Cristiana M. N. Gomes

Date and place of birth:
10/31/1979 Penedo-AL, Brazil
cristianaMN.gomes@gmail.com
HomePage

Research interests

Combinatorics and Graph Theory (in particular, graph coloring and flow problems), Network Optimization (bandwidth allocation problems), Mathematical Programming, Complexity Theory and Approximations.
Recent interests: Stochastic Optimization and Distributed Algorithms (e.g. with Game Theory).

Details:

- **Network Optimization (bandwidth allocation problems, routing problems)**
  In my thesis, a joint routing and slot assignment problem was addressed. The objective is to minimize the overall period of slot activations providing enough capacity to satisfy the flow transmission between the source and the destination nodes in a graph. The complexity of the problem was studied deriving lower and upper bounds and providing approximation algorithms.

- **Combinatorics and Graph Theory (in particular, graph coloring and flow problems)**
  Here, the objective is to identify real problems that can be represented by graphs, using the theory to define complexity and helping with problem resolution. In my thesis, I worked in a mix of two classical problems: Network flow and Coloring problems. The flow has to be routed and the graph (with weights given by the flow) has to be colored. Both problems have to be solved at the same time in such a way that the optimal solution is obtained giving the maximum throughput. We proved that using k-disjoint paths (from all source nodes) solves our problem for some graphs (eg. grid graphs) in polynomial time considering the instances of gathering.

- **Mathematical Programming (e.g. multi-objective, column generation, convex programming, stochastic programming)**
  I use Mixed-Linear Integer Programming to solve graph problems and techniques as column generation to obtain efficient models (for problems with exponential variables). Multi-objective analysis deriving Pareto frontier is used to help decision making. At the present moment, I am studying convex problems and how to explore its characteristics using, for example, Game Theory to develop distributed (approximation) algorithms. I am also interested in considering uncertain parameters in a context of Stochastic Programming.

Education

PhD - Université de Nice Sophia Antipolis (UNSA) / INRIA–France 2006–2009
Area: Wireless Network Optimization and Graph Theory
Advisors: Jean-Claude Bermond and Jérôme Galtier
Supported by CAPES Foundation – Ministry of Education of Brazil.

Master - Universidade Federal de Minas Gerais (UFMG)–Brazil
Operational Research Laboratory (LaPO) 2002–2004
Area: Optical Network Optimization
Advisor: Geraldo Robson Mateus
Supported by CAPES.

Bachelor - Universidade Federal de Alagoas (UFAL)–Brazil 1998–2002
Course: Computer Science

Technician Courses - Centro Federal de Educação Tecnológica de Alagoas (CEFET-AL)–Brazil
Course: Electronic/Telecommunications 1999–2001
Course: Data Processing 1994–1998

References

- Ph.D advisor: Jean-Claude Bermond
  email: Jean-Claude.Bermond@sophia.inria.fr
- Ph.D co-advisor: Jerome Galtier
  email: jerome.galtier@orange-ftgroup.com
- Master advisor: Geraldo Robson Mateus
  email: mateus@dcc.ufmg.br

Internships

INRIA Sophia Antipolis–France 03–06/2005
Research in optimization of dynamic optical networks (pre-doctoral).
Areas/skills: AMPL, Cplex, methematical modeling.
Supported by Institut National de Recherche en Informatique et en Automatique (INRIA).

Universidade Federal de Minas Gerais (UFMG)–Brazil 03–06/2003
Teaching Introduction to Computer Science and Programming Language.

Universidade Federal de Alagoas (UFAL)–Brazil 08/2000–07/2002
Modeling (UML) and Implementation of a distributed Tutor System.
Areas/skills: Mobile Agents, Intelligent tutor, UML, Distributed Systems, Java.
Supported by the National Counsel of Technological and Scientific Development (CNPq).

Universidade Federal de Alagoas (UFAL)–Brazil 08–10/2001
Modeling (UML) and Implementation of an Automatic Segmentation System of Musical Flows.
Areas/skills: Artificial Intelligence, Multi-Agents, Parallel Processing.
Supported by CNPq.

Centro Federal de Educação Tecnológica de Alagoas (CEFET-AL)–Brazil 04–09/1998
UNIX/WindowsNT networks management.

Employment and working experience

Teaching

Faculdade Kennedy de João Monlevade, MG–Brazil 05/2004–05/2006
Courses: Advanced Programming, Data Structures and Computer Architecture.

Faculdade Metropolitana de Belo Horizonte, MG–Brazil 03–04/2006
Course: Operational Research.

System analyst / Java software developper

UFMG/Synergia (Laboratory of programming)–Brazil 08/2004–01/2005
Modeling (UML) and Implementation of a legislative information system (SIL).

Selected Publications

Published (see complete list)

- ◇ Doctoral thesis
- ◇ C. Gomes and J. Galtier. Optimal and Fair Transmission Rate Allocation Problem in Multi-hop Cellular Networks. In 8th International Conference on ADHOC Networks & Wireless, Murcia, Spain, September 2009. **Keywords:** Nonlinear problems, Convex optimization, KKT conditions.
- ◇ C. Gomes and G. Huiban. Multiobjective Analysis in Wireless Mesh Networks. In International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), pages 103–108, October 2007. Bogazici University, Istanbul, Turkey, IEEE. **Keywords:** Linear programming, Column generation, Multiobjective model and Epsilon-restricted technique.

Preprints

- ◇ C. Gomes, P. Reyes and J-C. Bermond. Round Weighting Problem and gathering in wireless networks with symmetrical interference. **Keywords:** Flow problem, Duality theory, Coloring problem, Bandwidth allocation in Wireless Networks.

Computer Programming Skills and Experience

Modeling Languages A Modeling Language for Mathematical Programming (AMPL), ILOG-concert (with Java language).

Optimization softwares CPLEX solver, Interior Point OPTimizer (IPOPT) - COIN-OR (software library for nonlinear optimization of continuous systems).

Optimization background Linear (Simplex, columns generation), Non-linear (KKT), Mixed (BnB, BnP), Other (Multiobjective, Heuristics).
