

Div Operator

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Definition & Gradient

The Division Operator is defined as $f(u, v) = \frac{u}{v}$. To find the gradient w.r.t x and y , we will use the quotient rule of derivatives, which is defined as:

$$\frac{\delta}{\delta x} \left(\frac{u}{v} \right) = \frac{(u \frac{\delta}{\delta x})v - u(v \frac{\delta}{\delta x})}{v^2}$$

To find the gradient w.r.t u , we will set u as our x and treat v as constant, which gives us the following:

$$\frac{\delta}{\delta u} \left(\frac{u}{v} \right) = \frac{v \frac{\delta u}{\delta u} - u \frac{\delta v}{\delta u}}{v^2} = \frac{v - u \frac{0}{\delta u}}{v^2} = \frac{v}{v^2} = \frac{1}{v}$$

To find the gradient w.r.t v , we will set v as our x and treat u as constant, which gives us the following:

$$\frac{\delta}{\delta v} \left(\frac{u}{v} \right) = \frac{v \frac{\delta u}{\delta v} - u \frac{\delta v}{\delta v}}{v^2} = \frac{v \frac{0}{\delta v} - u}{v^2} = -\frac{u}{v^2}$$

Therefore, we can say that the gradient w.r.t u is $\frac{1}{v}$, and the gradient w.r.t v is $-\frac{u}{v^2}$.