Simple Beamer Class

Sascha Frank

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Overview of Variational Inference

- Turns a complicated inference problems into an optimization problem
- Minimizes the KL divergence from the variational distribution to the posterior distribution
- EM is a special case

Model Image

put fig 2 here
give gloss of variables: relate them to the input/output/nuissance ones Jason defines

Evidence Lower Bound (ELBO)

- Key insight is the use of Jensen's inequaltiy
- We choose q from some family of distributions $\mathcal{Q}$

$$\log(p(x \mid \alpha)) \quad = \quad \log \int p(x, z, \beta \mid \alpha) dz \ d\beta$$

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\begin{aligned}
\log(p(x \mid \alpha)) &= \log \int p(x, z, \beta \mid \alpha) dz \; d\beta \\
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&\geq \mathbb{E}_q \left[\log p(x, z, \beta \mid \alpha) \right] - \mathbb{E}_q \left[q(z, \beta) \right] \\
&= \mathcal{L}(q)
\end{aligned}
$$

Why does maximizes the ELBO minimize the KL-Divergence?

$$
\begin{aligned}
\mathrm{KL}(q(z,\beta)||p(z,\beta|x) &= \mathbb{E}_q\left[\log(q(z,\beta)\right] - \mathbb{E}_q\left[\log p(z,\beta|x)\right] \\
&= \mathbb{E}_q\left[\log(q(z,\beta)\right] - \mathbb{E}_q\left[\log p(z,\beta,x)\right] + \log p(x) \\
&= -\mathcal{L}(q) + const.
\end{aligned}
$$

- Maximizing $\mathcal{L}(q)$ is just minimizing $-\mathcal{L}(q)$

How is EM a special case?

- How do we choose $\mathcal{Q}$?
- We want it to be easily computable!
- What is $p(z, \beta | x) \in \mathcal{Q}$?
- Minimizing the KL divergence is trivial! Set $q(z, \beta) = p(z, beta|x)$

Variational + x, $\forall x$

- Clearly we have some choices...and they have names!

unnumbered lists

- Introduction to LaTeX
- Course 2
- Termpapers and presentations with LaTeX
- Beamer class

lists with pause

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Tables

Date	Instructor	Title
WS 04/05	Sascha Frank	First steps with LaTeX
SS 05	Sascha Frank	LaTeX Course serial

Tables with pause

A	B	C

Tables with pause

A	B	C
1	2	3

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A	B	C

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