Noise in Images: Notes

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1 Gaussian Noise

An image is defined as being perturbed by Gaussian noise if the intensity of every pixel in the image $I(i, j)$ becomes $I(i, j) + N(0, \sigma)$, where $N(0, \sigma)$ is a random number sample from a Normal (aka Gaussian) distribution with standard deviation σ.

This roughly means that the probability that the random number is x is proportional to:

$$\frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{x^2}{2\sigma^2}},$$

so that x's around 0 are more likely than x's far away from 0, and x's that are larger than 3σ or smaller than -3σ are extremely unlikely.

2 Salt and Pepper Noise

An image is defined as being perturbed by Gaussian noise if the intensity of every pixel in the image $I(i, j)$ becomes 0 with some probability p_0 and becomes 1 with some probability p_1. The result is black and white pixels on the image.