snakes

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Abstract

snakes

1 Inference for Snakes

The likelihood is formula (17.3)

$$Pr(\mathbf{x}|\mathbf{W}) \propto \prod_{n=1}^{N} \exp\left[-(\text{dist}[\mathbf{x}, \mathbf{w}_n])^2\right] \tag{1}$$

The prior is formula (17.4)

$$Pr(\mathbf{W}) \propto \prod_{n=1}^{N} \exp\left[\alpha\text{space}[\mathbf{w}, n] + \beta\text{curve}[\mathbf{w}, n]\right] \tag{2}$$

The inference is

$$\arg\max_{\mathbf{W}}[Pr(\mathbf{W}|\mathbf{x})] = \arg\max_{\mathbf{W}}[Pr(\mathbf{x}|\mathbf{W})Pr(\mathbf{W})] \tag{3}$$

Since log is monotone I can write

$$\begin{aligned}
\arg\max_{\mathbf{W}}[Pr(\mathbf{W}|\mathbf{x})] &= \arg\max_{\mathbf{W}}[\log[Pr(\mathbf{W}|\mathbf{x})]] \\
&= \arg\max_{\mathbf{W}}[\log[Pr(\mathbf{x}|\mathbf{W})Pr(\mathbf{W})]] \\
&= \arg\max_{\mathbf{W}}[\log[Pr(\mathbf{x}|\mathbf{W})] + \log[Pr(\mathbf{W})]]
\end{aligned} \tag{4}$$

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And so for what regard the likelihood I can write:

$$\log\left[Pr(\mathbf{x}|\mathbf{W})\right] \propto \log\left[\prod_{n=1}^{N} \exp\left[-(\text{dist}[\mathbf{x}, \mathbf{w}_n])^2\right]\right]$$

$$= \sum_{n=1}^{N} \log\left[\exp\left[-(\text{dist}[\mathbf{x}, \mathbf{w}_n])^2\right]\right] \tag{5}$$

$$= \sum_{n=1}^{N} -(\text{dist}[\mathbf{x}, \mathbf{w}_n])^2$$

And for what regard the prior I can write:

$$\log\left[Pr(\mathbf{W})\right] \propto \log\left[\prod_{n=1}^{N} \exp\left[\alpha\text{space}[\mathbf{w}, n] + \beta\text{curve}[\mathbf{w}, n]\right]\right]$$

$$= \sum_{n=1}^{N} \log\left[\exp\left[\alpha\text{space}[\mathbf{w}, n] + \beta\text{curve}[\mathbf{w}, n]\right]\right] \tag{6}$$

$$= \sum_{n=1}^{N} \alpha\text{space}[\mathbf{w}, n] + \beta\text{curve}[\mathbf{w}, n]$$

And finally

$$\arg\max_{\mathbf{W}}[\log\left[Pr(\mathbf{W}|\mathbf{x})\right]] = \arg\max_{\mathbf{W}}\left[\sum_{n=1}^{N} -(\text{dist}[\mathbf{x}, \mathbf{w}_n])^2 + \alpha\text{space}[\mathbf{w}, n] + \beta\text{curve}[\mathbf{w}, n]\right] \tag{7}$$