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Batch Normalization

Batch Norm at test time

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$$\begin{aligned} \rightarrow \underline{\mu} &= \frac{1}{\underline{m}} \sum_i \underline{z^{(i)}} \\ \rightarrow \underline{\sigma^2} &= \frac{1}{\underline{m}} \sum_i (\underline{z^{(i)}} - \underline{\mu})^2 \end{aligned}$$

$$\rightarrow \underline{z_{\text{norm}}^{(i)}} = \frac{\underline{z^{(i)}} - \underline{\mu}}{\sqrt{\underline{\sigma^2} + \underline{\epsilon}}} \leftarrow$$

$$\rightarrow \underline{\tilde{z}^{(i)}} = \gamma \underline{z_{\text{norm}}^{(i)}} + \underline{\beta}$$

$\underline{\mu}, \underline{\sigma^2}$: estimate using exponentially weighted average (across mini-batches).

