Taller cero

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Oscar Carreño
mauricio.carreno@udea.edu.co

Ingeniería Eléctrica
Universidad de Antioquia
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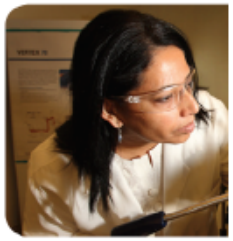
Problema de la Mochila

Se tiene una mochila con un volumen máximo de carga. (20L, 40L). Se tienen unos artículos para ser empacados en la mochila. Cada artículo tiene un nivel de satisfacción y un volumen de ocupación. Encontrar el conjunto de artículos que maximicen la satisfacción.



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1. Overview of Pyomo

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

CCR Center for Computing Research

http://www.pyomo.org/workshop-examples

Optimization Modeling

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Goal:

- Provide a natural syntax to describe mathematical models
- Formulate large models with a concise syntax
- Separate modeling and data declarations
- Enable data import and export in commonly used formats

Impact:

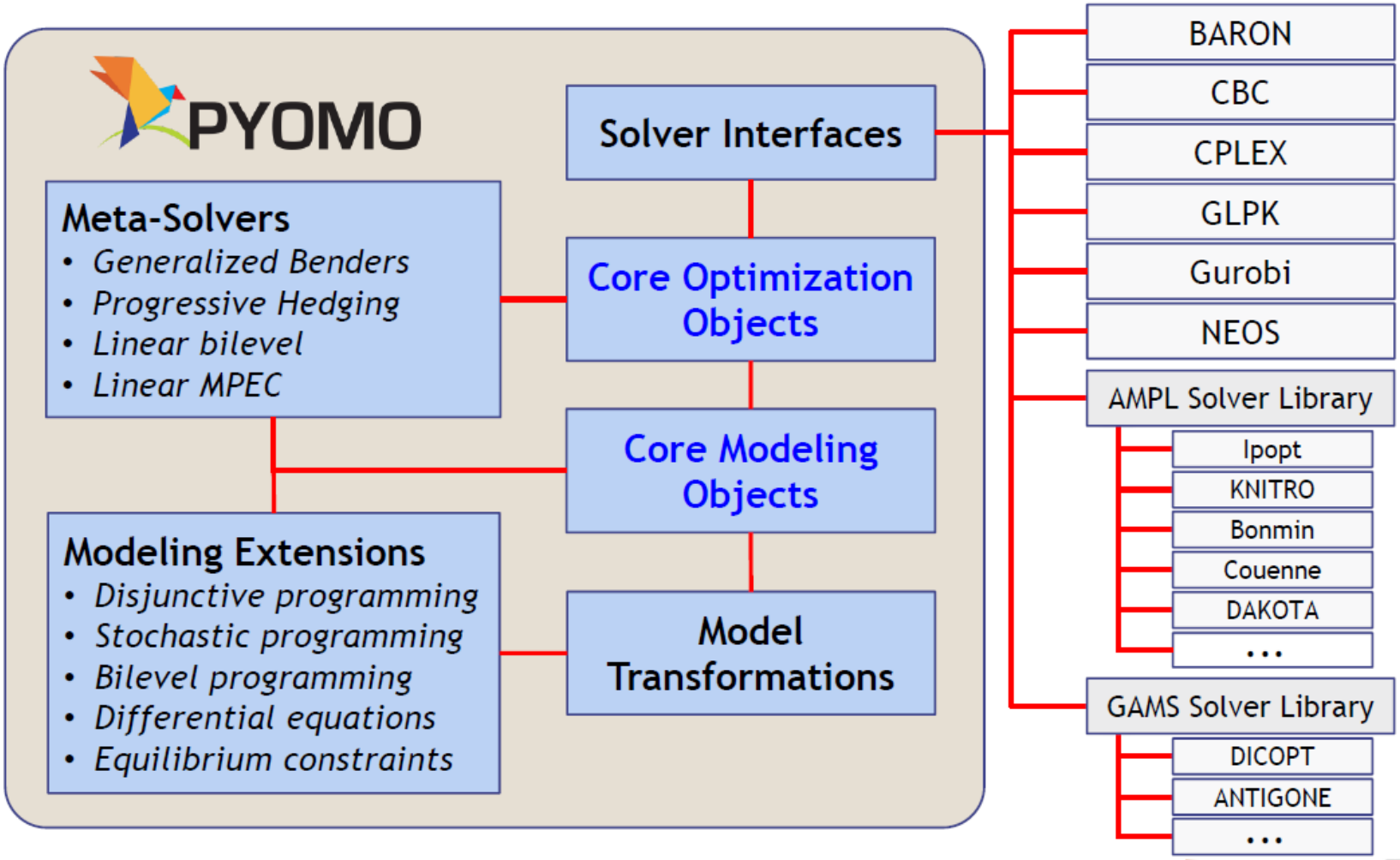
- Robustly model large systems
- Integrated automatic differentiation for complex nonlinear models

Examples:

- AMPL, GAMS, AIMMS, …
- OptimJ, FlopCPP, PuLP, JuMP, …

- **Pyomo: A Python-based optimization modeling package**

Pyomo at a Glance



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Why Open Source?

