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A Refinement of Jensen's Inequality

Authors: **Jamal Rooin**,

Abstract: We refine Jensen's inequality as

$$\varphi\left(\int_X f d\mu\right) \leq \int_Y \varphi\left(\int_X f(x)\omega(x,y)d\mu(x)\right) d\lambda(y) \leq \int_X (\varphi \circ f)d\mu,$$

where $(X, \mathcal{A}, \mu)$ and $(Y, \mathcal{B}, \lambda)$ are two probability measure spaces,

$\omega : X \times Y \to [0, \infty)$ is a weight function on $X \times Y$, I is an interval of the

real line, $f \in L^1(\mu)$, $f(x) \in I$ for all $x \in X$ and φ is a real-valued convex

function on I.

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