Intensity Transformations

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Intensity transformations

Goal:

Improve the quality of an image by applying a transformation to the intensity of individual pixels

Let I be the original image

$T[i,j] = f(I[i,j])$

where f is the transformation function and T is the transformed image

Intensity transformations are commonly used to improve the lighting of an image, correcting over-exposure or under-exposure

Gamma Correction

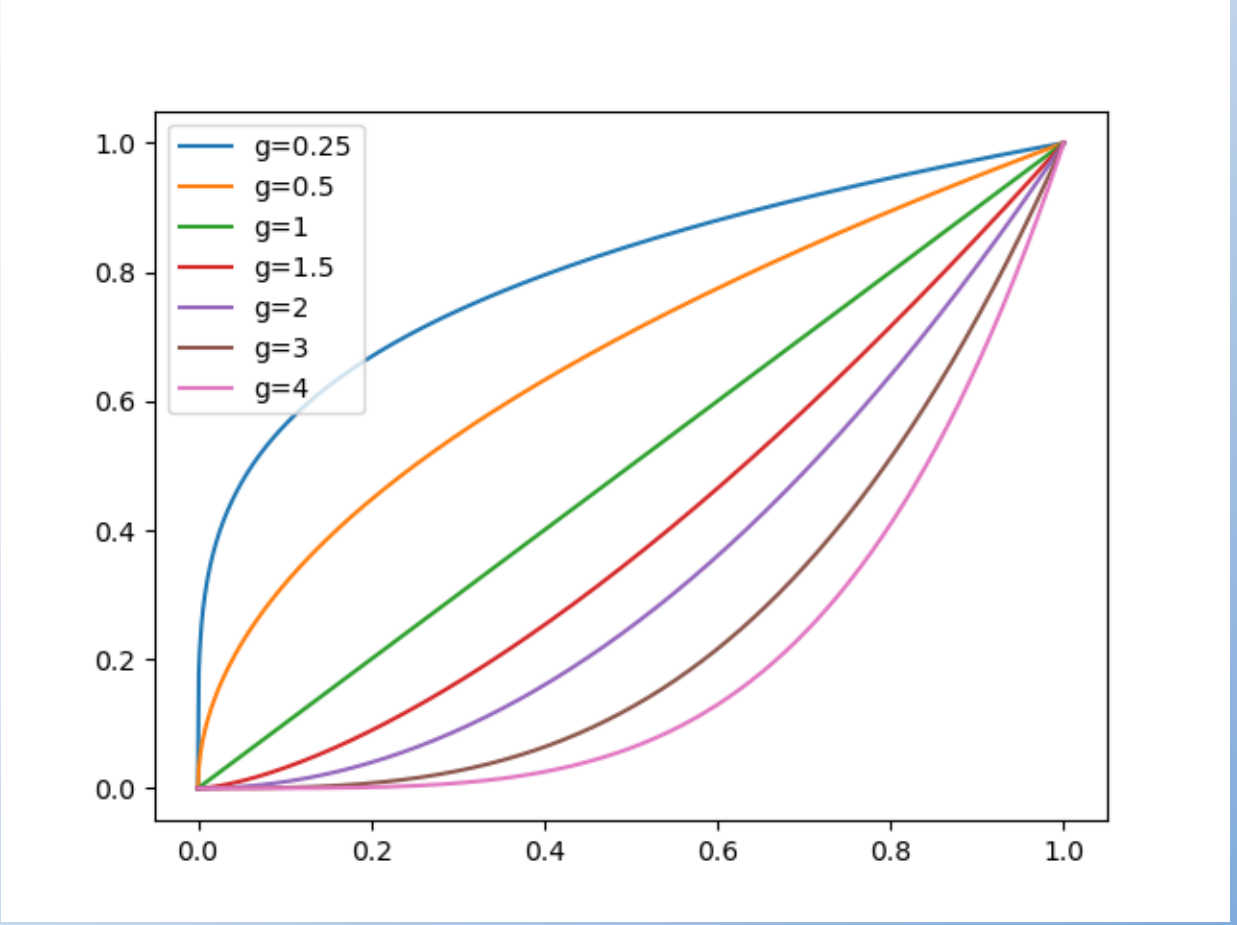
Let I be a gray-level image where $0 \leq I[i,j] \leq 1$

