$$VS = \frac{\sum_{\forall n} (I(i, j) - \mu)^2}{\|n\|}$$

$$\mu = \frac{\sum_{\forall n} I(i, j)}{\|n\|}$$

$$VN = \frac{\sum (I_N(i, j) - I(i, j) - \mu_N)^2}{\|n\|}$$

$$\mu_N = \frac{\sum_{\forall n} (I_N(i, j) - I(i, j))}{\|n\|}$$

$$SNR = 20 \log_{10} \frac{\sqrt{VS}}{\sqrt{VN}}$$