

Ottimizzazione Stocastica - Laboratorio

Installazione di AMPL (opzionale)

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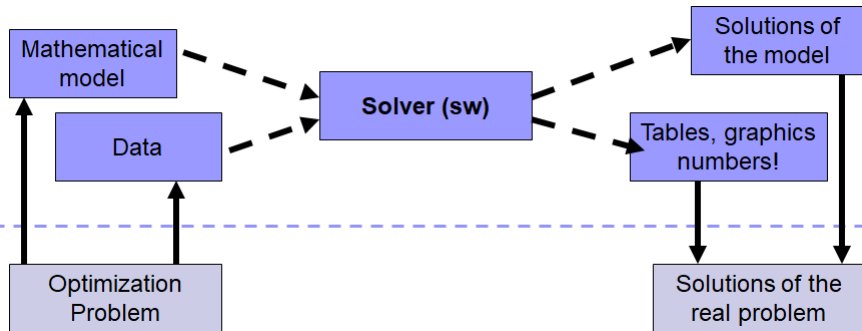
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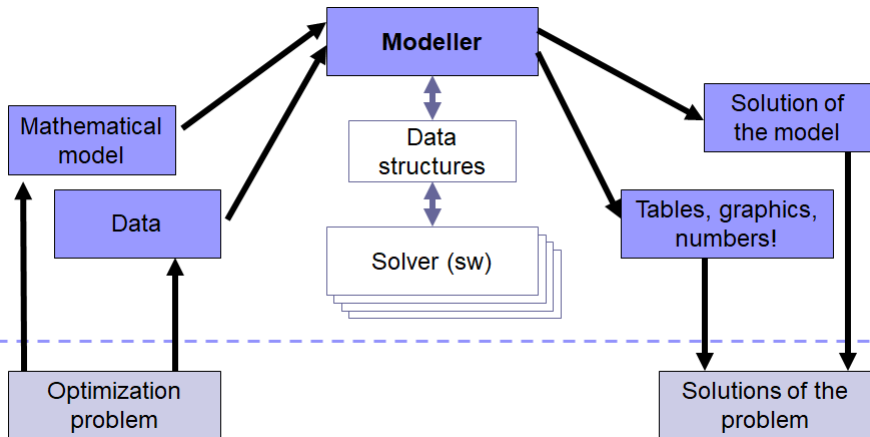
Tools for the solution of Mathematical Programming Models (i)

A **solver** is a software that receives as input a model describing an optimization problem and provides as output the optimal solution of the model (and related information).



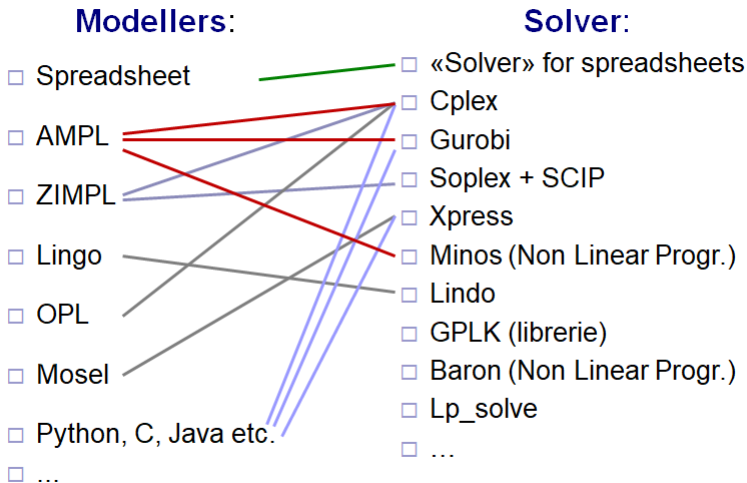
Tools for the solution of Mathematical Programming Models (ii)

A **modeller** provides an interface between the model of problem model and the solver.



Tools for the solution of Mathematical Programming Models (iii)

Some possible configurations



A Mathematical Programming Language (AMPL)

- algebraic model generator: the syntax reproduces the algebraic language
- interface between the algebraic model and the numerical solver

Reference book:

- Robert Fourer, David M. Gay, Brian W. Kernighan. *AMPL A Modeling Language For Mathematical Programming*, Second Edition, Duxbury Thomson, 2003

freely available on the AMPL website, link

<https://ampl.com/learn/ampl-book/>

Installing AMPL (i)

AMPL distributed under different licences:

- "commercial" (upon payment of a fee "business" or "academic")
- "learning" (free, limited in time, authorization required)
- "size-limited demo" (free, up to 500 [300 NL] constraints and 500 [300 NL] variables)
includes free versions of most popular solvers

AMPL "size-limited demo" versions

- command line or basic integrated development environment (IDE)
- for different platforms (windows, linux, macOS)

To install AMPL IDE

- open `https://ampl.com/start-free-now/`
- carefully read the terms of use ("evaluation and instructional use only")
- follow instructions: *Community Edition* (see Moodle)

The screenshot displays the AMPL IDE interface with three main panels:

- File Browser:** Shows the current directory structure (C:\) with various folders and files, including .Trash-1000, bin, BKP, DATA, eSupport, EUROCONTROL, NEST_DATA, NEST 1.6, PerfLogs, Program Files, Program Files (x-86), SAAM_USER_PREF, Users, usr, Windows, and SAWPKG_LOG.TXT.
- Console (AMPL):** Displays the execution output for the model cerchi.mod:

```
AMPL  
ampl: model cerchi.mod;  
ampl: data cerchi.dat;  
ampl: display N;  
N = 3  
  
ampl: solve;  
MINOS 5.51: optimal solution fo  
11 iterations, objective 0.25  
Nonlin evals: constrs = 20, Jac  
ampl: |
```
- Text Editor (cerchi.mod):** Shows the source code for the cerchi.mod model:

```
param N;  
set Cerchi := 1..N;  
var x{Cerchi} := Uniform(0,1);  
var y{Cerchi} := Uniform(0,1);  
var r := Uniform(0,1), >= 0;  
maximize f : r;  
s.t. v_quad_x_l{i in Cerchi}:  
s.t. v_quad_x_u{i in Cerchi}:  
s.t. v_quad_y_l{i in Cerchi}:  
s.t. v_quad_y_u{i in Cerchi}:  
s.t. v_dist{i in Cerchi, j in Cerchi}:  
(x[i]-x[j])^2 + (y[i]-y[j])^2
```