$f(x) = x^{\gamma}$

T = I**gamma

where I is the original image and T is the transformed image

Gamma Correction



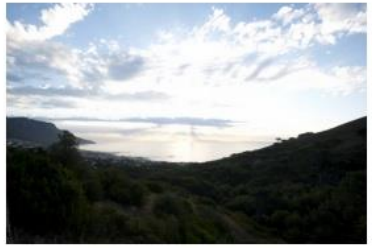
Gamma Correction

Original image

Gamma =0.5



Gamma =1


Gamma =2



Gamma Correction

Original image

Gamma =0.5

Gamma =1

Gamma =2

Log Correction

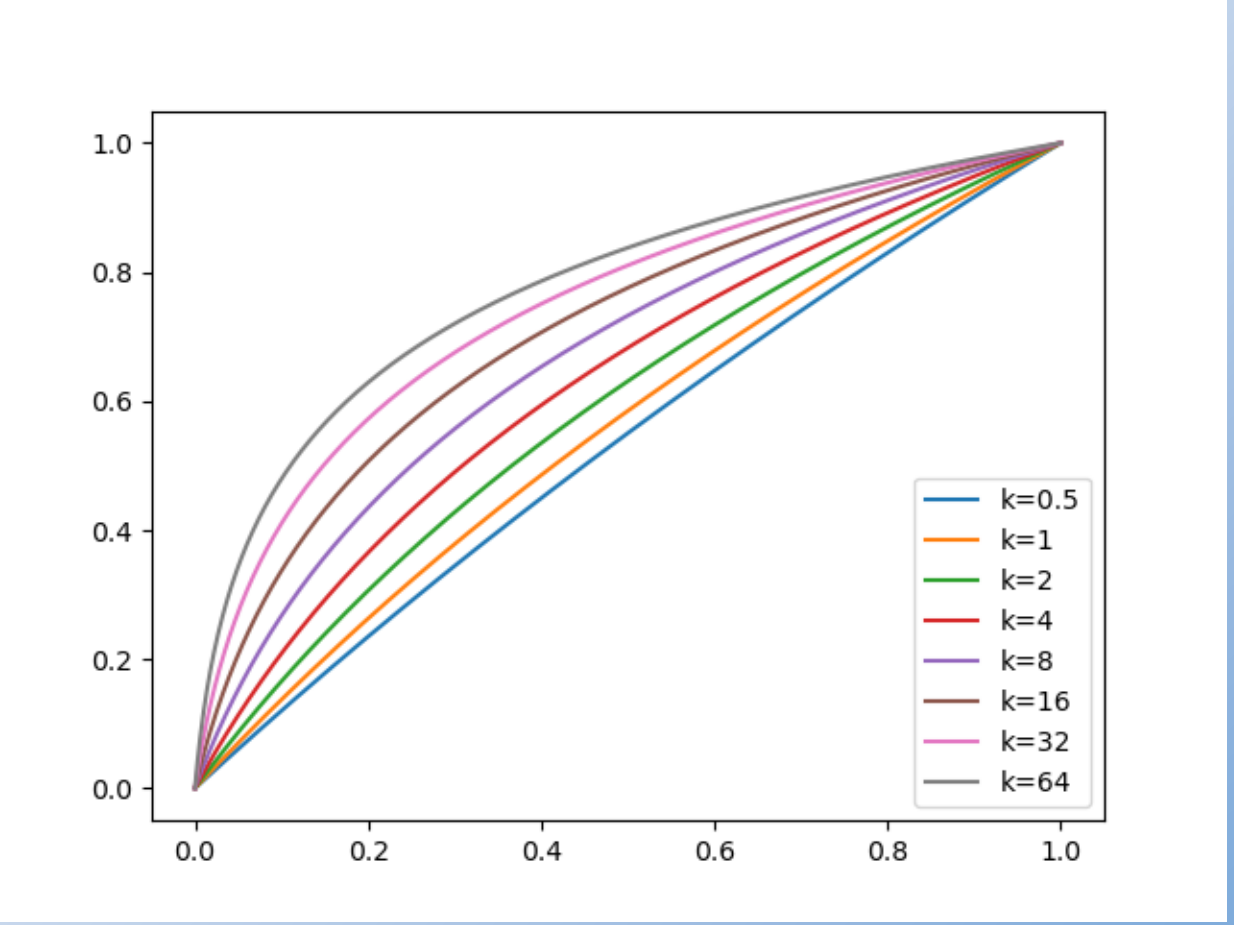
Let I be a gray-level image where $0 \leq I[i,j] \leq 1$

f(x) = np.log (x*k + 1)/np.log (k + 1)

