1. Write a script to reproduce Figures 3.8 and 3.9. Write a function that implements the power-law \((b = c a^\gamma)\) formula. The function should take a uint8 input image, a gamma value and a value for \(c\) and return a uint8 output image. Your script should read the input files and then reproduce Figures 3.8 and 3.9 by making use of your function to do the necessary gamma correction. Figure 3.8 should be reproduced in one window while Figure 3.9 is reproduced in another window. Remember to use the element-by-element power operation instead of the matrix power operation.

2. Write a script that reproduces Figures 3.14 and 3.15. Write a function that accepts a gray-level (uint8) image and a bit-plane number (1-8 with 8 being the most significant bit) arguments and returns a black-and-white (logical) image. Figure 3.14 should be reproduced in one window while Figure 3.15 should be reproduced in a second window. Your script should read the input file and use your function to reproduce Figures 3.14 and 3.15. Note that Figure 3.14 contains black-and-white (logical) images while Figure 3.15 contains gray-level (uint8) images. The \texttt{bitand} and \texttt{bitor} functions should be useful, \(b = \text{logical}(\text{bitand}(a, 128))\) will return the most significant bit-plane of \(a\) as a black-and-white image.

3. Write a script and function to reproduce Figure 3.35. The function should implement local (3 x 3) median processing. It should accept a uint8 image and return a uint8 image. The script should read in the input image and reproduce Figure 3.35. You do not need to write a function to implement the averaging for Figure 3.35 b, use the \texttt{conv2} function. In your median processing function, you may find it useful to pad the input image with zeros along all edges.

Note: I got an error from Octave when I tried to read in some of the original TIF images. I got around the problem by using imagej to convert the original TIF image to PNG format. I had no problems reading in the PNG images in Octave.
FIGURE 3.8
(a) Magnetic resonance image (MRI) of a fractured human spine.
(b)–(d) Results of applying the transformation in Eq. (3.2-3) with $c = 1$ and $\gamma = 0.6, 0.4,$ and 0.3, respectively.
(Original image courtesy of Dr. David R. Pickens, Department of Radiology and Radiological Sciences, Vanderbilt University Medical Center.)
**FIGURE 3.9**
(a) Aerial image. (b)–(d) Results of applying the transformation in Eq. (3.2-3) with $c = 1$ and $\gamma = 3.0, 4.0, \text{ and } 5.0$, respectively. (Original image for this example courtesy of NASA.)
FIGURE 3.15 Images reconstructed using (a) bit planes 8 and 7; (b) bit planes 8, 7, and 6; and (c) bit planes 8, 7, 6, and 5. Compare (c) with Fig. 3.14(a).
Chapter 3
Intensity Transformations & Spatial Filtering

**FIGURE 3.35** (a) X-ray image of circuit board corrupted by salt-and-pepper noise. (b) Noise reduction with a $3 \times 3$ averaging mask. (c) Noise reduction with a $3 \times 3$ median filter. (Original image courtesy of Mr. Joseph E. Pascente, Lixi, Inc.)