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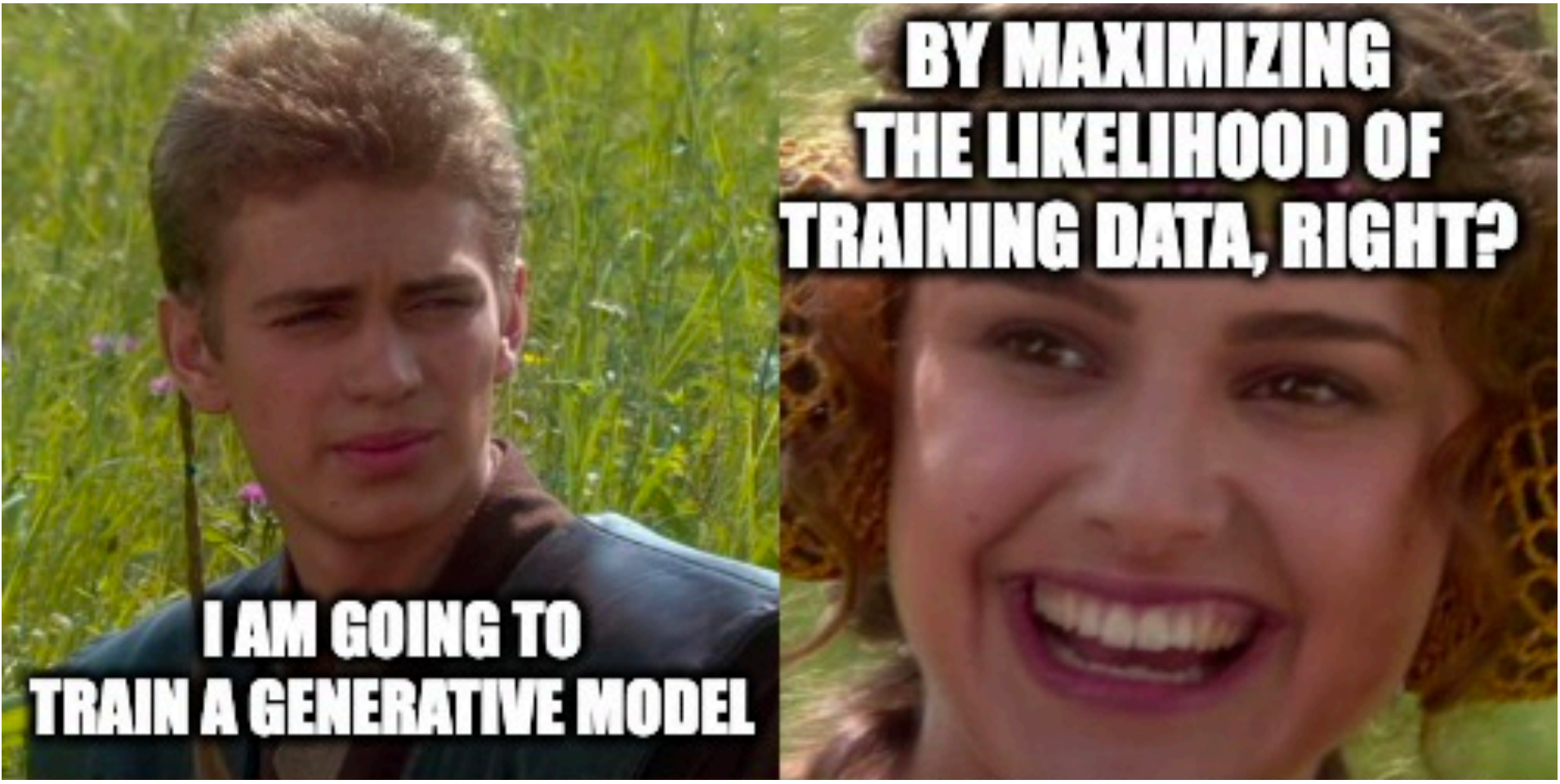
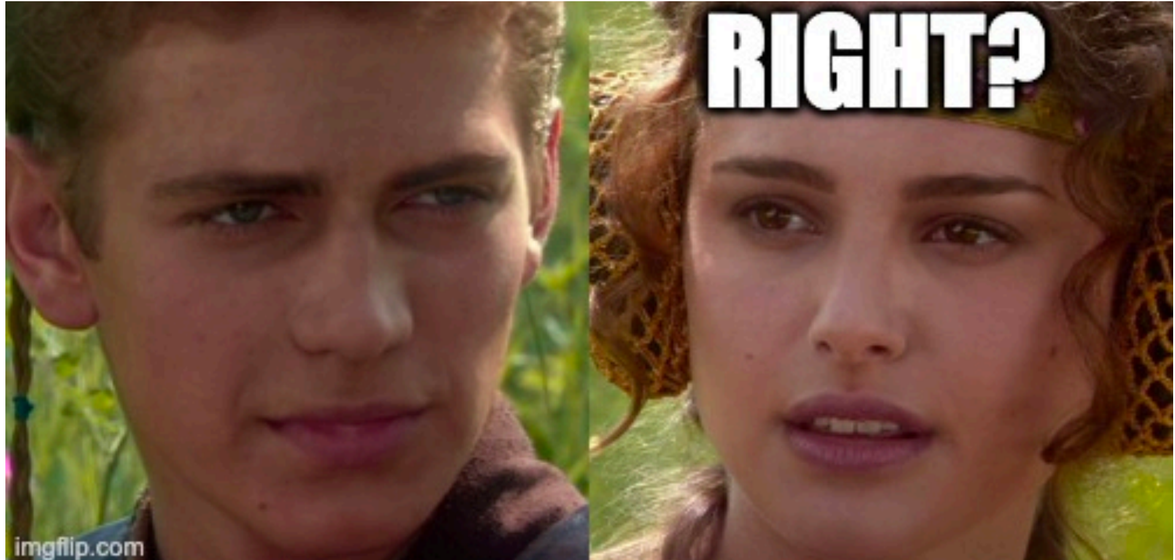

