

5th International Conference on **Wireless, Telecommunication & IoT**
&
11th Euro Biosensors & Bioelectronics Congress

October 23-24, 2019 Rome, Italy

Strong and stable optimization approaches to wireless network design

Fabio D'Andreagiovanni^{1,2}

¹CNRS, France

²Sorbonne University, France

The Wireless Network Design Problem (WND) consists in establishing the location and the radio-electrical configuration of the transmitters that constitute a wireless network, in order to maximize a revenue function associated with service coverage of user devices located in a target area. Because of the impressive growth and evolution experienced by wireless communications in recent times, solving the WND has become a very challenging task, which requires the adoption of sophisticated mathematical optimization methods. Classical optimization models for the WND correspond to Mixed-Integer Linear Programming Problems (MILPs) that directly include signal-to-interference quantities and the notorious big-M coefficients to model disjunctive constraints. Such MILPs have been widely used in different application contexts, such as 5G, LTE and DVB-T, as they allow to easily model the WND. However, such MILPs present heavy numerical drawbacks that greatly limit their use in real planning. In practice, optimal solutions may be computed only in the case of small-sized instances, while, for large real-life instances, even finding feasible solutions may constitute a hard task for state-of-the-art optimization solvers. Furthermore, solutions may contain coverage errors. In order to tackle such computational issues, we discuss how we can exploit the combinatorial structure of the WND to define Pure 0-1 Linear Programming formulations, which prove strong from a polyhedral point of view and stable from a numerical point of view, thus allowing to greatly increase the capacity of solving real WND instances and to find high quality solutions without coverage errors. Our contributions are strongly based on our direct experience with realistic WND instances, considered in industrial partnership (e.g., with British Telecom Italia and Agcom, the Italian Authority for Telecommunications).

Recent Publications:

1. L Chiaraviglio, F D'Andreagiovanni, R Choo, F Cuomo, S Colonnese (2019) Joint optimization of area throughput and grid-connected microgeneration in UAV-based mobile networks. IEEE Access 7: 69545-69558.
2. L Chiaraviglio, F D'Andreagiovanni, R Lancellotti, M Shojafar, N Blefari-Melazzi and C Canali (2018) An approach to balance maintenance costs and electricity consumption in cloud data centers. IEEE Transactions on Sustainable Computing 3(4): 274-288.
3. A Trotta, F D'Andreagiovanni, M Di Felice, E Natalizio, K R Chowdhury (2018) When UAVs ride a bus: towards energy-efficient city-scale video surveillance. IEEE INFOCOM 1043-1051.
4. A Marotta, F D'Andreagiovanni, A Kassler, E Zola (2017) On the energy cost of robustness for green virtual network function placement in 5G virtualized infrastructures. Computer Networks 125: 64-75.
5. F D'Andreagiovanni, C Mannino, A Sassano (2013) GUB covers and power-indexed formulations for wireless network design. Management Science 59(1): 142-156.

5th International Conference on **Wireless, Telecommunication & IoT**
&
11th Euro Biosensors & Bioelectronics Congress

October 23-24, 2019 Rome, Italy

Biography

Fabio D'Andreagiovanni has completed his M.Sc. in Industrial Engineering in 2006 and Ph.D. in Operations Research in 2010 from the University of Rome Sapienza. Since 2016, he has been a First Class Research Scientist in the French National Center for Scientific Research (CNRS) and at the Laboratory "Heudiasyc" of UTC-Sorbonne University. From 2008 to 2009, he was a Research Scholar at the Department of Industrial Engineering and Operations Research of Columbia University in the City of New York. Until 2016, he was the Head of Research Group at the Department of Mathematical Optimization of Zuse Institute Berlin. He was also Lecturer at the Department of Mathematics and Computer Science, Free University of Berlin, and at the Faculty of Engineering of Technical University of Berlin. He has worked as consultant for several major European telecommunications and electric utility companies. His research has been focused on theory and applications of robust optimization and mixed integer programming and, besides having been published in premier scientific journals and in proceedings of top international conferences, has received many awards, such as the Accenture M.Sc. Prize 2006, the INFORMS Telecom Ph.D. Award 2010, the INFORMS Telecom Best Paper Award 2014, the RNDM Best Paper Award 2017, the EvoStar-EvoApplications Best Paper Award 2018, and the ICIN Best Paper Award 2018.

d.andreagiovanni@hds.utc.fr

Notes: