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Rate-distortion theory: *neural compression*

Autoencoding is a form of (neural) compression!

$$\mathrm{ELBO} = \left\langle \log p_{\vartheta}(x \mid z) \right\rangle_{q_{\varphi}} - D_{\mathrm{KL}} \left(q_{\varphi}(z \mid x) \,\|\, p(z) \right)$$

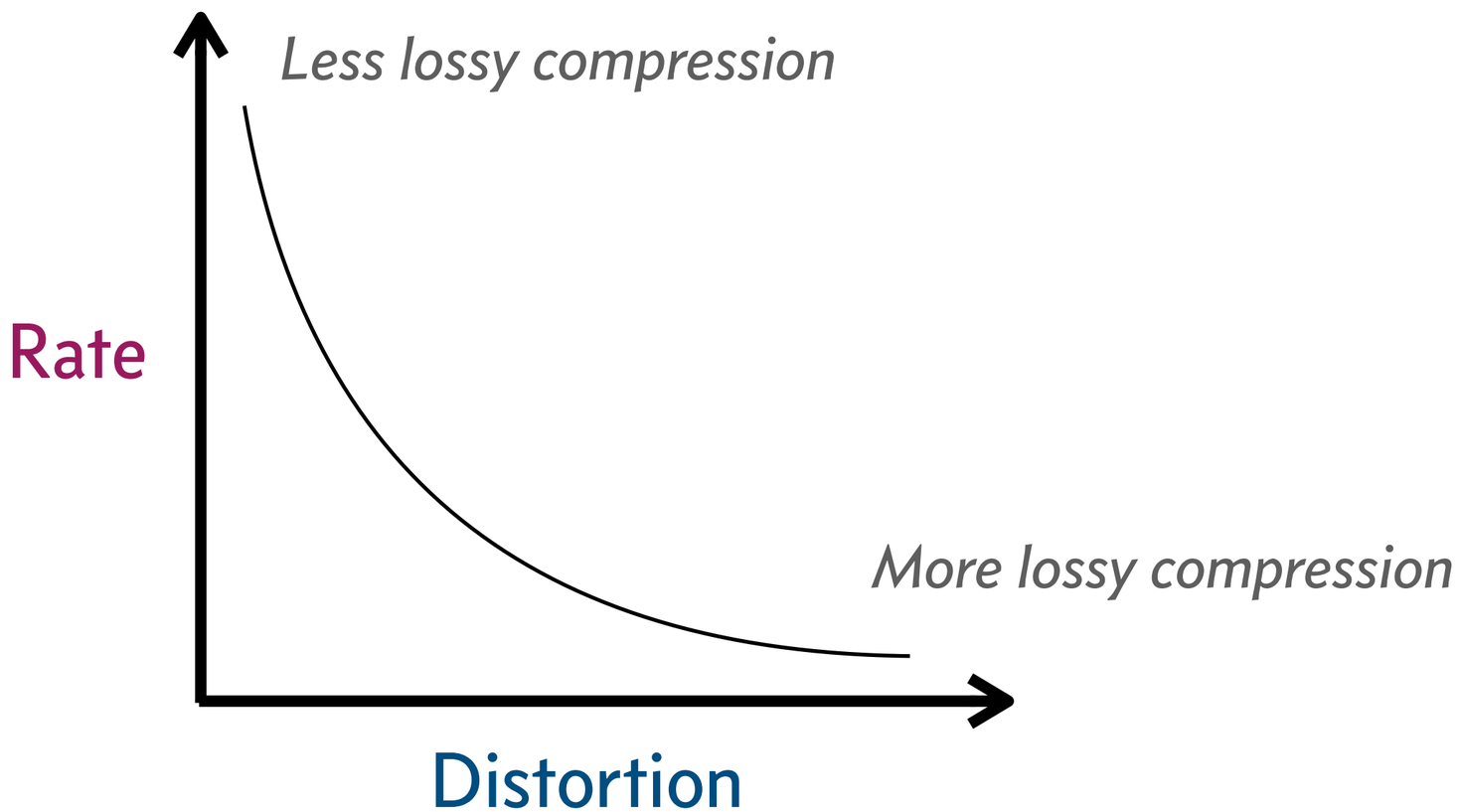
Rate

"Amount of compression"

Distortion

“Information loss”

Rate-distortion curve quantified this tradeoff



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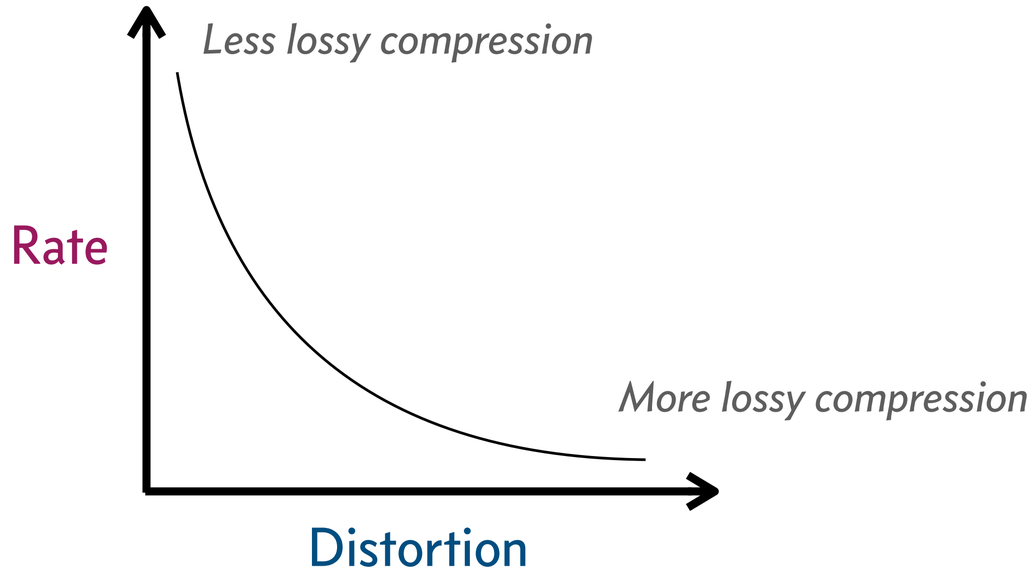

Controlling compression and disentanglement: β-VAEs

$$\text{ELBO} = \left\langle \log p_\vartheta(x \mid z) \right\rangle_{q_\varphi} - \beta \cdot D_{\text{KL}} \left(q_\varphi(z \mid x) \,\|\, p(z) \right)$$

Distortion

Rate