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ABSTRACT

Abstract.
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1. LIKELIHOOD FUNCTION

Define the distribution function, $f(\mathbf{x})$ for n particles, as

$$f(\mathbf{x}) = \frac{1}{n}\sum_i K\left(\mathbf{x} - \mathbf{x}_i\right) \tag{1}$$

where the kernel is,

$$K(\mathbf{x}) = (2\pi)^{-d/2}\, e^{-\frac{1}{2}\mathbf{x}^T\mathbf{H}^{-1}\mathbf{x}} \tag{2}$$

where the covariance matrix is, e.g

$$H_{ij} = \sigma_i \delta_{ij} \tag{3}$$

We calculate a time-averaged distribution function, $\langle f\rangle = \int \frac{dt}{T} f(\mathbf{x}, t)$. Numerically we evaluate this as,

$$\langle f\rangle = \frac{1}{N}\sum_n f^n(\mathbf{x}) = \frac{1}{Nn}\sum_n\sum_i K(\mathbf{x} - \mathbf{x}_i^n) \tag{4}$$

We define the likelihood as the joint probability of drawing m points from $\langle f\rangle$.

$$\mathcal{L} = \prod_j \langle f\rangle(\mathbf{x}_j) \tag{5}$$

with the log-likelihood being,

$$\ln\mathcal{L} = \sum_j \ln\left(\langle f\rangle(\mathbf{x}_j)\right) = \sum_j \ln\left(\frac{1}{Nn}\sum_n\sum_i K(\mathbf{x_j} - \mathbf{x}_i^n)\right) \tag{6}$$

Regions of low probability correspond to regions of low phase space density.