Mini-Workshop C1

From Random Walks to Particle Physics

organized by: Stefan Foerste, Carsten Urbach

Sun, 9:30 - 12:00

This workshop consists of two parts, one introductory talk and one hands-on session. In the talk I will give an introduction to Monte-Carlo methods and their application in statistical and particle physics. Special emphasis will be on the fascinating result that a random walk in a huge space of states can be used to solve otherwise analytically not solvable problems.

The physics background for this introduction is given by the standard model of particle physics and in particular Quantum Chromodynamics (QCD). QCD is strongly coupled at low energies and can hence not be studied using perturbation theory. An adequate non-perturbative tool is provided by Monte-Carlo methods. But QCD is not the only interesting application: in statistical physics Monte-Carlo methods find many applications starting with simple spin-systems like the Ising model. And also beyond the standard model in explaining the symmetry breaking in the electro-weak part a strongly coupled theory might need to be solved, of course depending on the experimental evidence as found at LHC.

The second part gives then the possibility for the participants to perform some simulations by themselfes. For this a simple code will be provided, which requires only little programming to simulate a simple quantum field theory (most probably ϕ^4 theory). Afterwards results can be produced and visualised by every participant individually.

Requirements for participation: Every participant should have a laptop available on which she or he can compile and run the sample code that will be provided. For this also a standard C-compiler is required. Alternatively, participants can use their laptops to log onto remotely a linux box for instance in the CIP pools at their departments. (Under Windows you may want to install Bloodshed Dev-C++ from `http://www.bloodshed.net/devcpp.html` before the workshop)