

Information Criterion

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Introduction

In this slides, we are going to introduce the following concept.

- ▶ Laplace approximation
- ▶ BIC
- ▶ AIC

Laplace Approximation I

The idea of Laplace Approximation is use a Gaussian distribution to approximate a distribution.

$$p(z) = \frac{f(z)}{\int_z f(z)dz}$$

First we find the mode z_0 of the distribution

$$\left. \frac{df(z)}{dz} \right|_{z=z_0} = 0$$

Then we evaluate the Hessian matrix A at $z = z_0$,

$$A = -\nabla^2 \ln f(z) \Big|_{z=z_0}$$

Then we approximate the function as

$$\ln f(z) \approx \ln f(z_0) - \frac{1}{2}(z - z_0)^\top A(z - z_0)$$

Laplace Approximation II

Remark of Laplace's approximation

In context of model comparison, we are given a data set \mathcal{D} , and a set of models \mathcal{M}_i . We are interested in computing the model evidence,

$$p(\mathcal{D}|\mathcal{M}_i) = \int p(\mathcal{D}|\theta, \mathcal{M}_i)p(\theta|\mathcal{M}_i)d\theta$$