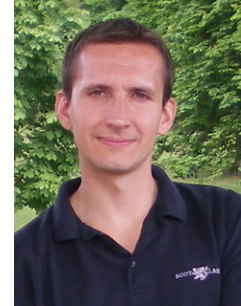


# Curriculum Vitae

**Name:** Grigori Fursin, Ph.D.  
**Current job:** Tenured Research Scientist at INRIA Saclay, France  
**Address:** INRIA Saclay, ZAC des Vignes,  
3 rue Jean Rostand, 91893, Orsay, France  
**E-mail** [grigori.fursin@inria.fr](mailto:grigori.fursin@inria.fr)  
**Website:** <http://fursin.net/research>  
**Birthday:** 1977/07  
**Languages:** English, Russian, French (beginner)



## Summary

My research goal since 1999 is to automate compiler and architecture design and program optimization to overcome the complexity of emerging and future computing systems (heterogeneous multi-core architectures, compilers, operating systems and programming environments) and reduce their cost and time to market. I am developing smart self-tuning adaptive systems capable to improve performance, power consumption, size and fault-tolerance entirely automatically based on machine learning, artificial intelligence, statistical methods and biologically inspired techniques. I believe that this is critical to be able to continue innovation in science and industry (bioinformatics, medicine, physics, chemistry, finances, gaming, etc). Similar ideas started appearing in EU and US research visions recently.

In my spare time, I enjoy thinking about emerging technologies and innovative intelligent systems in IT, AI, biotechnology and other areas, and interested in the knowledge transfer, consulting and startups. In my leisure time, I enjoy traveling, playing football, learning new languages, learning to play guitar and participating in community activities. More information about my research activities is available at <http://fursin.net/research>.

### Current job and education:

- 2007 - current: Tenured research scientist and UNIDAPT Group leader (<http://unidapt.org>) at INRIA Saclay, France
- 2005 - 2007: Postdoctoral researcher at INRIA Futurs, France
- 1999 - 2004: Ph.D. from the University of Edinburgh, UK
- 1993 - 1999: B.S & M.S. from MIPT, Russia

### Recent professional activities:

- GROW'10 Co-chair
- SMART'10 Co-organizer
- ICPADS'09 PC member (multi-core architectures track)
- iWART'09 PC member
- SMART'09,08,07 Organizer and PC member
- GROW'09 PC member
- IPDPS'08 PC member
- CASES'07 PC member
- HiPEAC GCC Tutorial'07 organizer

### Recent collaborations:

- IBM, ARC, CAPS Enterprise, STMicro, NXP, Thales, ARM
- University of Edinburgh (UK), Imperial College (UK), UPC (Spain), ICT (China), UIUC (USA), Ghent University (Belgium)

### Recent teaching activities:

- 2008/2009: M2R Course organizer (Future Computing Systems) at LRI, Paris South University, France and teaching part of the course on adaptive self-tuning systems.

### Current research developments:

- Collective Tuning Center (<http://ctuning.org>) to develop collaborative R&D tools with open API and Collective Optimization Database to enable sharing of optimization knowledge from multiple users and automate program optimization, compiler design and architecture tuning based on statistical and machine learning techniques.

## Objectives

Current innovations in science and industry demand ever-increasing computing resources while placing strict requirements on system performance, power consumption, size, response, reliability, portability and design time. Both embedded and large-scale systems tend to evolve toward complex heterogeneous multi-chip systems with dramatically increased design, test and optimization time. Optimizing compilers play a key role in producing executable codes quickly and automatically while satisfying all the above requirements for a broad range of programs and architectures. However, for many years, state-of-the-art compilers fail to deliver satisfactory levels of performance on new systems due to necessarily simplistic hardware models, fixed and black-box optimization heuristics, inability to tune application at fine-grain level, highly dynamic behavior of the system and inability to adapt to varying program and system behavior at run time with low overhead. This suggests that current system design and program optimization technologies are reaching their limits and should be revisited to keep pace with rapidly evolving hardware.

During my Ph.D. at the University of Edinburgh (1999-2004), I had been working with Prof. Michael O'Boyle to introduce *iterative compilation* at a *fine-grain level* (function, loop or instruction) to automatically find best optimization settings for *large applications* (rather than kernels) on rapidly evolving architectures that beat state-of-the art optimizing compilers.

I had also been working with Prof. Olivier Temam to develop a *fast and accurate technique to determine lower bound of the execution time* of memory intensive applications by replacing all array accesses with scalars to have a stopping criterion for iterative compilation.

In 2004-2005, we developed a new concept to *enable continuous run-time optimization and adaptation for statically compiled programs* and to *speed up iterative compilation* by 3 orders of magnitude using a *run-time low-overhead program phase detection scheme and function versioning*. At the same time, I started developing an *Interactive Compilation Interface (ICI)* for Open64/PathScale compilers and GCC to covert production compilers into interactive research toolsets and enable research on *self-tuning intelligent compilers and systems*. We participated in many discussions to add plugin system to GCC and finally after nearly 5 years similar plugin system is included in GCC 4.5. We plan to provide various optimization plugins to select fine-grain optimizations and their parameters using machine learning within Google Summer of Code'09.

