Lecture 28: Variational Inference

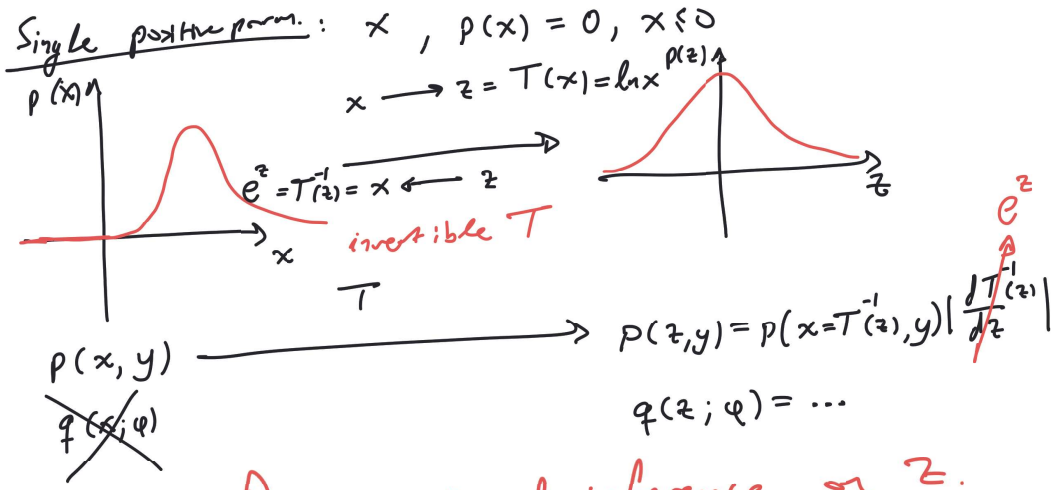
Professor Ilias Bilionis

Enforcing parameter constraints

The Optimization of the ELBO may be Constrained

- Some parameters may be positive.
- Some parameters may be within specific bounds.
- etc.

Automatic transformation of constrained variables



PREDICTIVE SCIENCE LABORATORY

$\mathcal{X} = \text{supp}\, p(x) = \{ x : p(x) > 0 \}$

$T : \mathcal{X} \longrightarrow \mathbb{R}^K$, T 1-1

$z = T(x)$; $x = T^{-1}(z)$

$p(z, y) = p(x = T^{-1}(z), y) \left| \det J_{T^{-1}}(z) \right|$

Jacobian

$$\begin{vmatrix} \frac{\partial T_1^{-1}}{\partial z_1} & \cdots & \frac{\partial T_1^{-1}}{\partial z_K} \\ \vdots & & \\ \frac{\partial T_K^{-1}}{\partial z_1} & \cdots & \frac{\partial T_K^{-1}}{\partial z_K} \end{vmatrix}_z$$