$b = \frac{COV(X,Y)}{VAR(X)}$, $a = \bar{y} - b\bar{x}$

</LAB>

Precision = $\frac{TP}{TP+FP}$ ⇒ Out of all predicted positive, how many actually have cancer?

Recall = $\frac{TP}{TP+FN}$ ⇒ out of all cancer patients, how many are we predicting?

wormhole
<you enter here>

Note: This is not an accidental ink spill at all ⇒ 100% Intentional

ML Lab Project

Structural Similarity

Problem with MSE is that it only estimate absolute error

SSIM: AKA Structural Similarity is a perception based model

↳ Considers image degradation

↳ As perceived change in Structural Information

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Structural Information

⇒ Idea that pixels have strong interdependencies especially when they are spatially close.

SSim is calculated on various N×N windows of the image

Say window x [N×N]

and window y [N×N]

$$SSim(x, y) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2 + \sigma_y^2 + C_2)}$$

Where

μ_x = average of x

σ_x^2 = var of x

σ_{xy} = covar (x, y)

And $C_1 = (k_1 L)^2$; $C_2 = (k_2 L)^2$

L is the dynamic range of pixel values

$L = 2^{\#\text{bits per pixel}} - 1$

$k_1 = 0.01$, $k_2 = 0.03$

Formula Components

SSim is based on 3 comparison measurements between the samples of x & y

Luminance, Contrast & Structure
(l) (c) (s)

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where
luminance $l(x,y) = \frac{2\mu_x\mu_y + C_1}{\mu_x^2 + \mu_y^2 + C_1}$

contrast $= c(x,y) = \frac{2\sigma_x\sigma_y + C_2}{\sigma_x^2 + \sigma_y^2 + C_2}$

Structure: $s(x,y) = \frac{\sigma_{xy} + C_3}{\sigma_x\sigma_y + C_3}$

Note: $C_3 = C_2/2$

Ssim is a weighted combination of those comparative measures

ie $Ssim(x,y) = l(x,y)^{\alpha} c(x,y)^{\beta} s(x,y)^{\gamma}$

If $\alpha = \beta = \gamma = 1$, we get

$$Ssim(x,y) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2 + \sigma_y^2 + C_2)}$$

Ssim is not a distance measure as it does not obey triangle inequality

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