We also developed a novel technique to *characterize programs or architectures* using *program reaction to optimizations* (transformations). I had been collaborating with my colleagues from the University of Edinburgh, UK to *introduce this technique as well as statistical search and machine learning* to enable *optimization knowledge reuse* among different programs and architectures using static and dynamic program and architecture features.

Since 2004, I have been developing a new concept to enable transparent statistical collective optimization of computing systems leveraging experience of multiple users. Based on this research, I created a community-driven Collective Tuning Center (<http://ctuning.org>) to enable sharing of optimization knowledge among multiple users and development of common R&D tools with open APIs to automate program optimization, compiler design and architecture tuning using empirical, statistical and machine learning techniques. I am steering the development of Collective Optimization Database to share optimization cases from the

## Objectives

community, Interactive Compilation Interface (event-driven plugin system) to “open up” production compilers and transform them into interactive research toolsets, Continuous Collective Compilation Framework to automate and distribute iterative compilation, Collective Benchmark with multiple datasets to enable realistic research on iterative compilation and run-time adaptation, UNIDAPT framework to enable self-tuning adaptive programs and MILEPOST GCC to predict good optimizations based on program features using machine learning. Collective optimization tools and techniques have been included in the EU HiPEAC 2012-2020 research roadmap.

I currently hold tenured research scientist position at INRIA Saclay, France and use my research results in several EU-funded and international projects (HiPEAC, MilePost, SARC, GGCC and others) to move towards my *long-term goal to develop and generalize automatic continuous program optimization and parallelization techniques and architecture design exploration using innovative search methods, adaptation, machine learning and knowledge reuse*. This should enable *realistic intelligent self-tuning systems*, particularly in the presence of *rapidly evolving multi-core heterogeneous architectures*.

I am developing publicly available software tools for *GCC* and *Open64* compilers. I collaborate with my colleagues from the University of Edinburgh, INRIA, Ghent University, ICT, IBM, ARC, CAPS Enterprise, NXP, STMicro and others, and open to new contacts, collaborations and proposals to realize these goals.

In my spare time, I enjoy thinking about *emerging technologies* and *innovative intelligent systems* in *IT, AI, biotechnology* and other areas, and interested in the knowledge transfer, consulting and startups. In my leisure time, I enjoy traveling, playing football, learning new languages, learning to play guitar and participating in community activities.

More information about my research projects is available online:

<http://fursin.net/research>

## Professional experience

- 09/2007-  
current - Tenured research scientist and UNIDAPT Group founder (<http://unidapt.org>) at INRIA Saclay, France. I am researching continuous collective optimizations, iterative compilation, run-time program adaptation, machine learning (predictive modeling and reinforcement learning), auto-parallelization, architecture design space exploration, hardware/software co-design, performance prediction and low power optimization techniques. I am trying to put most of my ideas into practice and develop multiple open-source research tools (<http://ctuning.org>) for my long-term goal to develop and generalize automatic continuous program optimization and parallelization techniques and architecture design exploration using innovative search methods, adaptation, machine learning and knowledge reuse. This should enable realistic intelligent self-tuning systems, particularly in the presence of rapidly evolving multi-core heterogeneous architectures.
- 12/2005-  
08/2007 - Postdoctoral researcher in the Alchemy group at INRIA Futurs, France. I had been working with Prof. Olivier Temam to develop a new concept to *enable continuous run-time optimization and adaptation for statically compiled programs* and to *speed up iterative compilation* by 3 orders of magnitude using a *run-time low-overhead program phase detection scheme and function versioning*. At the same time, I started developing an *Interactive Compilation Interface (ICI)* for Open64/PathScale compilers and GCC to create *self-tuning intelligent compilers and systems*.
- We also developed a novel technique to *characterize programs or architectures* using *program reaction to optimizations* (transformations). I had been collaborating with my colleagues from the University of Edinburgh, UK to *introduce this technique as well as statistical search and machine learning* to enable *optimization knowledge reuse* among different programs and architectures using static and dynamic program and architecture features.
- These techniques are now used in multiple international research projects and are referenced in CGO, PLDI, PACT and other publications and IBM patent application.
- 01/2002-  
11/2005 - Research associate at the Institute for Computing Systems Architecture, University of Edinburgh, UK. I had been working with Prof. Michael O'Boyle to *introduce iterative compilation* at a *fine-grain level* (function, loop or instruction) to *automatically find best optimization settings* for *large applications* (rather than kernels) on *rapidly evolving architectures* that *beat state-of-the art optimizing compilers*. I had also been working with Prof. Olivier Temam to develop a *fast and accurate technique* to determine *lower bound of the execution time* of memory intensive applications by replacing all array accesses with scalars to have a stopping criterion for iterative compilation.
- 02/2000-  
03/2000 - Visiting researcher at Paris-Sud XI University, France. I had been working in the Alchemy group with Prof. Olivier Temam to develop a fast and accurate technique to predict lower bound of the execution time of memory intensive applications by replacing all array accesses with scalars to have a stopping criterion for iterative compilation.
- 02/1999-  
12/2001 - Research assistant at the University of Edinburgh, UK in the European Project "MHAOTEU" (Memory Hierarchy Analysis and Optimization Tools for the End-User). I had been developing iterative optimization techniques for memory intensive applications.

