Derivatives of the Nutella Model

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1 Maths

note on notation: x', y' refers to pixel coordinates in the model domain, whereas x, y are pixel coordinates in the data domain. $c_{x'}$ and $c_{y'}$ are the center positions of the PSF.

$$\phi_n = f_n p_n(c_{x'}, c_{y'})\delta \tag{1}$$

$$\Phi_n = \sum_{x',y'} \phi_n \tag{2}$$

1.1 Likelihood

$$\mathcal{L}_n = \sum_{x,y} \frac{(\Phi_n - d_n)^2}{\sigma^2} \tag{3}$$

$$C \triangleq 2\frac{(\Phi_n - d_n)}{\sigma^2} \tag{4}$$

$$\frac{\partial \mathcal{L}_n}{\partial f_n} = \sum_{x,y} p_n(c_{x'}, c_{y'}) \cdot C\delta \tag{5}$$

$$\frac{\partial \mathcal{L}_n}{\partial \delta} = \sum_{x,y} p_n(c_{x'}, c_{y'}) \cdot C f_n \tag{6}$$

$$\frac{\partial \mathcal{L}_n}{\partial c_{x'}} = \sum_{x,y} \frac{\partial p_n(c_{x'}, c_{y'})}{\partial c_{x'}} \cdot C f_n \delta \tag{7}$$

$$\frac{\partial \mathcal{L}_n}{\partial c_{y'}} = \sum_{x,y} \frac{\partial p_n(c_{x'}, c_{y'})}{\partial c_{y'}} \cdot C f_n \delta \tag{8}$$