

Internship proposal @ n-Side: *Implementation of a Dynamic Programming module*

About n-Side

n-Side provides consulting services and develops solutions based on optimization techniques in areas such as the steel making industry, the pharmaceutical industry, and power systems.

Subject description

The Dynamic programming (DP) method can be applied to a wide range of optimization problems (knapsack, shortest path, unit commitment, to name a few). It can be extended to stochastic settings (SDP) and is very efficient on some problems (e.g. Stochastic Dynamic Dual Programming for long term hydro electric generation planning). DP is thus of general interest and is in addition widely used in power system applications. A module was developed for our unit commitment solution (Unicorn) to solve single generation unit problems. It was generalized to solve other types of problems such as the Knapsack problem.

Internship objective

The goal of this internship is to

- Identify and make a short review of the problems that can be solved using DP and of the existing software or libraries
- evaluate and implement the set of functionalities required for a *general purpose* DP module in [Scampi](#), either based on the existing module or on existing open source libraries

The module should

- be developed in Scala,
- be well structured,
- use efficient data structures where needed,
- be versioned using Mercurial and BitBucket,
- be properly documented
- be unit tested (e.g. using scalaCheck, it can also be evaluated on “standard problems” against solutions based on Mixed Integer Programming or Constraint Programming).

References

http://en.wikipedia.org/wiki/Dynamic_programming

<http://www.cs.berkeley.edu/~vazirani/algorithms/chap6.pdf>

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