History of my education background
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At the earlier stage of my higher education, I was trained in pure mathematics and more generally in fundamental sciences. Starting in that way has certainly influenced my taste for formal approaches, and forged my ability to understand and move deeper into mathematically oriented topics. Then, I get introduced into computer sciences, focusing on *algorithm, complexity, scientific programming*, and *parallel computing*. The outcome of this step towards advanced scientific research is a PhD in computer science that I got in march 2001. The title of my PhD dissertation was "Contributions to Parallel Computing", where I presented my results in *parallel linear algebra*, *systolic computation*, and *methodology for parallel scheduling*. I was actively involved in three distinct teams working in *numerical computation*, *discrete mathematics*, and *integrated parallel architectures* respectively. This was a great chance to strengthen my scientific culture and to have a broad range of technical contributions. This was also the occasion to see how different aspects of computer science could be connected in order to achieve more efficient solutions or more robust methodology. This is mainly the hallmark of my scientific route.

After my PhD, I moved to the university of Geneva (Switzerland) for a postdoctoral position. The research topics of the host laboratory (LOGILAB, headed by Pr Jean-Philippe Vial and Pr. Alain Haurie), included *mathematical programming*, *non-differentiable optimization*, and *operation research*. It was expected of me to study the linear algebra kernel of the *cutting planes method* and help implementing them as efficient as possible at the level of high performance computing state-of-the-art. Another (but indirect) expectation was to benefit from my background in *combinatorial optimization* to improve the heuristics that will be used to solve subproblems. This was really a very exciting and fruitful adventure. Indeed, from a personal point of view, the area of *continuous optimization*, by itself and though its connection with combinatorial optimization, was a nice complementary skill that would allow me to have a more mature capability to tackle large-scale combinatorial problems. In addition, I attended several national and international scientific meetings, where I could meet notorious scientists in the field of *optimization* and *operation research*. The main outcome of this postdoctoral step was the design of a flexible *oracle based* solver that is used to solve non-differentiable optimization problems. For combinatorial optimization problems, the solver can be used to solve the linear relaxation at each nodes of the *branch-and-bound* or one of its variants (branch-and-cut, branch-and-price, $\cdots$). Other contributions include the application of the method to solve number of operation research problems, and matrix computation improvements related to the kernel of the solver. The second chapter of the document is devoted to this part of my background and potential perspectives.

Next to my stay at the LOGILAB (around 3 years), I was hired at *Centre Universitaire Informatique* of the university of Geneva, precisely at *laboratory of theoretical computer science* (TCS-Lab, headed by Pr. Rolim Jose). The laboratory was involved in cutting-edge research in the *foundations of computation* and in *parallel distributed computing*. My main contributions during my stay the TCS-Lab were on a formal study of the energy minimization problem (modeling and power-aware scheduling). I was able to use my recent skill in mathematical programming to develop a mixed integer programming model for power consumption of computer programs. This contribution is presented in chapter 4, where we discuss about the topic of power-aware computing. We again used the mathematical programming approach to solve the dual-power management in sensors networks. We clearly see how rewarding was

my investment in the field of mathematical programming. We also developed efficient distributed algorithms for sensors networks and studied the localization problem. My activities at the TCS-Lab, through international projects, gave me the opportunity to cooperate with number of reputed laboratories and talented scientists. In addition, I could attend several international scientific events as a speaker. Moreover, I was able to initiate funded scientific projects in the field of *power aware computing*.

After my two years at the TCS-Lab, I joined the European Laboratory of Molecular Biology at Grenoble (France), in the team of Raymond Ravelli and Florent Cipriani, where I was concerned with mathematical modeling and computational engineering to study the effect of radiation damage in X-ray synchrotron crystallography. The goal was to provide an analytical model for the radiation damage and then find a way to refine collected data by means of computer processing. This was an opportunity for me to work together with people from other disciplines related to structural genomics, and get familiar with experimental research and distributed high-throughput computing.

Next, I moved to the Institute of Fundamental Electronics at University of Paris-Sud Orsay (France), working with Lionel Lacassagne on automatic code optimization and deployment on various parallel architectures. Our aim was to understand, trough an intensive benchmark, the key point in the performance of parallel multi-level memory machines. Based on a unified model of major applications classes, and a model of the target architecture, we studied systematic ways to structure the parallel program in order to reach optimal performances. This was a kind of comeback into heart of *parallel computing*. Indeed, two years later, still within the university of Orsay, I joined the Laboratoire Accélérateur Linéaire (LAL), whose the main activity is on cutting edge research in particles physics, nuclear physics, and astrophysics. At the LAL, in collaboration with pluridisciplinary team, we were involved with HPC investigations related to LQCD (Lattice Quantum ChromoDynamics) simulations at the highest scale. Chapter 3 reports my contributions in the fields of *accelerated computing*, which is an approach I suggested for local LQCD calculations and also for heavy image processing applications. Our efforts on large-scale LQCD simulations (with Gilbert Grosdidier, Christine Eisenbeis, Olivier Pène, Denis Barthou,$\cdots$), involved a broad range of complementary HPC topics (*parallel algorithm, SIMD, ill-conditioned matrix computation, supercomputing, high-throughput computing, failure, accelerators*).

I currently hold a research position at the Centre de Recherche Informatique (CRI, headed by François Irigoin) of the Ecoles des Mines de Paris (France) since 2011. My main research topics include *High Performance Computing, Operation Research, Matrix Computation, Combinatorial Algorithm and Complexity, Scientific and Technical Programming, Automatic Code Transformations*. In addition to my pure research activities, I use to initiate and drive various scientific projects and national/international collaborations. I teach CS courses, mainly at a higher level, in different kinds of institution including industries. In addition, I use to supervise PhD students and be part of PhD boards. I am active member of well established scientific corporations and reviewer of number of international journals and conferences.