

Curriculum vitae

Dr. rer. nat. Frank Löffler

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Professional Preparation

Center for Computation & Technology, Louisiana State University	Physics	Postdoc, 2007 – 2011
SISSA, Italy	Physics	Postdoc 2005 – 2007
Albert–Einstein–Institut, Germany	Physics	PhD 2005
Friedrich–Schiller–University Jena, Germany	Physics	Diplom (Master) 2001
Chemnitz University of Technology, Germany	Physics	Vordiplom 1998

Appointments

Center for Computation & Technology, Louisiana State University	IT Consultant	since 2011
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Fellowships

VESF/EGO Postdoc Fellowship	2005 – 2007
Graduate Fellowship of The German National Merit Foundation	1998 – 2001

Scientific Interests

- Efficient computational infrastructure for Petascale computing, e.g. research in parallelization techniques of different numerical methods, or the possibility of using graphics processors for HPC
- Numerical methods, including – but not limited to – adaptive mesh refinement, Monte-Carlo particle radiation codes, spectral solvers and discontinuous Galerkin methods
- Application of above techniques to science problems, e.g. research in binary systems of compact objects and their connection to Gamma Ray Bursts, or storm surge models in connection with hurricane forecasts.

Key Scientific Achievements

- Examined the head-on collision of neutron star - black hole systems in full General Relativity, including the first calculations of the gravitational waveforms of such systems
- Examined the collapse of rotating neutron stars and stellar iron cores in 3D, including the first calculations of the gravitational waveforms of such systems
- Leading the Einstein Toolkit, a large international community project with the aim to provide the core computational tools for simulating and analyzing general relativistic astrophysical systems.

Synergistic Activities

I am currently working as IT consultant at the Center for Computation and Technology at Louisiana State University, to perform research in numerical relativity, and to develop computational infrastructure for the *Cactus* computational toolkit, supporting the relativity research.

I am a core developer of the *Cactus* computational toolkit, which is spanning research in especially high-performance computer science, astrophysics and computational fluid dynamics. It provides computer scientists an ideal platform to perform state-of-the-art research which is directly benefiting research in other areas of science.

My research using the *Cactus* computational toolkit includes research of algorithms for massively parallel adaptive mesh refinement and parallel I/O, coupling *Cactus* simulations with Web 2.0 technologies, large-scale problem solving using automatic code generation and distributed visualization.

I am one of the authors of the general relativistic hydrodynamics code *Whisky*. I have been responsible for the releases of the public version of *Whisky* which I integrated into the Einstein Toolkit and guided its further extension.

I am leading the Einstein Toolkit, which provides a complete, open-source, production-level infrastructure for general relativistic hydrodynamics, building upon the *Cactus* computational toolkit. It currently has 77 members from 36 research groups world-wide.

I am involved in training of graduate students of both physics and software engineering to develop an implementation of a variational Monte-Carlo code for solid state physics on GPUs. In addition I am helping to develop an efficient parallel code to evolve the shallow water and Boussinesq equations to e.g. simulate the disappearance of lake Peigneur due to a drilling accident.

Within the *XiRel* project I did extensive benchmarks of the *Cactus*/*Carpet*/*Whisky* code combination, especially I/O benchmarks on LONI and TeraGrid machines.

My practical computer science skills include a large set of programming languages, especially C, C++ and Fortran, but also Perl and Python, to name only the most important for my current work. I am an expert for HPC software development and usage, and I am very familiar with software debugging, profiling and tuning.

I am also working on research on merging neutron star - black hole binaries, within a collaboration with Georgia Institute of Technology and Rochester Institute of Technology, sponsored by the National Science Foundation (NSF) grant *CIGR*. The topic of another collaboration with groups at California Institute of Technology and Princeton University is research of core-collapse supernovae, and on the development of a Monte-Carlo neutrino radiation code within the NSF PetaCactus project.

I have reviewed publications for the following journals and conferences: Classical and Quantum Gravity, the 12th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid 2012), the International Conference on High Performance Computing (HiPC'11) and the International Conference for High Performance Computing, Networking, Storage and Analysis (SC12).

I have experience in teaching at undergraduate and graduate level, including designing and teaching a new graduate course "Scientific Computing" at LSU, and several invited lectures at the APCTP International School on Numerical Relativity and Gravitational Waves in South Korea. I held several tutorials at conferences and training series. I co-supervised several undergraduate and graduate computer science and physics students.

I organized the third *Whisky* retreat, and the third Einstein Toolkit workshop, meetings of the respective software developers.

Collaborators & Other Affiliations

Collaborators

E. Abdikamalov (LSU/Caltech), G. Allen (LSU/NSF), M. Ansorg (FSU Jena), L. Baiotti (Kyoto), W. Benger (LSU), E. Bentivegna (AEI), S. R. Brandt (LSU), A. Burrows (Princeton), M. Campanelli (RIT), E. O'Connor (Caltech), P. Diener (LSU), J. Faber (RIT), T. Goodale, R. Haas (Caltech), J. Hansen (KISTI), I. Hawke (Southampton), S. H. Hawley (Nashville), I. Hinder (AEI), A. Hutanu (LSU/Google), S. Jha (Rutgers), P. Kalmus (Caltech), Y. El Khamra (UT Austin), O. Korobkin (LSU), P. Laguna (GaTech), C. Lousto (RIT), P. Mösta (AEI), B. Mundim (RIT), C. D. Ott (Caltech), D. Pollney (UIB), T. Radke, C. Reisswig (Caltech), L. Rezzolla (AEI), S. Rosswog (Bremen), E. Schnetter (LSU/PI), E. Seidel (LSU/NSF), E. L. Seidel (New York), N. Stergioulas (Thessaloniki), J. Tao (LSU), M. Thomas (LSU), J. Thornburg, J. Tohline (LSU), A. Yates (LSU), A. Zebrowski (Rutgers), Y. Zlochover (RIT)

Advisors and Sponsors

G. Allen (LSU), P. Diener (LSU), L. Rezzolla (AEI), E. Schnetter (LSU), E. Seidel (LSU/NSF)