

Neural Computer

Thesis Subtitle

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Abstract

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Implementing some equations that represent the Brain as a Dynamical System:

Latent factor $Z \rightarrow X[TSO]$ Observation

The distribution of x is compatible with the sampled Z

$P(x|z)$ – P of x given z conditional probability

This is Bayesian

The joint probability of x and z occurring together 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 leveraging 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

$$\sum_x^{states} P(x) \cdot \log P_{\theta}(x)$$

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 $\frac{P_{\theta}(z)}{Q_{\theta}(z|x)}$