I AM GOING TO
TRAIN A GENERATIVE MODEL
BY MAXIMIZING
THE LIKELIHOOD OF
TRAINING DATA, RIGHT?

Latent-variable modeling

Maximum-likelihood training?

$$
\begin{aligned}
\vartheta^* &= \arg\max_{\vartheta} p_{\vartheta}(x) \\
&= \arg\max_{\vartheta} \int p_{\vartheta}(x \mid z) p(z) \, \mathrm{d}z \\
&= \arg\max_{\vartheta} \left\langle p_{\vartheta}(x \mid z) \right\rangle_{p(z)}
\end{aligned}
$$

Difficult to build a good estimator!



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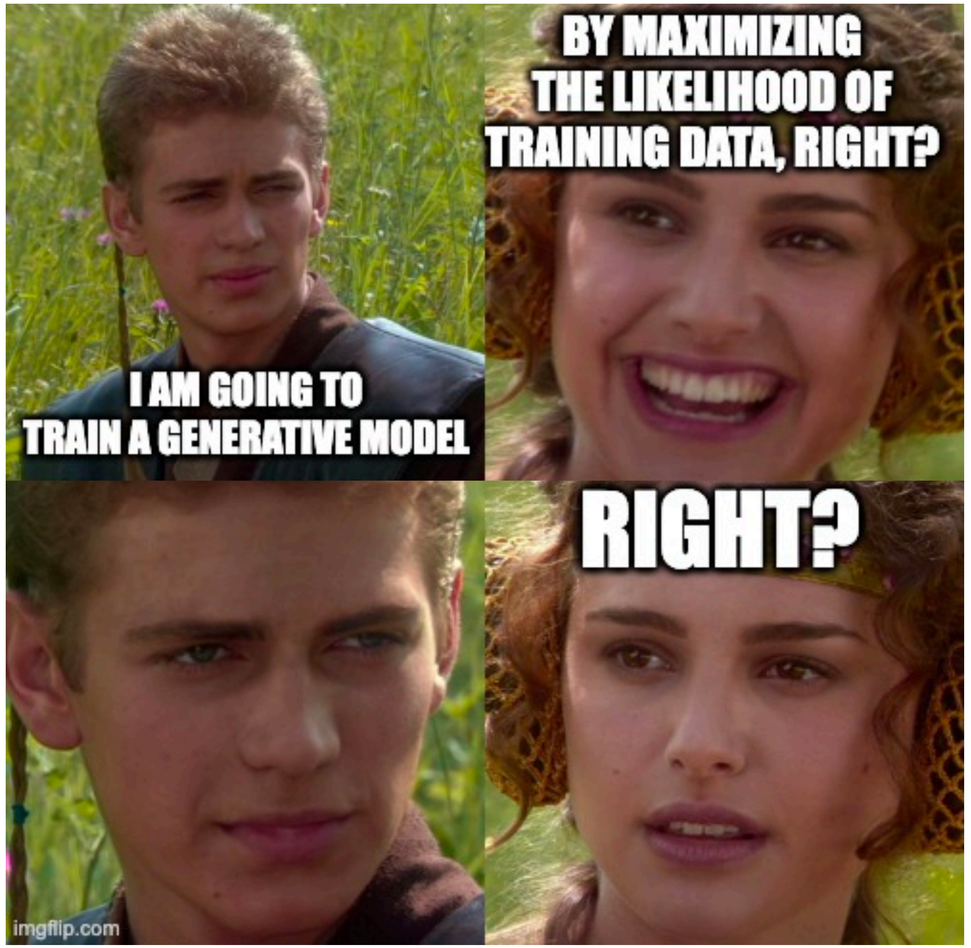

KL-divergence

A measure of similarity between two probability distributions

$$D_{\mathrm{KL}}(Q\|P) = \int_{-\infty}^{\infty} \mathrm{d}x\, q(x)\, \log\left(\frac{q(x)}{p(x)}\right)$$

$$= \left\langle \log \frac{q(x)}{p(x)} \right\rangle_{x\sim q(x)}$$

Formally: *expected excess "surprise" from using P as a model when the actual distribution is Q*