
LIST OF RESEARCH PROJECTS

1990-1992: Diploma thesis, Johann Wolfgang Goethe University, Frankfurt, Germany

Particle production in peripheral heavy-ion collisions.

Monte Carlo FORTRAN 77 code, implemented under MVS on IBM 3090/VF.

1992-1997: Doctoral thesis, Johann Wolfgang Goethe University, Frankfurt, Germany

Modern numerical methods in lattice gauge theory.

High-performance simulations performed on a APE 100 single-instruction multiple-data custom-designed supercomputer. Adapted simulation code in the TAO custom programming language. Wrote a C++ post-simulation analysis (10,000 LOC) code to extract observable quantities for publication. Also wrote smaller C++ simulation code including a wavelet transform library for exploratory research. Responsible for management of computer cluster and relations to super-computing centers.

1998: Research scientist, Konrad Zuse Zentrum (ZIB), Berlin, Germany

Contributed to the Amira visualization environment (>200,000 LOC total size, pure C++). Responsible for implementing molecular dynamics visualization component. Designed advanced data storage format library. Performed research on clustering algorithms for analyzing molecular dynamics trajectories using spectral clustering and multidimensional scaling.

1999-2000: Postdoctoral Scientist, John von Neumann Institute for Computing, Jülich, Germany

Evaluated DEC Alpha architecture for high-performance cluster computing in lattice gauge theory. Devised cache-aware algorithm for critical kernels in the simulation. Researched multigrid algorithms for stochastic linear operators. Responsible for operation of DEC Alpha/Myrinet 12-processor cluster computer prototype.

2001-2002: Postdoctoral Fellow, MIT Center for Theoretical Physics, Cambridge, Mass.

Wrote C++ simulation code to investigate and visualize topological objects in various lattice gauge theories. Worked in group designing software for QCDOC lattice supercomputer.

2003-2004: Postdoctoral scientist, Bioinformatics group, Ludwig Maximilians University, Munich, Germany

Researched machine-learning algorithms for analyzing gene expression data, protein-interaction networks, and predicting protein function from networks. Implemented algorithms both in Java and C++.

2005-: Research Scientist, Max Planck Institute of Biochemistry, Munich, Germany

Responsible for image processing research applied to cryo-electron tomography. Introduced Python/C++ platform and implemented large image processing package. Designed algorithms for image classification and 3D tomographic reconstruction. Responsible for management of small research group (2-3 students, technical assistant) and operation of computing facility (workstations, SGI Prism 24-processor supercomputer).