## Professional experience

- 09/1998-01/1999 - Programmer at the Laboratory for Computer Technologies in Teaching at Moscow Institute of Physics and Technology, Russia. I had been developing software and DSP boards to be used in Electronics Labs to teach undergraduate and postgraduate students.
- 02/1998-01/1999 - Research assistant at the Institute for High-Performance Computing in the Russian Academy of Sciences in the project "Remote access to high-performance computer systems through the Internet". I had been developing a portable software system to enable remote access to heterogeneous high-performance computers as an Internet service and to dynamically manage/balance their resources.
- 01/1994-06/1994 - Research assistant at Moscow Institute of Physics and Technology, Russia in the project "Computer simulation of non-linear wave processes in gaseous streams". I had been developing simulation and visualization software.

## Education

- 2008 - Attended ACACES'2008 - International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems (with courses by Josep Torrellas, Dean Tulsen, Babak Falsafi and Christos Kozyrakis).
- 2006 - Attended ACACES'2006 - International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems (with courses by Wen-mei Hwu, David Padua, David Whalley and Michael Hind).
- 2005 - Attended ACACES'2005 - First International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems (with courses by Josh Fisher, Ayal Zaks, Trevor Mudge and Rajiv Gupta).
- 1999-2004 - Received Ph.D. degree (computer science) from the University of Edinburgh, UK, advisor: Prof. Michael O'Boyle, thesis title: "Iterative Compilation and Performance Prediction for Numerical Applications", first advisor (before moving to industry): Prof. Nigel Topham.
- We introduced *iterative compilation* at a *fine-grain level* (function, loop or instruction) to automatically find best optimization settings for *large applications* (rather than kernels) on rapidly evolving architectures that beat state-of-the art optimizing compilers. We also developed a fast *and accurate technique* to determine *lower bound of the execution time* of memory intensive applications by replacing all array accesses with scalars to have a stopping criterion for iterative compilation.
- These techniques are currently used in several EU-funded projects to introduce novel search techniques and machine learning to automatic program optimization and architecture design exploration (in collaboration with the University of Edinburgh, INRIA, Ghent University, ICT, IBM, ARC, CAPS Enterprise, NXP, STMicro and others).
- 1997-1999 - Received M.S. degree with medal from Moscow Institute of Physics & Technology, Russia (High-Performance Computing, GPA=4.00/4.00). I had been developing a portable software system to enable remote access to heterogeneous high-performance computers as an Internet service and to dynamically manage/balance their resources.
- 1996-1999 - Had a research practice at the Institute for High-Performance Computer Systems of Russian Academy of Sciences.
- 1993-1997 - Received B.S. degree with highest honors (*summa cum laude*) from Moscow Institute of Physics & Technology, Russia (Department of Physical & Quantum Electronics, GPA=3.98/4.00).
- 1990-1993 - Finished Moscow Physical & Technical College, Russia (GPA=4.00/4.00).
- 1983-1993 - Finished Moscow Secondary School, Russia with medal.

### Professional activities (serving on PCs, organizing workshops, conferences and tutorials)

- 2009
  - iWAPT'09 PC member (International Workshop on Automatic Performance Tuning)
  - ICPADS'09 PC member (International Conference on Parallel and Distributed Systems), multi-core architectures track
  - Open64 Workshop at CGO'09 PC member
  - SMART'09: Organizer and PC member (3<sup>rd</sup> Workshop on Statistical and Machine Learning Approaches applied to Architectures and Compilation)
  - GROW'09: PC member (1<sup>st</sup> International Workshop on GCC Research Opportunities)
- 2008
  - IPDPS'08: PC member (IEEE International Parallel and Distributed Processing Symposium)
  - SMART'08: PC member (2<sup>nd</sup> Workshop on Statistical and Machine Learning Approaches applied to Architectures and Compilation)
- 2007
  - CASES'07: PC member (International Conference on Compilers, Architecture, and Synthesis for Embedded Systems)
  - 2<sup>nd</sup> HiPEAC GCC Tutorial: organizer (<http://www.hipeac.net/gcc-tutorial>)
  - SMART'07: chair and organizer (1<sup>st</sup> Workshop on Statistical and Machine Learning Approaches applied to Architectures and Compilation <http://www.hipeac.net/smart-workshop.html>).