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- Transparency and reliability
- Foster community involvement
  - Extend the modeling language
  - Develop new solvers / algorithms
  - Interface with additional external utilities
  - “Stone Soup” model
- Flexible licensing
  - Pyomo released under 3-clause BSD license
  - No restrictions on deployment or commercial use

http://www.pyomo.org/workshop-examples

For More Information

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See the Pyomo homepage

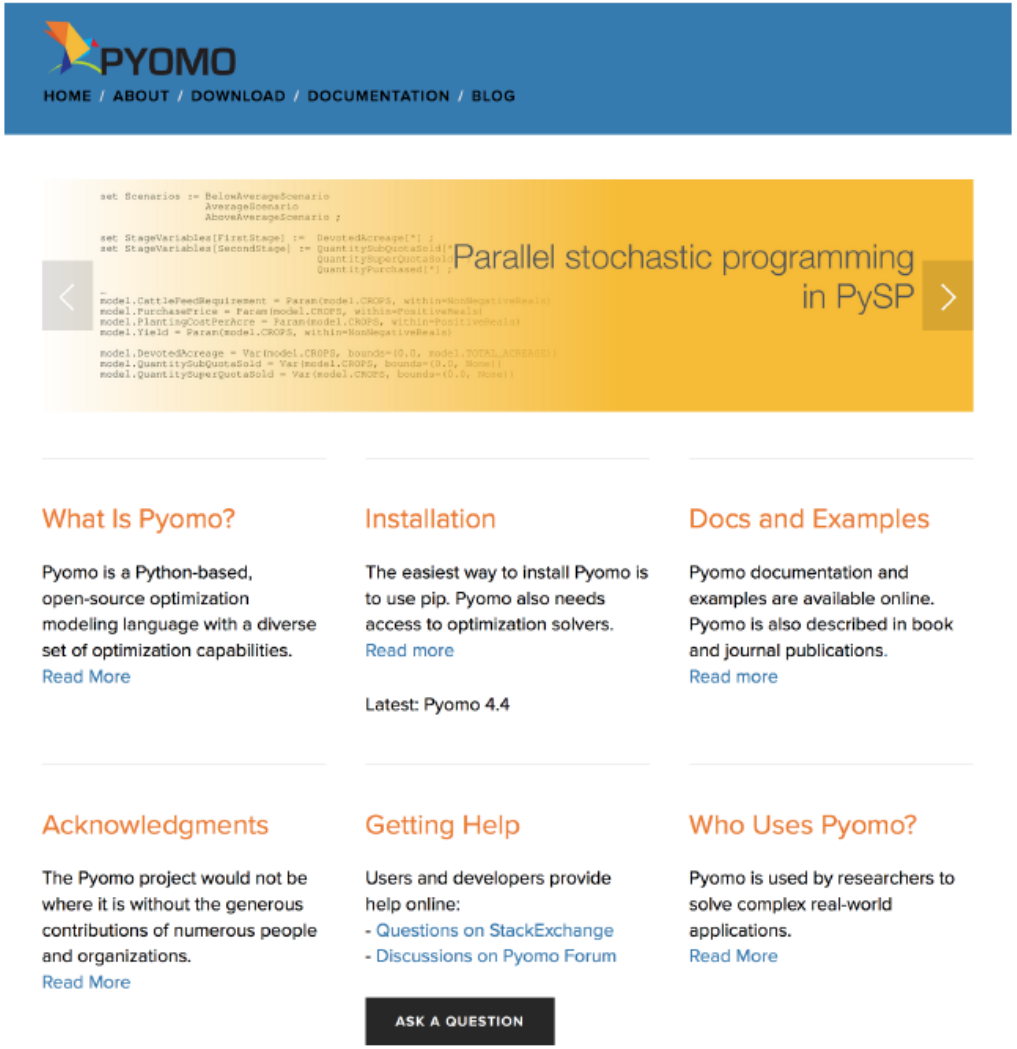
- www.pyomo.org

The Pyomo homepage provides a portal for:

- Online documentation
- Installation instructions
- Help information
- Developer links

GitHub:

- github.com/Pyomo



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Simple Modeling Example: Classic Knapsack Problem

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- Given a set of items A, with weight and value (benefit)
- Goal: select a subset of these items
  - Maximize the benefit
  - Under weight limit

Item (A)	Weight (w)	Benefit (b)
hammer	5	8
wrench	7	3
screwdriver	4	6
towel	3	11

Max weight: 14

Symbol	Meaning
A	set of items available for purchase
b_i	benefit of item i
w_i	weight of item i
$W_{\max}$	max weight that can be carried
x_i	discrete variable (select i or not)

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Anatomy of a Concrete Pyomo Model

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$$\max_x \quad \sum_{i \in A} b_i x_i$$

$$s.t. \quad \sum_{i \in A} w_i x_i \leq W_{\max}$$

$$x_i \in \{0,1\} \qquad \forall\, i \in A$$

Item	Weight	Value
hammer	5	8
wrench	7	3
screwdriver	4	6
towel	3	11

```
from pyomo.environ import *

A = ['hammer', 'wrench', 'screwdriver', 'towel']
b = {'hammer':8, 'wrench':3, 'screwdriver':6, 'towel':11}
w = {'hammer':5, 'wrench':7, 'screwdriver':4, 'towel':3}
W_max = 14

model = ConcreteModel()
model.x = Var( A, within=Binary )

model.value = Objective(
    expr = sum( b[i]*model.x[i] for i in A),
    sense = maximize )

model.weight = Constraint(
    expr = sum( w[i]*model.x[i] for i in A) <= W_max )

opt = SolverFactory('glpk')
result_obj = opt.solve(model, tee=True)

model.pprint()
```

← Import packages

← Specify/import data

Can be imported or even applied to model later

← Define problem

← Solve problem

← Report results

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1. Desarrollar modelo de Python con la formulación del problema de la Mochila propuesta.
2. Hacer un informe .pdf con la siguiente información:
   - Nombre y cédula del estudiante
   - Escribir la solución óptima del problema
   - Describir en palabras una variación del problema de la mochila como un problema de minimización
3. Enviar el informe .pdf al correo mauricio.carreno@udea.edu.co antes de las 4:00 pm. En el asunto escribir:

   nombre – cédula – taller0 – fecha(dd-mm-yyyy)