T = np.log(I**k + 1)/log(k+1)

(notice that the skimage implementation only allows for k=1)

Log Correction



Log Correction

k =1

k =4

k =32

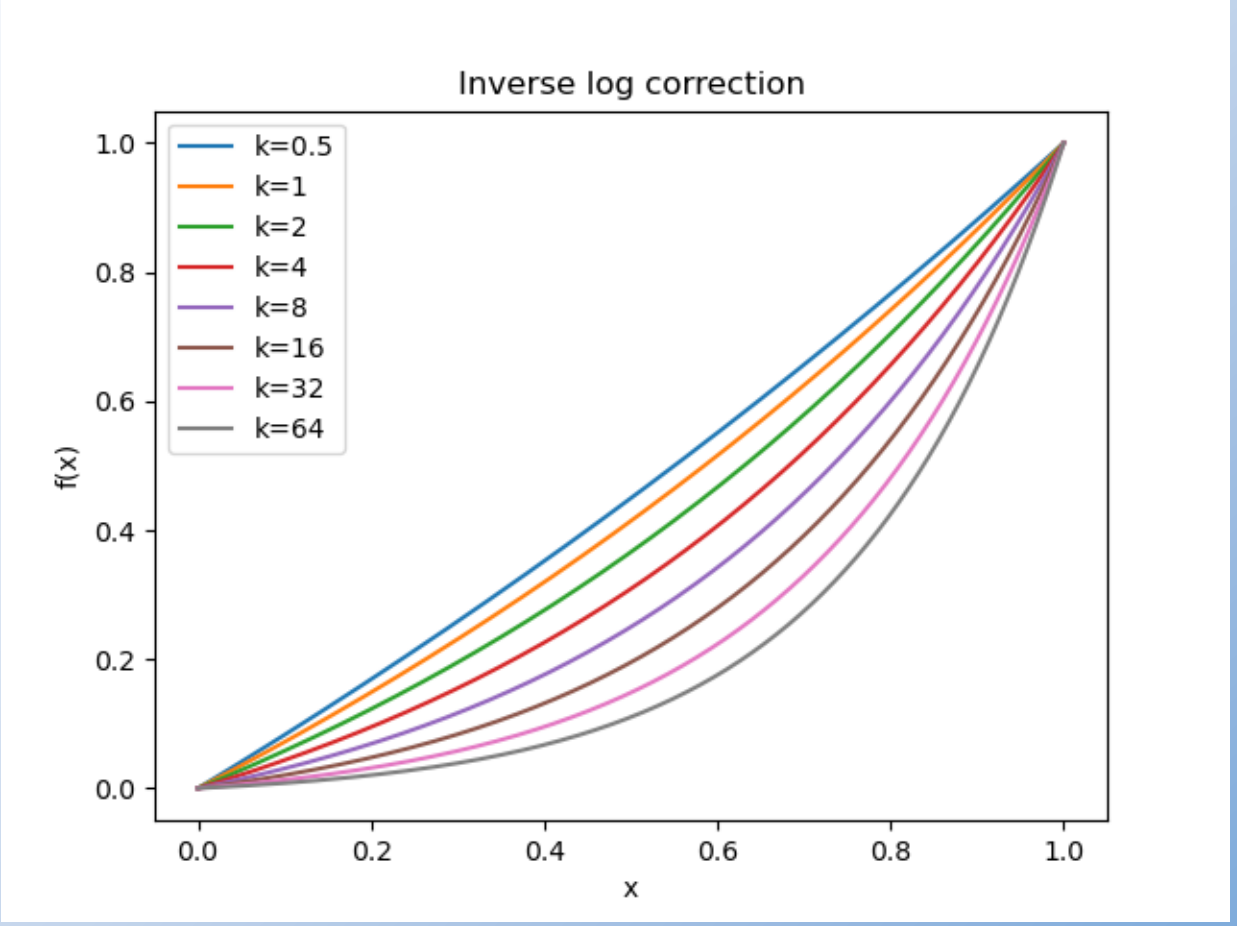
Log Correction

k =1

k =4

k =32

Inverse log Correction



