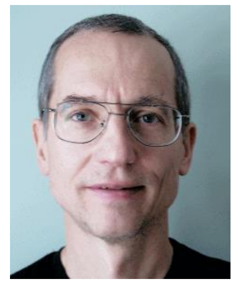
University POLITEHNICA of Bucharest
Faculty of Automatic Control and Computers

Splaiul Independenței nr.313, sector 6, cod 060042,
Bucharest, ROMANIA



Prof. Bogdan Dumitrescu
PhD advisor in ”Systems Engineering”

Doctoral school Automatic Control and Computers
University Politehnica of Bucharest

Contact:
Prof.dr.ing. Bogdan Dumitrescu
University Politehnica of Bucharest
Faculty of Automatic Control and Computers
Department of Automatic Control and Systems Engineering
Splaiul Independenței, 313, sala ED206, sector 6, 060042, București, Romania
Tel: +40722640094, Fax: +40214029587
E-mail: bogdan.dumitrescu@acse.pub.ro
Web: www.schur.pub.ro/bogdan_dumitrescu.htm

Research profile:
General interest: numerical methods and optimization, with applications in signal processing. The purpose is always the same: to find efficient algorithms for solving known and new problems. Proving theoretical properties of the algorithms is a bonus. The most relevant results fall into two main topics:
1. Optimization with trigonometric polynomials, starting from their parameterization with semidefinite matrices. The applications are diverse, from filter design to finding correlations between data generated in a single big process.
2. Sparse representations and dictionary learning. Specific problems: adaptive algorithms for sparse representations, the sparse total least squares problem, parallel or regularized algorithms for dictionary learning, possibly with structured dictionaries.

PhD advisor since 2007;
- 4 graduated students
- 3 current students;

Scientific publications:
- the monography Positive trigonometric polynomials and signal processing applications, Springer, 2007.

- 50 papers in journals like IEEE Transactions on Signal Processing (9 articles), IEEE Signal Processing Letters (8), Signal Processing (8), BIT Numerical Mathematics, etc.
- 80+ conference papers

Research projects:

- Sparse representations in signal processing, IDEI 2011-2016
- Convex optimization in signal processing, FiDiPro fellow grant 2010-2013 (Finland)
- Positivity in the analysis and synthesis of multidimensional systems, IDEI 2007-2010
- Filter bank design (Nokia 2008, Microsoft 2015)

Leading positions / Membership to scientific organizations and committees, editorial boards

- Associate editor to IEEE Trans. Signal Proc. (2008-2014), Mathematical Problems in Engineering (2015-)

- Member in the technical program committee at conferences like EUSIPCO, IEEE Statistical Signal Proc. Workshop, etc.

Proposed PhD research topics:

1. Dictionary learning for sparse representations, with application to medical images classification.

There are several classification methods using dictionaries that can be trained with standard or specialized algorithms. Besides the investigation of other methods, including those from the nonlinear case, the goal is to classify images characterizing certain diseases like skin cancer.

2. Robust dictionary learning.

Generally, the data used for classification are not necessarily clean, but contain noise. However, most of the design methods work on the implicit assumption that data are exact. The goal is to find methods for dictionary learning for sparse representations considering possible uncertainties, thus obtaining robust dictionaries.

3. Adaptive algorithms for the sparse total least squares problem.

The total least squares problem is useful when solving linear systems of equations in which all data are affected by noise (like in the identification of the parameters of a dynamical system when both input and output contain noise). The problem is sparse when only a small number of variables is nonzero, without knowing which ones. The goal is to design adaptive algorithms that are able to follow the solution of such a problem in real time.

4. Autoregressive models for inferring conditional dependencies.

Being in possession of a set of measurements (time series) of some variables that evolve simultaneously, but whose dependence relations are not known, the goal is to detect the pairs of variables that are independent in that context by investigating methods using the multivariable autoregressive model, with application to existing sets of times series (e.g. air pollution data, stock market values, etc.)

5. Parallel algorithms on GPU for solving numerical problems that occur in signal processing.

This is a generic topic, which can contain several classes of problems, starting from the standard ones and going to special problems like those related to sparse representations. The goal is to obtain efficient algorithms on graphic processing units or mixed architectures, with OpenCL implementation.