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Convex and Stochastic Optimization

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This book is dedicated to Viviane, Juliette, Antoine, and Na Yeong

Preface

These lecture notes are an extension of those given in the master programs at the Universities Paris VI and Paris-Saclay, and in the École Polytechnique. They give an introduction to convex analysis and its applications to stochastic programming, i.e., to optimization problems where the decision must be taken in the presence of uncertainties. This is an active subject of research that covers many applications. Classical textbooks are Birge and Louveaux [21], Kall and Wallace [62]. The book [123] by Wallace and Ziemba is dedicated to applications. Some more advanced material is presented in Ruszczynski and Shapiro [105], Shapiro et al. [113], Föllmer and Schied [49], and Carpentier et al. [32]. Let us also mention the historical review paper by Wets [124].

The basic tool for studying such problems is the combination of convex analysis with measure theory. Classical sources in convex analysis are Rockafellar [96], Ekeland and Temam [46]. An introduction to integration and probability theory is given in Malliavin [76].

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