

SC 11 Global optimization techniques based on evolutionary strategies – foundations and applications to electromagnetics

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Course Lecturers Prof. Andrea Massa
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Course Description

This course will focus on:

- (a) Introduction to Evolutionary Algorithms (EAs),
- (b) Key theorems on global optimization and mathematical foundations of EAs,
- (c) Competitive EAs (Genetic Algorithms, Differential Evolution),
- (d) Cooperative EAs (Particle Swarm, Ant Colony Optimizer),
- (e) Numerical recipes and rules-of-thumb,
- (f) Applications to electromagnetics (antenna synthesis, inversion problems, microwave circuit synthesis, etc..)

The course is dedicated to Researchers, Scientists, and Engineers who are willing to learn about the basics of global optimizers based on EAs, how they work, why they work, and a review of EAs' application to electromagnetics with a main emphasis on antenna synthesis and inversion problems.

Background Knowledge:

Basics of Mathematical Analysis, Electromagnetics, and Antenna Theory

Biography

Prof. Andrea Massa received the “laurea” degree in Electronic Engineering from the University of Genoa, Genoa, Italy, in 1992 and Ph.D. degree in electronics and computer science from the same university in 1996.

From 1997 to 1999 he was an Assistant Professor of Electromagnetic Fields at the Department of Biophysical and Electronic Engineering (University of Genoa) teaching the university course of Electromagnetic Fields 1.

From 2001 to 2004, he was an Associate Professor at the University of Trento. Since 2005, he has been a Full Professor of Electromagnetic Fields at the University of Trento, where he currently teaches electromagnetic fields, inverse scattering techniques, antennas and wireless communications, and optimization techniques. At present, Prof. Massa is the director of the ELEDIA Research Center at the University of Trento and Deputy Dean of the Faculty of Engineering. Moreover, he is Adjunct Professor at Penn State University (USA), and Visiting Professor at the Missouri University of Science and Technology (USA), at the Nagasaki University (Japan) and at the University of Paris Sud (France).

He is a member of the IEEE Society, of the PIERS Technical Committee, of the Inter-University Research Center for Interactions Between Electromagnetic Fields and Biological Systems (ICEmB) and Italian representative in the general assembly of the European Microwave Association (EuMA).

His research work since 1992 has been principally on electromagnetic direct and inverse scattering, microwave imaging, optimization techniques, wave propagation in presence of

nonlinear media, wireless communications and applications of electromagnetic fields to telecommunications, medicine and biology.

Prof. Massa serves as an Associate Editor of the *IEEE Transactions on Antennas and Propagation*.

Paolo Rocca received the MS degree in Telecommunications Engineering from the University of Trento in 2005 and the PhD Degree in Information and Communication Technologies from the same University in 2008. He is currently an Assistant Professor at the Department of Information Engineering and Computer Science (University of Trento) and a member of the ELEDIA Research Center. He has been a visiting student at the Pennsylvania State University and at the University “Mediterranea” of Reggio Calabria. Dr. Rocca has been awarded from the IEEE Geoscience and Remote Sensing Society and the Italy Section with the best PhD thesis awarded from IEEE-GRS Central Italy Chapter. He is an Associate Editor of the IEEE Antennas Wireless Propagation Letters. His main interests are in the framework of antenna array synthesis and design, electromagnetic inverse scattering, and optimization techniques for electromagnetics.

Giacomo Oliveri received the B.S. and M.S. degrees in Telecommunications Engineering and the Ph.D. degree in Space Sciences and Engineering from the University of Genoa, Italy, in 2003, 2005, and 2009, respectively. Since 2008, he has been a Member of the Electromagnetic Research Center, University of Trento, Italy. His research work is mainly focused on cognitive radio systems, electromagnetic direct and inverse problems, antenna array design and synthesis, and optimization techniques for electromagnetics.