In recent years, machine learning and statistical search techniques have shown a great potential in constructing compilers and architectures. Therefore, we decided to organize this workshop to promote new ideas and to present recent developments in compiler and architecture design using machine learning, statistical approaches, and search in order to enhance their performance, scalability, and adaptability.
- 2001
  - CPC'01: local organizer (9<sup>th</sup> Workshop on Compilers for Parallel Computers)

### Professional activities (teaching)

- 2008/2009
  - Future Computing Systems - M2R Course organizer and teaching part of the course on adaptive self-tuning systems (LRI, Paris South University, France)
- 2007/2008
  - Continuous adaptive iterative compilation and machine learning techniques (part of the postgraduate course at LRI, Paris South University, France)
- 2006/2007
  - Continuous adaptive iterative compilation and machine learning techniques (part of the postgraduate course at LRI, Paris South University, France)
- 2005/2006
  - Adaptive and feedback driven compilation (part of the postgraduate course at LRI, Paris South University, France)

### Professional activities (advising/collaborating)

- 2009
- Mentoring 2 Google Summer of Code'2009 projects to develop run-time adaptation techniques, iterative compilation and machine learning at fine-grain level (<http://socghop.appspot.com/org/home/google/gsoc2009/gcc>).
  - Advising Abdul Wahid Memon and Menjato Rakoto (M2R students from Paris South University) during their internship at my group - we are extending Collective Tuning Center and tools (<http://ctuning.org>).
  - Collaborating with Dr. Cosmin Oancea (postdoctoral researcher from Cambridge University) to develop software TLS tools and techniques to improve automatic program parallelization.
- 2008
- Advised Lianjie Luo (M.S. student at ICT, China) to perform iterative compilation and create self-tuning applications and libraries using Open64 with ICI and Continuous Collective Compilation Framework.
  - Advised Abid Malik (postdoc at INRIA, France working on the MILEPOST project) to improve GCC ICI, add support for fine-grain optimizations such as vectorization, scheduling, register allocation, etc and substitute default GCC optimization heuristic with the automatically learnt one using machine learning and statistical techniques.
- 2007
- Advised Victor Jimenez (Ph.D. student at UPC, Barcelona) to develop automatic run-time adaptation techniques for heterogeneous computing systems with multiple ISA.
- 2006 – 2007
- Advised Piotr Lesnicki (Ph.D. student at Paris-South University, France) to develop automatic adaptive staged compilation techniques (Java and .NET) on multi-core embedded systems.
- 2006
- Advised Hamid Daoud (M.S. student at Paris-South University, France) to tune GCC optimization heuristic using machine learning techniques available in WEKA and using GCC ICI (Interactive Compilation Interface).
  - Advised Cupertino Miranda (engineer at INRIA, France) to implement Interactive Compilation Interface and a plug-in system for GCC to enable research on program iterative optimizations, and to implement run-time adaptation technique for statically compiled programs with varying context.
- 2003-2004
- Advised Edwin Bonilla (M.S. student at the University of Edinburgh, UK) to perform iterative optimizations experiments on the loop level for his M.S. thesis "Predicting Good Compiler Transformations Using Machine Learning"

### Professional activities (reviewing)

Conferences & workshops: *CGO, PACT, CASES, ICS, DATES, HiPEAC, CPC, IJHPSA, JPDC, IJHPSA, ICPADS, SMART, GROW, iWAPT*

### Professional activities (memberships)

- ACM member (SIGARCH - Special Interest Group on Computer Architecture)
- IEEE member (Computer Society)

## Professional activities (collaborations)

- IBM
- ARC
- CAPS Enterprise
- AMD
- STMicro
- NXP (Philips)
- ARM
- University of Edinburgh, UK
- Imperial College, UK
- INRIA, France
- UPC, Spain
- UIUC, USA
- Ghent University, Belgium
- ICT, China

## Major R&D projects

- 2008-cur - **Collective Tuning Center:** I am developing collaborative R&D tools with open API and Collective Optimization Database to share, rank, reference and systematize optimization knowledge based on statistical and machine learning techniques. This should help automate compiler and architecture design and program optimization.  
*Website:* <http://ctuning.org>  
*Major papers:* HiPEAC'09
- Collective Benchmark** is a collection of open-source sequential and parallel programs with multiple datasets assembled by the community to enable realistic benchmarking and research on program and architecture optimization. The source code of individual programs is simplified to ease portability. All the benchmarks now include scripts to be used with CCC Framework to perform automatic optimizations (iterative compilation) using GCC, LLVM, GCC4CIL, Open64, PathScale, Intel and other compilers and a wide range of architectures.  
*Website:* <http://ctuning.org/wiki/index.php/CTools:CBench>
- 2006-cur - **MILEPOST GCC:** Together with my colleagues from the MILEPOST consortium, we are leading the development of the first machine learning based intelligent compiler. (I am MILEPOST infrastructure coordinator leading the research on collective optimization and run-time adaptation). Tuning hardwired compiler optimizations for rapidly evolving hardware makes porting an optimizing compiler for each new platform extremely challenging. Our radical approach is to develop a modular, extensible, self-tuning intelligent compiler that automatically learns the best optimization heuristics based on combining feedback-directed iterative compilation and machine learning (predictive modeling). MILEPOST GCC automatically adjusts its optimization heuristics to improve execution time, code size, or compilation time of specific programs on different architectures. It can be used interactively in research on adaptive computing through the Interactive Compilation Interface (GCC ICI).  
*Website:* <http://unidapt.org/index.php/Developments:MilepostGCC>  
*Major papers:* HiPEAC'09, GCC Summit'08, CGO'06
- MiDataSets/Collective Benchmark:** Together with Prof. Olivier Temam, we decided to prepare multiple datasets for embedded benchmarks to enable research on realistic program optimization, run-time adaptation and benchmarking.  
*Website:* <http://unidapt.org/index.php/Developments:cBenchmark>  
*Major papers:* HiPEAC'09, GCC Summit'08, HiPEAC'07
- 2005-cur - **Interactive Compilation Interface (ICI):** At the end of my PhD study, I started developing an Interactive Compilation Interface (ICI) and a plug-in system for GCC in collaboration with IBM, the University of Edinburgh, CAPS Enterprise, ARC and others. The main purpose is to enable a systematic research on fine-grain program optimizations and to develop self-learning intelligent compilers and self-tuning programs for rapidly evolving hardware.  
*Website:* <http://unidapt.org/index.php/Developments:ICI>  
*Major papers:* GCC Summit'08

