SESO 2014 International Thematic Week
"Smart Energy and Stochastic Optimization"
June 23 to 27, 2014

P. Carpentier*, J.-P. Chancelier and M. De Lara†
ENSTA ParisTech and École des Ponts ParisTech

Abstract

Energy companies witness a rapidly changing landscape: increase of intermittent, variable and spatially distributed power sources (wind, sun); expansion of markets and actors at all spatial and temporal scales; penetration of telecom technologies (smart grids). Those new factors impact the practice of optimization. From June 23 to 27, 2014, the International Thematic Week *Smart Energy and Stochastic Optimization* (SESO 2014) will be devoted to stochastic optimization and its applications to energy. The Week alternates courses, tutorials, scientific workshops, a PhD defense and an industry day; it is aimed at a mixed public, in academy and in industry. The academic organizers are ENSTA ParisTech and École des Ponts ParisTech, with the financial support of the Gaspard Monge Program for Optimization and operations research (PGMO) and of the French Energy Council (CFE). The participation is free, but registration is compulsory.

`Link: http://cermics.enpc.fr/~delara/SESO/SESO2014/SESO2014/`

`Registration: http://www.fondation-hadamard.fr/fr/pgmo/seso2014`

*pierre.carpentier@ensta-paristech.fr
†delara@cermics.enpc.fr

Contents

1 Monday 23 June 2014: Course on Stochastic Optimization

- Title: "Stochastic Programming and Progressive Hedging", Roger Wets (UC Davis, USA)
- Location: ENSTA ParisTech, Palaiseau, France (Room: R112)
- Planning: 14h00–17h00
  - 14:00–15:30 - "A short introduction to stochastic programming models"
    Nearly all decision models involve uncertainty about some of the parameters of the problem. In a wide variety of instances, this uncertainty can be formulated in probabilistic (statistical) terms and, often, this leads a stochastic programming formulation of the decision model. This lecture will be concerned with the major implications: contrasting deterministic and stochastic programming formulations and the alternatives the decision maker might consider when setting up the model. Some elementary, but basic properties of stochastic programming problems will be examined.
  - 15:30–16:00 - Coffee break
  - 16:00–17:30 - "An aggregation principle in stochastic programming"
    Solving stochastic programming problems, in some way or another requires that the algorithmic procedures takes into account all possible (uncertain future) events that might occur. This immediately results in a complex, large scale problem and the design of algorithmic procedures must necessarily rely on a decomposition of some type. The "Progressive Hedging" algorithm relies on a "per event" decomposition that allows us to obtain a global solution but never requires solving (repeatedly) subproblems that aren't any larger than a deterministic version, i.e., involving just a single event. Implementation allows for a variety of strategies and raises a number of issues.

2 Tuesday 24 June 2014: Scientific Workshop on Stochastic Optimization

The academic-industrial workshop "Stochastic Methods for Large-Scale Optimization" is devoted to advances in stochastic methods for large-scale optimization problems: decomposition methods, stochastic combinatorial problems. It is financed by the Gaspard Monge Program for Optimization and operations research (PGMO).

- Title: "Stochastic Methods for Large-Scale Optimization"
- Location: ENSTA ParisTech, Palaiseau, France (Room: R112)
- Planning:
  - Morning:
    - 09:00–09:30 - Welcome
    - 09:30–09:45 - Introduction by ENSTA and PGMO
    - 09:45–10:30 - F. Bonnans (INRIA-Saclay and CMAP) *"Necessary second-order optimality conditions in Pontryagin form for stochastic control problems"*
    - 10:30–11:15 - Alexander Shapiro (Georgia Tech, USA) *"Risk Neutral and Risk Averse Multistage Stochastic Programming"*
    - 11:15–12:00 - Vincent Leclère (Cermics, ENPC) *"Theoretical and Practical Questions in Stochastic Decomposition"*
  - 12:00–14:00 - Lunch
  - Afternoon:
    - 14:00–14:45 - Philippe Mahey (ISIMA, Clermont-Ferrand) *"Space Decentralization and Primal-Dual Technics for Stochastic Optimal Control"*
    - 14:45–15:30 - Stéphane Gaubert (INRIA-Saclay) *"Attenuation of the Curse of Dimensionality in Optimal Control by Max-Plus Methods"*
    - 15:30–16:00 - Coffee break
    - 16:00–16:45 - David Woodruff (UC Davis, USA) *"Toward Scalable Stochastic Unit Commitment"*
    - 16:45–17:30 - Axel Parmentier (Cermics, ENPC) *"Minimizing Risk Measures on Paths in Graphs"*

