the changes in the above file(s),
you should run fmtutil-sys or fmtutil.
Setting up texlive (2017.20180305-1) ...
Setting up texlive-latex-extra (2017.20180305-2) ...
Setting up texlive-xetex (2017.20180305-1) ...
Setting up ruby2.5 (2.5.1-1ubuntu1.10) ...
Setting up ruby (1:2.5.1) ...
Setting up ruby-test-unit (3.2.5-1) ...
Setting up rake (12.3.1-1ubuntu0.1) ...
Setting up libruby2.5:amd64 (2.5.1-1ubuntu1.10) ...
Processing triggers for mime-support (3.60ubuntu1) ...
Processing triggers for libc-bin (2.27-3ubuntu1.2) ...
/sbin/ldconfig.real: /usr/local/lib/python3.7/dist-
packages/ideep4py/lib/libmkldnn.so.0 is not a symbolic link

Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for fontconfig (2.12.6-0ubuntu2) ...
Processing triggers for tex-common (6.09) ...
Running updmap-sys. This may take some time... done.
Running mktexlsr /var/lib/texmf ... done.
Building format(s) --all.
        This may take some time... done.
Processing triggers for dictionaries-common (1.27.2) ...
aspell-autobuildhash: processing: en [en-common].
aspell-autobuildhash: processing: en [en-variant_0].
aspell-autobuildhash: processing: en [en-variant_1].
aspell-autobuildhash: processing: en [en-variant_2].
```

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aspell-autobuildhash: processing: en [en-w_accents-only].
aspell-autobuildhash: processing: en [en-wo_accents-only].
aspell-autobuildhash: processing: en [en_AU-variant_0].
aspell-autobuildhash: processing: en [en_AU-variant_1].
aspell-autobuildhash: processing: en [en_AU-w_accents-only].
aspell-autobuildhash: processing: en [en_AU-wo_accents-only].
aspell-autobuildhash: processing: en [en_CA-variant_0].
aspell-autobuildhash: processing: en [en_CA-variant_1].
aspell-autobuildhash: processing: en [en_CA-w_accents-only].
aspell-autobuildhash: processing: en [en_CA-wo_accents-only].
aspell-autobuildhash: processing: en [en_GB-ise-w_accents-only].
aspell-autobuildhash: processing: en [en_GB-ise-wo_accents-only].
aspell-autobuildhash: processing: en [en_GB-ize-w_accents-only].
aspell-autobuildhash: processing: en [en_GB-ize-wo_accents-only].
aspell-autobuildhash: processing: en [en_GB-variant_0].
aspell-autobuildhash: processing: en [en_GB-variant_1].
aspell-autobuildhash: processing: en [en_US-w_accents-only].
aspell-autobuildhash: processing: en [en_US-wo_accents-only].
    Building wheel for pypandoc (setup.py) ... done
```

[55]:
```python
# TO DO: Provide the full path to your Jupyter notebook file
!jupyter nbconvert --to PDF "Comp Vision/Homework1_dhanushnd.ipynb"
#!jupyter nbconvert --to PDF "/content/drive/MyDrive/Colab Notebooks/
 →Homework1_USERNAME.ipynb"
```

```
[NbConvertApp] Converting notebook Comp Vision/Homework1_dhanushnd.ipynb to PDF
[NbConvertApp] Support files will be in Homework1_dhanushnd_files/
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
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[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Making directory ./Homework1_dhanushnd_files
[NbConvertApp] Writing 84279 bytes to ./notebook.tex
[NbConvertApp] Building PDF
Traceback (most recent call last):
  File "/usr/local/bin/jupyter-nbconvert", line 8, in <module>
```

```
    sys.exit(main())
  File "/usr/local/lib/python2.7/dist-packages/jupyter_core/application.py",
line 267, in launch_instance
    return super(JupyterApp, cls).launch_instance(argv=argv, **kwargs)
  File "/usr/local/lib/python2.7/dist-packages/traitlets/config/application.py",
line 658, in launch_instance
    app.start()
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/nbconvertapp.py", line
338, in start
    self.convert_notebooks()
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/nbconvertapp.py", line
508, in convert_notebooks
    self.convert_single_notebook(notebook_filename)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/nbconvertapp.py", line
479, in convert_single_notebook
    output, resources = self.export_single_notebook(notebook_filename,
resources, input_buffer=input_buffer)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/nbconvertapp.py", line
408, in export_single_notebook
    output, resources = self.exporter.from_filename(notebook_filename,
resources=resources)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/exporters/exporter.py",
line 179, in from_filename
    return self.from_file(f, resources=resources, **kw)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/exporters/exporter.py",
line 197, in from_file
    return self.from_notebook_node(nbformat.read(file_stream, as_version=4),
resources=resources, **kw)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/exporters/pdf.py", line
178, in from_notebook_node
    rc = self.run_latex(tex_file)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/exporters/pdf.py", line
149, in run_latex
    self.latex_count, log_error)
  File "/usr/local/lib/python2.7/dist-packages/nbconvert/exporters/pdf.py", line
111, in run_command
    "at {link}.".format(formatter=command_list[0], link=link))
OSError: xelatex not found on PATH, if you have not installed xelatex you may
need to do so. Find further instructions at
https://nbconvert.readthedocs.io/en/latest/install.html#installing-tex.
```