- 2004-cur - **UNIDAPT Framework:** During my postdoctoral training in the Alchemy group at INRIA Futurs (France) I had been working with Prof. Olivier Temam to develop a new concept to enable continuous run-time optimization and adaptation for statically compiled programs (self-tuning static binaries adaptable to changes in program inputs, program phases and execution environments at run-time) and to speed up iterative compilation by 3 orders of magnitude (iterative search for different optimization cases). In this technique we statically produce multiple versions of hot functions, apply combinations of aggressive optimizations for different optimization cases (performance/power/fault-tolerance etc) and then use a run-time low-overhead program phase detection scheme based on monitoring of hardware counters to learn program behavior, associate it with different versions of functions (different optimizations), and then react to changes in program run-time behavior based on this association table. Preserving this table across runs enables continuous adaptation of static binaries. We currently develop this technique in GCC, extend it to enable adaptation on multi-core heterogeneous systems and use it in several projects in collaboration with UPC, IBM, CAPS Enterprise, STMicro and others.
- Website: <http://unidapt.org/index.php/Developments:UNIDAPT>
- Major papers: HiPEAC'09, CGO'07, GCC Summit'07, NPC'07, HiPEAC'05
- **Continuous Collective Compilation Framework** I am developing a Continuous Collective Compilation (and Parallelization) framework (currently for GCC and PathScale/Open64 compilers) to enable continuous program and architecture optimization knowledge reuse based on *MILEPOST GCC*, *ICI*, *UNIDAPT*, *MiDataSets*. We developed a new technique to characterize programs or architectures using program reaction to optimizations (transformations) to be able to learn good optimizations across heterogeneous environments. We use UNIDAPT technique to create self-tuning static binaries adaptable to changing inputs and environments at run-time without even a need for a reference run to detect the influence of optimizations by combining static function multi-versioning and dynamic optimization selection. This framework is currently used in several research projects and will be publicly available in the near future.
- Website: <http://unidapt.org/index.php/Developments:CCC>
- Major papers: HiPEAC'09, GCC Summit'08, CASES'06
- **Open64-ICI:** I started developing an Interactive Compilation Interface (ICI) and continuous optimization framework for PathScale/Open64 compilers to enable automatic fine-grain program optimizations. It is currently used in a collaborative project with the ICT, China.
- Website: <http://open64-ici.sourceforge.net>
- Major papers: HiPEAC'05
- 1999-2004 - I had been developing an iterative compilation framework to automatically optimize memory intensive applications within EU project MHAOTEU (Memory Hierarchy Analysis and Optimization Tools for the End-User). This software had later been used in several M.S. and Ph.D. projects at the University of Edinburgh, UK.
- 1998-1999 - I had been developing a portable software system to enable simple remote access to heterogeneous high-performance computers as an Internet service in the Russian Academy of Sciences.

- 1996-1998 - I had been developing a system to measure characteristics of semiconductor devices that involved designing and implementing a special DSP board and developing a communication and client software. This system is still used in the Electronics Labs of the Moscow Institute of Physics and Technology, Russia to teach undergraduate and postgraduate students.
- 1994 - I had been developing a simulation and visualization software in the research project “Computer simulation of non-linear wave processes in gaseous streams” at Moscow Institute of Physics and Technology (Russia).

## Awards, grants and funding

- 2009 - INRIA/EU grants for 2 post-doctoral researchers and 2 interns for 6 months
- 2008 - HiPEAC grant for the project “Context-aware optimization and run-time adaptation of sequential libraries for multi-core systems” - principal investigator
- 2007-2009 - EU funding through the MILEPOST project (machine learning for embedded programs optimization)
- 2006-2009 - EU funding through the SARC project (scalable computer architecture)
- 2006-2007 - HiPEAC grant for the project “Exploring optimization techniques and runtime code selection mechanisms for heterogeneous systems” – principal investigator
- 2005-2006 - HiPEAC Postdoctoral research grant to collaborate with the Alchemy group at INRIA Futurs, France
- 1999,2000 - ORS award (UK Scholarship for International Research Students)
- 1999 - Golden medal for M.S. studies from Moscow Institute of Physics & Technology (Russia)
- 1997 - International George Soros award “In recognition and appreciation of outstanding achievements in the study of science at the university level”
- 1996-1998 - Research grants from International Soros Science Education Program
- 1993 - Medal for secondary school