3 Wednesday 25 June 2014: PhD defense

- Title: "Contributions to Decomposition Methods in Stochastic Optimization", Vincent Leclère, UPE
- Planning: 14h00
- Location: amphitheater Caquot I, Bâtiment Coriolis, École des Ponts ParisTech (ENPC), Champs sur Marne, France

`How to get there: http://www.enpc.fr/en/school-practice`

4 Thursday 26 June 2014: Industry Day on New Challenges for Optimization in Energy

Energy companies witness a rapidly changing landscape: increase of intermittent, variable and spatially distributed power sources (wind, sun); expansion of markets and actors at all spatial and temporal scales; penetration of telecom technologies (smart grids). The industry day "New challenges for optimization in energy" will focus on how those new factors impact the practice of optimization. US academic colleagues and French companies will describe their experiences of collaboration in applied research. The *Optimization and Systems* group (Cermics, ENPC) will present a study, commissioned by the French Energy Council (CFE).

- Title: "New challenges for optimization in energy"
- Location: amphitheater Caquot I, Bâtiment Coriolis, École des Ponts ParisTech (ENPC), Champs sur Marne, France

`How to get there: http://www.enpc.fr/en/school-practice`

- Planning:
  - Morning: academics present experiences of research with industries
    - 9h00–9h20: welcome
    - 9h30–9h45: introductory talk by Jean-Eudes Moncomble, French Energy Council (CFE)
    - 9h45–10h30: presentation by the *Optimization and Systems* group (Cermics, ENPC) of the report "Optimization for the smart grid" commissioned by Conseil Français de l'Energie
    - 10h30–11h00: break
    - 11h00–12h00: David Woodruff (UC Davis, USA) *"Stochastic Unit Commitment at ISO Scale: Issues and Experiences"*
    - 12h00–12h30: Alexander Shapiro (Georgia Tech, USA) *"SDDP algorithm for Brazilian Power System Generation"*
  - 12h30–14h30: lunch
  - Afternoon: industries present experiences of research with academics

* 14h30–15h00: presentation of the Efficacity ITR
* 15h00–15h30: Marc Porcheron (EDF R&D) *"New Challenges for Energy Management, An Insight into the EDF's Nuclear Outage Scheduling Problem"*
* 15h30–16h00: Pierre Girardeau (Artelys) *"Stochastic Optimization in practice, viewed from a consulting company in optimization"*
* 16h00–16h30: break
* 16h30–17h00: Nicolas Lebert (Setec Energy Solutions) *"Stochastic optimization for hydropower schemes design"*
* 17h00–17h30: Francis Sourd (Sun'R) *"Coupling storage and variable renewable energy sources: optimization under diverse uncertainties"*

5 Friday 27 June 2014: Course and Scientific Workshop on Statistics for Stochastic Optimization

This academic-industrial workshop is devoted to advances in coordination between statistics and optimization, with the goal of solving stochastic optimization problems.

- Title: "Statistics for Stochastic Optimization"
- Location: amphitheater Caquot I, Bâtiment Coriolis, École des Ponts ParisTech (ENPC), Champs sur Marne, France

  `How to get there: http://www.enpc.fr/en/school-practice`

- Planning:
  - Morning: tutorial
    - 9h00–9h25: welcome
    - 9h25–9h30: welcome talk by Pierre Vandekerkhove (UPEM, France and Georgia Tech, USA)
    - 9h30–10h30: tutorial by Alexander Shapiro (Georgia Tech, USA) *"Stochastic programming, risk and statistical analysis"*
      In this tutorial, we discuss Monte Carlo sampling approach to solving two and multi-stage stochastic programming problems. Statistical properties and computational complexity of the Sample Average Approximation (SAA) and Stochastic Approximation methods will be presented. We also discuss risk averse approach to multistage stochastic optimization.
    - 10h30–11h00: break
    - 11h00–12h00: tutorial by Alexander Shapiro
  - 12h00–14h00: lunch
  - Afternoon: academic talks
    - 14h00–14h45: Roger Wets (UC Davis, USA) *"Generating Scenarios for the Day-Ahead-Market I"*
    - 14h45–15h30: David Woodruff (UC Davis, USA) *"Generating Scenarios for the Day-Ahead-Market II"*
    - 15h30–16h00: break
    - 16h00–16h30: Vincent Lefieux (RTE) *"Nonparametric forecasting of the French load curve"*
    - 16h30–17h00: Yannig Goude (EDF Paris) and Georges Oppenheim (UPEM & Paris 11, France) *"Designing and aggregating experts for energy demand forecasting"*