4F13 Probabilistic Machine Learning - Gaussian Processes

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Abstract

1 Introduction

2 Questions

2.a Squared Exponential Covariance Function

We start with a simple squared exponential (SE) covariance function. As we start by working in one dimension this is necessarily isotropic. The covariance function is given by:

$$k(x, x') = \nu^2 \exp\left\{-\frac{(x - x')^2}{2l^2}\right\} \tag{1}$$

The hyperparameters are ν and l which control the baseline variance level and length scale of variation respectively. We load in the training data from *'cw1a.mat'* and train a GP model, with zero mean and covariance function given by equation 1. We train the model by minimising the negative log marginal likelihood. The hyperparameters are trained as follows:

$$\log \nu : -1 \mapsto -2.0540 \tag{2}$$

$$\log l : \quad 0 \mapsto -0.1087 \tag{3}$$

2.b Hyperparameter Initialisation

2.c Periodic Covariance Function

2.d Cholesky Decomposition

2.e Model Comparison