## References

**Prof. Michael O'Boyle,**

ICSA, School of Informatics, JCMB,  
Mayfield Road, Edinburgh, EH9 3JZ, Scotland, UK

**Dr. Bilha Mendelson**

*Senior manager*  
*(Code Optimization and Quality Technologies)*  
COT department, IBM, Haifa University Campus,  
Carmel Mountain Range, Haifa, 31904, Israel

**Prof. Olivier Temam,**

INRIA Saclay, Parc Club Orsay Université,  
ZAC des vignes, 3, rue Jacques Monod – Bât G,  
91893-ORSAY Cedex, France

**Prof. François Bodin,**

*CTO CAPS Entreprise, Professor at Université de Rennes 1*  
CAPS, Immeuble CAP NORD, Bât A - 2ème étage,  
4 Allée Marie Berhaut, 35000 Rennes, France

**Prof. David Padua** (IEEE Fellow)

University of Illinois at Urbana-Champaign,  
201 N. Goodwin Avenue, Urbana,  
IL 61801-2302, USA

**Phil Barnard**

*Product manager*  
ARC, Verulam Point, Station Way,  
St Albans AL1 5HE, UK

[FT2009]

Grigori Fursin and Olivier Temam. **Collective optimization.** *Proceedings of the International Conference on High Performance Embedded Architectures & Compilers (HiPEAC 2009)*, Paphos, Cyprus, January 2009

- *Extended version has been accepted for ACM Transactions on Architecture and Code Optimization (TACO)*
- *Concept is included in the HiPEAC 2012-2020 research roadmap*

[Fur2009]

Grigori Fursin. **Collective Tuning Initiative: automating and accelerating development and optimization of computing systems.** *Proceedings of the GCC Summit'09*, Montreal, Canada, June 2009

[LCWP2009]

Lianjie Luo, Yang Chen, Chengyong Wu, Shun Long and Grigori Fursin. **Finding representative sets of optimizations for adaptive multiversioning applications.** *3<sup>rd</sup> International Workshop on Statistical and Machine Learning Approaches Applied to Architectures and Compilation (SMART'09)*, Paphos, Cyprus, January 2009

[JGVP2009]

Victor Jimenez, Isaac Gelado, Lluís Vilanova, Marisa Gil, Grigori Fursin and Nacho Navarro. **Predictive runtime code scheduling for heterogeneous architectures.** *Proceedings of the International Conference on High Performance Embedded Architectures & Compilers (HiPEAC 2009)*, Paphos, Cyprus, January 2009

[LF2009]

Shun Long and Grigori Fursin. **Systematic search within an optimisation space based on Unified Transformation Framework.** *International Journal of Computational Science and Engineering (IJCSSE)*, Vol.4, No.2, pages 102-111, 2009 (submitted in 2005)

[FMTP2008]

Grigori Fursin, Cupertino Miranda, Olivier Temam, Mircea Namolaru, Elad Yom-Tov, Ayal Zaks, Bilha Mendelson, Phil Barnard, Elton Ashton, Eric Courtois, Francois Bodin, Edwin Bonilla, John Thomson, Hugh Leather, Chris Williams, Michael O'Boyle. **MILEPOST GCC: machine learning based research compiler.** *Proceedings of the GCC Developers' Summit*, Ottawa, Canada, June 2008

[DFGP2007]

Veerle Desmet, Grigori Fursin, Sylvain Girbal and Olivier Temam. **Leveraging Modular Simulation for Systematic Design Space Exploration.** *4<sup>th</sup> HiPEAC Industrial Workshop on Compilers and Architectures organized by ARM Ltd.*, Cambridge, UK, November 2007

[LCFP2007]

Piotr Lesnicki, Albert Cohen, Grigori Fursin, Marco Cornero, Andrea Ornstein and Erven Rohou. **Split Compilation: an Application to Just-in-Time Vectorization.** *International Workshop on GCC for Research in Embedded and Parallel Systems (GREPS'07) in conjunction with PACT'07*, Brasov, Romania, September 2007

[LFF2007]

Shun Long, Grigori Fursin, Björn Franke. **A Cost-Aware Parallel Workload Allocation Approach based on Machine Learning Techniques.** *Proceedings of the IFIP International Conference on Network and Parallel Computing (NPC 2007)*, LNCS-4672, pages 506-515, Dalian, China, September 2007

[FMPP2007]

Grigori Fursin, Cupertino Miranda, Sebastian Pop, Albert Cohen and Olivier Temam. **Practical Run-time Adaptation with Procedure Cloning to Enable Continuous Collective Compilation.** *Proceedings of the GCC Developers' Summit*, Ottawa, Canada, July 2007

[DCFP2007]

Christophe Dubach, John Cavazos, Björn Franke, Grigori Fursin, Michael O'Boyle and Oliver Temam. **Enabling fast compiler optimization evaluation via code-features based performance predictor.** *Proceedings of the ACM International Conference on Computing Frontiers*, Ischia, Italy, May 2007

[CFAP2007]