Inverse Log Correction

k =4

k =16

k =64

Inverse Log Correction

k =4

k =16

k =64

Sigmoid Correction

Let I be a gray-level image where $0 \leq I[i,j] \leq 1$

$f(x) = 1/(1+\exp(k*(1/2 - x)))$

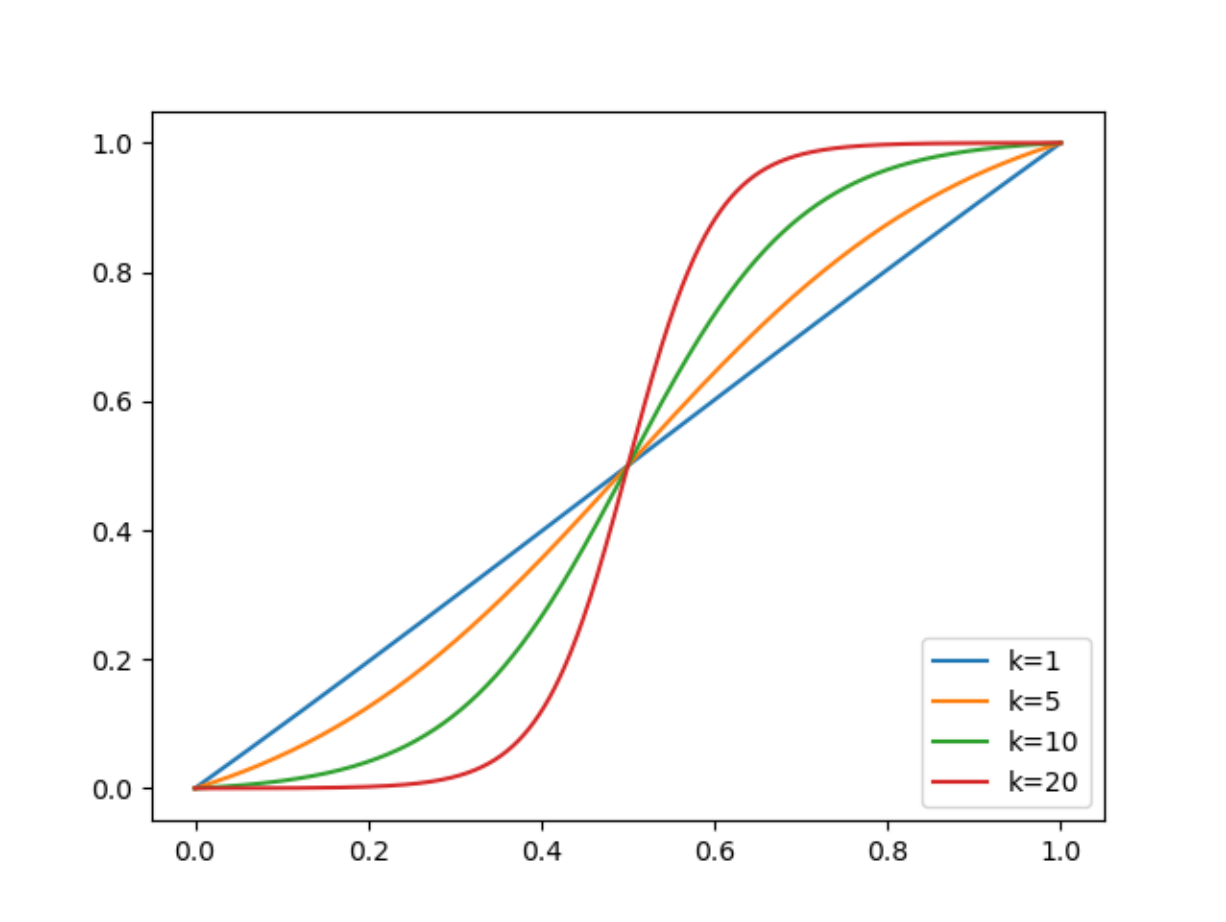
T = 1/(1 + np.exp(k*(0.5-I)))

