Contributions to Decomposition Methods in Stochastic Optimization.

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We address large-scale stochastic multistage optimization problems. These problems being too complex to be solved directly, we study decomposition methods that consist in splitting the original problem into easier to solve subproblems. Iteratively, these subproblems are solved and updated until we can solve the original problem.

In a first time, we work on Dynamic Programming, a well-known method that turn a problem in \( T \) stage, into \( T \) problem with 1 stage. We extend its usual application framework to a general one. Besides we show the convergence of an approximated Dynamic Programming algorithm.

In a second time, we aim at splitting spatially the optimization problem by replacing constraints by a price mechanism. Those technics are well-known in a deterministic setting, but cannot be transposed directly to a stochastic problem : prices became too complex to be dealt with. Hence, we approximated the problem by forcing prices to rely only on specific signals. We deduce an algorithm that solve an approximation of the original problem, along with convergence results. Along the way we need results on the existence of a price mechanism that can replace the constraints.