John Cavazos, Grigori Fursin, Felix Agakov, Edwin Bonilla, Michael F.P.O'Boyle and Olivier Temam. **Rapidly Selecting Good Compiler Optimizations using Performance Counters.** *Proceedings of the 5<sup>th</sup> Annual International Symposium on Code Generation and Optimization (CGO)*, San Jose, USA, March 2007

[FC2007]

Grigori Fursin and Albert Cohen. **Building a Practical Iterative Interactive Compiler.** *1<sup>st</sup> International Workshop on Statistical and Machine Learning Approaches Applied to Architectures and Compilation (SMART'07)*, Ghent, Belgium, January 2007

[FCOP2007]

Grigori Fursin, John Cavazos, Michael O'Boyle and Olivier Temam. **MiDataSets: Creating The Conditions For A More Realistic Evaluation of Iterative Optimization.** *Proceedings of the International Conference on High Performance Embedded Architectures & Compilers (HiPEAC 2007)*, Ghent, Belgium, January 2007

[CDAP2006]

John Cavazos, Christophe Dubach, Felix Agakov, Edwin Bonilla, Michael F.P. O'Boyle, Grigori Fursin and Olivier Temam. **Automatic Performance Model Construction for the Fast Software Exploration of New Hardware Designs.** *Proceedings of the International Conference on Compilers, Architecture, And Synthesis For Embedded Systems (CASES 2006)*, Seoul, Korea, October 2006

*(finalist best paper award)*

[FCOP2006]

Grigori Fursin, Albert Cohen, Michael O'Boyle and Oliver Temam. **Quick and practical run-time evaluation of multiple program optimizations.** *Transactions on High-Performance Embedded Architectures and Compilers*, 1(1), pages 13-31, 2006

[ABCP2006]

F. Agakov, E. Bonilla, J. Cavazos, B. Franke, G. Fursin, M.F.P. O'Boyle, J. Thomson, M. Toussaint and C.K.I. Williams. **Using Machine Learning to Focus Iterative Optimization.** *Proceedings of the 4<sup>th</sup> Annual International Symposium on Code Generation and Optimization (CGO)*, New York, NY, USA, March 2006

*(best presentation award)*

[FCOP2005]

Grigori Fursin, Albert Cohen, Michael O'Boyle and Oliver Temam. **A Practical Method For Quickly Evaluating Program Optimizations.** *Proceedings of the 1<sup>st</sup> International Conference on High Performance Embedded Architectures & Compilers (HiPEAC 2005)*, number 3793 in LNCS, pages 29-46, Barcelona, Spain, November 2005

*(highest ranked paper, acceptance rate=18%)*

*This paper presents a novel concept to statically enable run-time optimizations and self-tuning binaries through function cloning and integrated low-overhead program/system behavior monitoring routines. It has been referenced in IBM patent application, in a number of PLDI, CGO and PACT publications and has been extended in a number of international research projects.*

[FOTP2005]

B. Franke, M. O'Boyle, J. Thomson and G. Fursin. **Probabilistic Source-Level Optimisation of Embedded Systems Software.** *Proceedings of the Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES'05)*, pages 78-86, Chicago, IL, USA, June 2005

[LF2005]

Shun Long and Grigori Fursin. **A heuristic search algorithm based on Unified Transformation Framework.** *Proceedings of the 7<sup>th</sup> International Workshop on High Performance Scientific and Engineering Computing (HPSEC-05)*, pages 137-144, Oslo, Norway, June 2005

[FOTP2004]

Grigori Fursin, Mike O'Boyle, Olivier Temam, and Gregory Watts. **Fast and Accurate Method for Determining a Lower Bound on Execution Time.** *Concurrency Practice and Experience*, 16(2-3), pages 271-292, 2004

[FOK2002]

G.G.Fursin, M.F.P.O'Boyle, and P.M.W. Knijnenburg. **Evaluating Iterative Compilation.** *Proceedings of the 15<sup>th</sup> Workshop on Languages and Compilers for Parallel Computing (LCPC'02)*, College Park, MD, USA, pages 305-315, 2002

[FOTP2001]

Grigori Fursin, Mike O'Boyle, Olivier Temam, and Gregory Watts. **Fast and Accurate Evaluation of Memory Performance Upper-Bound.** *Proceedings of the 9<sup>th</sup> Workshop on Compilers for Parallel Computers (CPC'2001)*, pages 163-172, Edinburgh, UK, 2001

[ATAP2000]

Abella, J., S. A. Ali Touati, A. Anderson, C. Ciuraneta, J. M. Codina, Min Dai, C. Eisenbeis, G. Fursin, A. Gonzalez, J. Llosa, M. O'Boyle, A. Randrianatoavina, J. Sanchez, O. Temam, X. Vera, and G. Watts. **MHAOTEU Tools for Memory Hierarchy Management**. *IMACS'2000, 16<sup>th</sup> IMACS World Congress on Scientific Computation, Applied Mathematics and Simulation*, Lausanne, Switzerland, August 2000

**Ph.D. thesis**

[FUR2004]

Grigori Fursin. **Iterative Compilation and Performance Prediction for Numerical Applications**. *Ph.D. thesis*, University of Edinburgh, Edinburgh, UK, January 2004