Then we must renormalize T

T = T – np.min(T)

T = T/np/max(T)

Sigmoid Correction



Sigmoid Correction

k =2

k =5

k =10

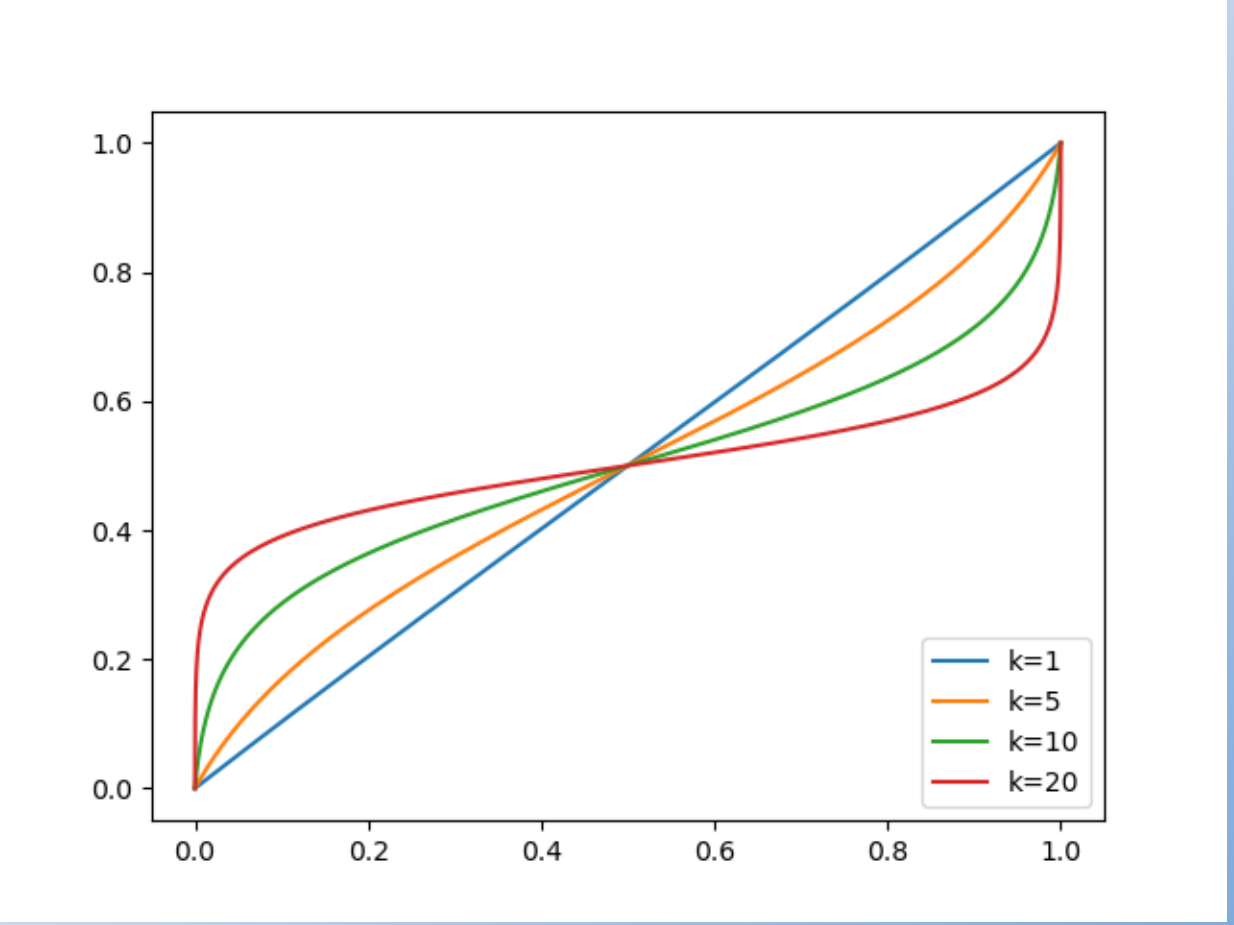
Sigmoid Correction

k =2

k =5

k =10

Inverse Sigmoid Correction



Inverse Sigmoid Correction

k =2

k =4

k =8

Inverse Sigmoid Correction

k =2

k =4

k =8