

Statistical Methods in Particle Physics

Quiz on chapter 4: Monte Carlo Methods

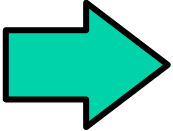
**Prof. Dr. Klaus Reygers (lectures)
Dr. Sebastian Neubert (tutorials)**

**Heidelberg University
WS 2017/18**

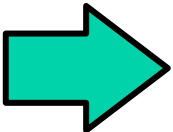
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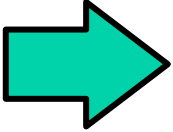
The name "Monte Carlo method" refers to

1. the inventor Carlo Montego
2. a conference which took place in Monte Carlo
-  3. the Monte Carlo Casino in Monaco
4. to the formula one race in Monte Carlo

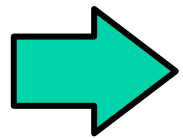
Random numbers generated on a Computer are called pseudo-random numbers because

1. of the limited precision of floating point numbers
-  2. they result from deterministic algorithms
3. they are only generated in the interval $[0,1]$
4. they are taken from big look-up tables obtained from throwing real dice

In the inverse transform method to get random numbers from a distribution $f(x)$ one needs to calculate the inverse of

1. $f(x)$
2. $1/f(x)$
3. the first derivative of $f(x)$
-  4. the CDF of $f(x)$

Let r be a random variable uniformly distributed in $[0, 1]$. To draw random numbers from the PDF $f(x) = 2x$ one can transform r as



1. \sqrt{r}

2. r^2

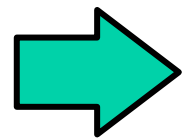
3. $\ln r$

4. r^4

To obtain random points uniformly distributed on the surface of a sphere one needs to uniformly distribute

1. ϕ and θ

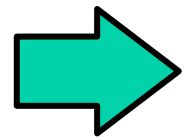
2. $\sin \phi$ and θ



3. ϕ and $\cos \theta$

4. ϕ^2 and θ

Monte Carlo integration outperforms other numerical methods
in case of



1. multi-dimensional integrals
2. Gaussian integrals
3. positive integrands
4. periodic integrands