**Talks**

- “Collective Tuning Initiative”  
*Presented at the GCC Summit'09, Montreal, Canada, June 2009*  
*Presented at the HiPEAC industrial workshop and HiPEAC clusters, Infineon, Munich, Germany, June 2009*  
*Presented at the University of Versailles, France, May 2009*
- “Collective Tuning Initiative: collective optimization, run-time adaptation and machine learning”  
*Presented at the University of Illinois at Urbana-Champaign, USA, April 2009*
- “Collective Optimization”  
*Presented at HiPEAC'09, Cyprus, January 2009*
- “Enabling Dynamic Optimization and Adaptation for Statically Compiled Programs Using Function Multi-versioning”  
*Presented at SMART'09, Cyprus, January 2009*
- “MILEPOST project - using machine learning to automate and speed up program optimization for reconfigurable processors”  
*Presented at the Information and Brokerage Conference on Information and Communication Technologies in the EU's 7<sup>th</sup> Framework, Moscow, Russia, October 2008.*
- “Enabling Dynamic Optimization and Adaptation for Statically Compiled Programs Using Function Multi-Versioning”  
*Presented at ScalPerf'08 (Scalable Approaches to High Performance and High Productivity Computing), Bertinoro, Italy, September 2008*
- “Continuous adaptive program optimizations”  
*Presented at Reservoir Labs and IBM TJ Watson Research Center, New York, USA, August 2008*  
*Presented at Imperial College (Software Performance Engineering Laboratory), London, UK, February 2008*  
*Presented at the Institute of Computing Technology (Chinese Academy of Sciences), Beijing, China, January 2008*
- “Program iterative continuous optimizations, run-time adaptation and machine learning”

*Presented at IBM Toronto Lab (compiler group), Canada, July 2007*

- “Machine learning techniques for iterative program optimizations and run-time adaptation”

*Presented for TAO group (machine learning group), LRI, Paris-Sud XI University, INRIA & CNRS, France, June 2007*

- “Overview of current activities: Interactive Compilation Interface for fine-grain program optimizations, dataset sensitivity, machine learning to speed up optimizations and DSE, run-time program adaptation, optimizations for heterogeneous computing systems, continuous collective optimizations, HiPEAC activities”

*Presented at Intel (compiler group), Moscow, Russia, February 2007*

*Presented at the ISP RAS (Institute for System Programming, Russian Academy of Sciences), Moscow, Russia, February 2007*

- “Continuous run-time adaptation and optimization of statically compiled programs”

*Presented at the UPC, Barcelona, Spain, January 2007*

- “Towards continuous collective compilation”

*Presented at the ICSA seminar, University of Edinburgh, UK, December 2006*

- “Continuous adaptive run-time optimizations for scientific applications” and
- “Using machine learning for compiler optimizations”

*Presented at the IBM Thomas J. Watson Research Center, Yorktown Heights, NY, USA, March 2006*

- “Continuous collective compilation for the MilePost project (Machine Learning Techniques for Adaptive Optimization)”

*Presented at the MilePost EC negotiation meeting, European Commission, Brussels, March 2006*

- “A practical method for quickly evaluating program optimizations”

*Presented at the ICSA seminar, University of Edinburgh, UK, December 2005*

- “Advanced iterative compilation and performance prediction for scientific applications”

*Presented at the LRI, Paris-Sud XI University, France, April 2003*

## Technical reports and miscellaneous

- Grigori Fursin, Mike O'Boyle, Olivier Temam, and Gregory Watts. **A Fast and Accurate Evaluation of a Memory Performance Upper-Bound.** Report for the MHAOTEU ESPRIT project No 24942, February, 2001
- Jaume Abella, Cédric Bastoul, Jean-Luc Béchenec, Nathalie Drach, Christine Eisenbeis, Paul Feautrier, Björn Franke, Grigori Fursin, Antonio Gonzalez, Toru Kisku, Peter Knijnenburg, Josep Llosa, Michael O'Boyle, Julien Sébot, and Xavier Vera. **Guided Transformations.** Report M3.D2 for the MHAOTEU ESPRIT project No 24942, February 2001
- Jaume Abella, Grigori Fursin, Antonio Gonzalez, Josep Llosa, Michael O'Boyle, Abhishek Prabhat, Olivier Temam, Sid Ahmed Ali Touati, Xavier Vera, and Gregory Watts. **Advanced Performance Analysis.** Report M3.D2 for the MHAOTEU ESPRIT project No 24942, February, 2001
- Grigori Fursin. **Simulation of processes of learning and recognition in modified neural network.** Proceedings of the national conference on physical processes in devices of electronic and laser engineering, Moscow Institute of Physics & Technology, pages 102-111, Moscow, Russia, 1997
- Grigori Fursin. **Measurement of characteristics of neural elements with the aid of personal computer.** Proceedings of the national conference on devices of electronic and laser engineering, Moscow Institute of Physics & Technology, pages 20-28, Moscow, Russia, 1997
- Grigori Fursin. **Restoration of symbols with noise by neural network.** Proceedings of the national conference on physical processes in devices of electronic and laser engineering, Moscow Institute of Physics & Technology, pages 112-117, Moscow, Russia, 1995