Instance Normalization

- **Title**: Instance Normalization: The Missing Ingredient for Fast Stylization
- **Authors**: Dmitry Ulyanov, Andrea Vedaldi, Victor Lempitsky
- **Link**: https://arxiv.org/abs/1607.08022

$\boldsymbol{H}$ = height
$\boldsymbol{W}$ = width
$\boldsymbol{T}$ = examples in mini-batch

Batch Normalization (applied to a CNN):

$$y_{tijk} = \frac{x_{tijk} - \mu_i}{\sqrt{\sigma_i^2 + \epsilon}}, \quad \mu_i = \frac{1}{HWT}\sum_{t=1}^{T}\sum_{l=1}^{W}\sum_{m=1}^{H} x_{tilm}, \quad \sigma_i^2 = \frac{1}{HWT}\sum_{t=1}^{T}\sum_{l=1}^{W}\sum_{m=1}^{H}(x_{tilm} - mu_i)^2.$$

Instance Normalization (applied to a CNN):

$$y_{tijk} = \frac{x_{tijk} - \mu_{ti}}{\sqrt{\sigma_{ti}^2 + \epsilon}}, \quad \mu_{ti} = \frac{1}{HW}\sum_{l=1}^{W}\sum_{m=1}^{H} x_{tilm}, \quad \sigma_{ti}^2 = \frac{1}{HW}\sum_{l=1}^{W}\sum_{m=1}^{H}(x_{tilm} - mu_{ti})^2.$$