Neural Computer

Thesis Subtitle

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Abstract

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Implementing some equations that repreent the Brain as a Dynamical System:
Latent factor $Z->X[TSC]$ Observation
The distribution of x is compatible with the sampled Z
$P(x|z)$ – P of x given z conditional probablity
This is Bayesian
The joint probability of x and z occuring togehter equals the probability of Z and x given z
$P(x,z) = P(z) \cdot P(x|z)$
It is important to note how we can parametrize this probability by leveragin a distribution and rely on the mean field theory.
$P(x) = \frac{1}{\sigma\sqrt{2\pi}}$

Isotropic Gaussian

minimize the KL divergence
$D_{KL}[P(x)||P_\theta(x)] = \sum_{x}^{states} P(x) \cdot \log \frac{P(x)}{P_\theta(x)}$
maximize the expected log probability
$\sum_{x}^{states} P(x) \cdot \log P_\theta(x)$

Important Sampling

Importance sampling is a variance reduction technique that can be used in the Monte Carlo method.
Example using the trees
1) Measure 50-50 from both regions
2) Corect for non-uniform Sampling

Variational Inference

There is a network which is trained to learn the Variational distribution
variational distribution: $Q_\theta(z|x)$
This is also referenced in the Free energy as the recognition model
$P_\theta(x) = \sum_{z} P_\theta(x|z) \frac{P_\theta(z)}{Q_\theta(z|x)} Q_\theta(z|x)$
Sampling Correction $\frac{P_\theta(z)}{Q_\theta(z|x)}$

ELBO - Evidence Lower Bound

In variational Bayesian methods, the evidence lower bound (often abbreviated ELBO, also sometimes called the variational lower bound[1] or negative variational free energy) is a useful lower bound on the log-likelihood of some observed data.