

Introduction

- We have seen how to estimate a probability density function \hat{f} from a set of observations $\{x_i\}$.
- Knowing the p.d.f. f (or its estimate \hat{f}) how can we generate some observations ?

Resampling from a set of observations

Examples:

- jackknife samples
- Bootstrap samples

Random number

Read <http://www.mathworks.com/moler/random.pdf>

Inversion method I

Definition (Sampling via inversion of the cdf)

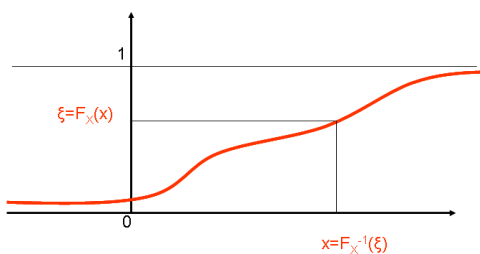
Assume X a r.v. with probability density function $f_X(x)$ and **cumulative density function**

$$F_X(x) = P(X \leq x) = \int_{-\infty}^x f_X(t) dt$$

- 1 Sample a random number ξ uniformly in $[0;1]$
- 2 Find x such that $F_X(x) = \xi$

Several routines are available to generate uniformly distributed pseudo-random numbers (see the command `rand` in Matlab for instance).

Inversion method II



Inversion method III

Exercise. Consider the Laplace density function:

$$f(x|\mu, b) = \frac{1}{2b} \exp\left(-\frac{|x - \mu|}{b}\right)$$

- 1 Compute the cumulative p. d. f. $F(x)$
- 2 Compute the inverse cumulative p. d. f. $F^{-1}(x)$
- 3 Propose a method to generate samples of the laplace distribution.