Helmut Wahanik

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Summary

Scientific Computing Developer with 14 years of experience. Core algorithm contributor to a top-ranked LP and MIP solver. Expertise in combinatorial optimization, numerical computing, computational geometry, and computational physics. Proven track record implementing performance-critical algorithms including the Fast Multi-Pole Method for 3D elastostatics and large-scale inverse tomography applications.

In previous appointments worked with prestigious research groups at Huawei, Rocscience Inc, University of Calgary, Schlumberger Research at University of Cambridge, and TU-Delft.

Obtained PhD and MSc degrees in Applied Mathematics at IMPA, Rio de Janeiro-Brazil.

Projects and Research

- Coding of Combinatorial Optimization and Linear Programming algorithms for a world-class optimization solver in C++ (https://plato.asu.edu/ftp/milp.html)
- Coding of High Performance Sparse Linear Algebra Solver, used in Huawei's software SDKs.
- Coding of the Fast Multipole Method: O(N) GMRES iterative algorithm for 3D elastostatic (calculates rock stress in excavations), for Rocscience Inc.
- Coding of the Winding Number algorithm for Computational Geometry, for Rocscience Inc.
- Coder of Parallel Seismic Tomography algorithms: MPI-based Bayesian MCMC tomography algorithms for image reconstruction.
- Hyperbolic Conservation Laws PhD research for computational fluid dynamics in porous media flow.

Technical Skills

- Programming Languages: C++, C#, MATLAB, Python,
- Optimization: Gurobi, CPLEX, LP, MIP, MINLP.
- Development Tools: Linux, Git, Unit Testing, .NET., VSCode, Gdb, Rubberband, Jenkins.
- Specialized Areas: Scientific Computing, Linear and Combinatorial Optimization, Applied PDEs, Comp. Physics, Computational Geometry.

Experience

Principal Research Engineer — *Vancouver, BC*
Huawei — *Nov 2022 – Sept 2025*

- Development of the numerical optimization solver OptVerse, one of the highest ranked commercial optimization solver in Hans Mittelmann's Benchmarks (https://plato.asu.edu/ftp/milp.html).
- Member of international research and development team located in Beijing, Minsk, Munich, Shenzhen, and Vancouver.
- Core developer for the MIQP and MIQCP solver, Sparse Linear Algebra Solver (Direct Sparse Methods), Quadratic Programming Barrier solver, Presolve techniques for LP Solver.

Applied Mathematician, Software Developer — *Toronto, ON*
Rocscience — *Oct 2019 - Nov 2022*

- Developed high-performance C++ algorithms for 3D elastostatics, deployed in commercial software used by many engineering firms worldwide.
- Implemented Fast Multipole Method for achieving a 10x speedup for large-scale boundary element problems for 3D elastostatics, published in 2 peer-reviewed conferences.
- Research and implementation of the Winding Number algorithm for determination of the side-ness of a meshed surface.
- Supervised 4 interns from the University of Toronto and the University of Waterloo.

Quantitative Developer - Contract *Victoria, BC*
Raymond James *Jun 2018 - Dec 2018*

- Short contract for writing custom Black-Scholes Python / Excel option pricing calculator.

Software Developer *Waterloo, ON*
Waterloo Hydrogeologic *Jun 2016 - Sep 2019*

- Development of industry-leading scientific computing platform for groundwater flow simulations, based on large C# and .NET architecture.

Research Scientist *Rio de Janeiro, Brazil*
Schlumberger *Mar 2011 - May 2015*

- Seismic tomography collaboration with Schlumberger Research at the University of Cambridge-UK.
- Application of parallel processing techniques in Fortran 90 and MPI.
- Author of a statistics reliability study for deepwater wells in the Gulf of México, study in characterization of Carbonates Rock lab samples, and numerical modeling of well fluids jointly with Schlumberger Moscow Research.
- Delivered business intelligence solutions for the creation of game-theory-inspired winning strategies for bidding contracts valued above 200 million USD.

Teaching assistant *Rio de Janeiro, Brazil*
IMPA *Feb 2007 - Aug 2011*

- TA for graduate math courses in fluid dynamics.

Teaching Assistant and Lecturer *Bogotá - Colombia*
Universidad de los Andes *Jan 2001 - Mar 2004*

- **Courses:** Statistics for the Social Sciences, Linear Algebra, Calculus I, Probability.

Education

University of Calgary *Sep 2015 – May 2016*
Postdoctoral Fellowship in Computer Science

- Surface meshing: Computational Geometry PostDoc at the Geo-innovation research group at Aramco Research Center, Houston, Texas, USA.

Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro *Feb 2007 – Aug 2011*
PhD in Mathematics

- Thesis work on hyperbolic conservation laws of continuum physics.
- Numerical computing in C++, Matlab, Linux.
- PhD examinations in Partial Differential Equations, Fluid Dynamics, and Functional Analysis.
- Collaboration work with TUDelft-The Netherlands.
- IMPA is internationally recognized for hosting the first Fields' Medal winner of all Latin America. IMPA also hosted the International Conference for Mathematicians in 2018.
- Link www.impa.br From a compound in the Brazilian hills excellence in math emerges

University of Bristol, UK *Sep 2006 – Feb 2007*
Scientific Computing Advanced Training

- EU travel grant for young scientists.
- Focus in scientific computing and numerical methods for fluid dynamics.

Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro *Jan 2005 – Sep 2006*
MSc in Mathematics

- Graduate coursework in applied mathematics.
- Applied PDEs, Fluid Dynamics, Numerical Linear Algebra, Numerical Analysis.

Universidad de los Andes *Jan 1999 – Mar 2004*
BSc in Mathematics

Awards

Instituto de Matemática Pura e Aplicada (IMPA), *Full graduate MSc and PhD scholarships.*

Universidad de los Andes, *Henry Yerly Scholarship of Excellence.*

Publications

Please find a list of publications and talks at: https://github.com/hwahanik