



## PhD Proposal 2017

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<b>Title: Stochastic and Robust Optimization applied to general supply chain problem.</b>
<b>Scientific field: Logistics / Operation Research</b>
<b>Key words: Optimization, Stochastic problem, supply chain Management (SCM), Meta-heuristics, uncertain numerical data.</b>

## **Details for the subject:**

### **Background, Context:**

Robust optimization has many roots and precursors in the applied sciences. Some of these connections are explicit, while others are a way, looking backwards in time, to interpret an approach that was developed under different ideas. Robustness has played, and continues to play an important role in several areas [3-6]. In Statistics, robustness usually refers to insensitivity to outliers [7]. In Machine Learning, it has witnessed great interest in Support Vector Machines, which are classification algorithms that can be interpreted as maximizing robustness to a special kind of uncertainty.

In Stochastic Optimization, the uncertain numerical data are assumed to be random. In the simplest case, these random data obey a known in advance probability distribution, while in more advanced settings, this distribution is only partially known. When this distribution is only partially known, the only thing that can be assert is that the problem belongs to a given family of probability distributions on the space of the data.

### **Research subject, work plan:**

The Stochastic Optimization approach seems to be less conservative than the worst-case-oriented Robust Optimization approach [8]. However, this is so if indeed the uncertain data are of a stochastic nature, and if we are smart enough to point out the associated probability distribution. Thus, the work is to advance the theory of Robust Optimization by proposing a novel methodology for handling Optimization Problems with Uncertain Data, practical application of the approach to Logistic and Planning Problems. The project involves theoretical work and software development

In fact, in this thesis, we propose to start with the study of practical case of dynamic supply chain under availability and uncertainty constraints. We propose to consider two main issues in the SCM: the practical case where uncertainties relating to additional orders arise and the key aspect of breakdown or unavailability due to preventive maintenance or resource absence occur. We propose to consider at first models by definite densities of probability. Indeed, the development of these estimated models is not an easy task. We find in the literature various types of models: among them, simple recursive models such as exponential smoothing of the general linear models which are used in several software's and have a large theoretical basis, nonlinear models, as well as models based on more recent techniques such as the Meta heuristics.

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