

ECE/OPTI 532, Spring 2023
Homework 1 Assignment
Due Tue. Jan. 31

Write a computer program (MATLAB, Python, or C/C++) to perform rms filtering. (There are better methods for image filtering, but this is a good introduction to image processing programming.)

Let $x(r, c)$ be the input image. For each pixel, calculate the output pixel value to be the square root of the mean of the squared pixel values within a radius of R pixels.

Specifically, define a “circular” disk neighborhood $N_R(r, c)$ centered at coordinates (r, c) and having radius R . Let $\# \{N_R(r, c)\}$ be the number of pixels in $N_R(r, c)$ — i.e., the number of pixels whose Euclidean distance from (r, c) is less than or equal to R . Calculate the output as

$$y(r, c) = \sqrt{\frac{1}{\# \{N_R(r, c)\}} \sum_{(r, c) \in N_R(r, c)} x^2(r, c)}$$

Run your program on the provided cman image using $R = 6$.

For comparison, apply a 13-by-13 local average filter to blur the cman image.

Submit the following:

- Your source code in a file format that allows it to be compiled and executed.
- Numerical pixel values of your rms filtered output for the following region:
 - If your array origin is at $(r, c) = (0, 0)$, show the numerical output pixel values for $309 \leq r \leq 313$, $309 \leq c \leq 313$ in a square array arrangement to facilitate grading.
 - If you are using MATLAB with array origin at $(r, c) = (1, 1)$, show the numerical output pixel values for $310 \leq r \leq 314$, $310 \leq c \leq 314$ in a square array arrangement to facilitate grading.
- Numerical pixel values of the 13-by-13 local average output for the same region.