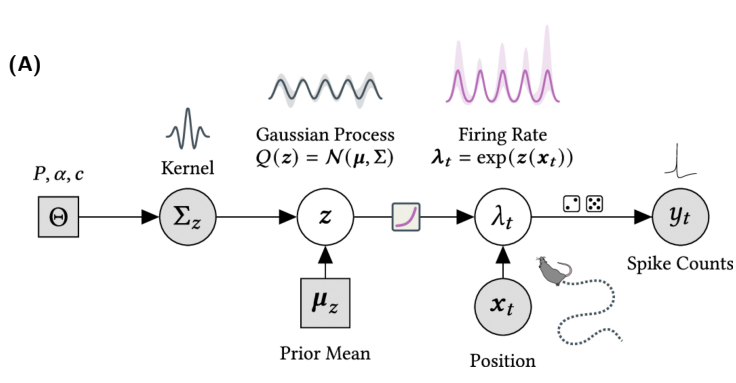
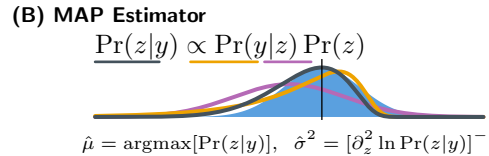
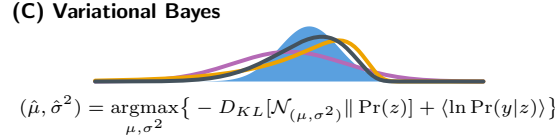
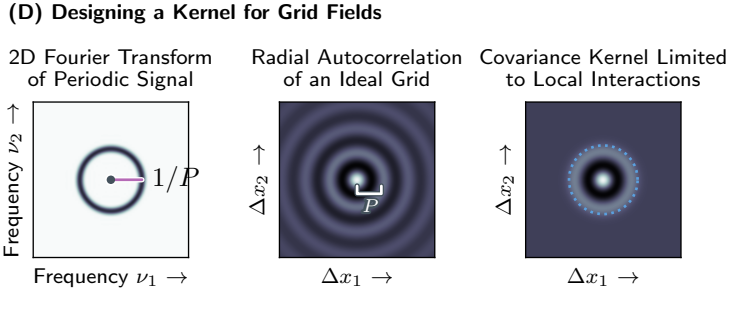
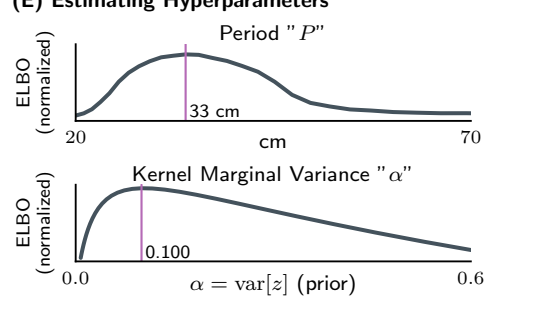

(A)
Gaussian Process
$Q(z) = \mathcal{N}(\mu, \Sigma)$
Firing Rate
$\lambda_t = \exp(z(x_t))$
Kernel
P, α, c
Θ
Σ_z
z
λ_t
y_t
Spike Counts
μ_z
Prior Mean
x_t
Position


(B) MAP Estimator
$\Pr(z|y) \propto \Pr(y|z)\Pr(z)$
$\hat{\mu} = \underset{z}{\operatorname{argmax}}[\Pr(z|y)], \quad \hat{\sigma}^2 = [\partial_z^2 \ln \Pr(z|y)]^{-1}$


(C) Variational Bayes
$(\hat{\mu}, \hat{\sigma}^2) = \underset{\mu,\sigma^2}{\operatorname{argmax}}\{ - D_{KL}[\mathcal{N}_{(\mu,\sigma^2)} \| \Pr(z)] + \langle \ln \Pr(y|z) \rangle \}$


(D) Designing a Kernel for Grid Fields
2D Fourier Transform of Periodic Signal
Radial Autocorrelation of an Ideal Grid
Covariance Kernel Limited to Local Interactions
Frequency $\nu_2 \rightarrow$
$1/P$
Frequency $\nu_1 \rightarrow$
$\Delta x_2 \rightarrow$
P
$\Delta x_1 \rightarrow$
$\Delta x_2 \rightarrow$
$\Delta x_1 \rightarrow$


(E) Estimating Hyperparameters
Period "P"
ELBO (normalized)
33 cm
20
cm
70
Kernel Marginal Variance "α"
ELBO (normalized)
0.100
0.0
$\alpha = \mathrm{var}[z]$ (prior)
0.6