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Topic: JuMP

JuMP

is a domain-specific modeling language for mathematical optimization embedded in Julia.

Problems classes:

It currently supports a number of open-source and commercial solvers for a variety of problem classes, including:
1- linear programming
2- mixed-integer programming
3- second-order conic programming
4- semidefinite programming
5- and nonlinear programming.

JuMP's features include:

1- User friendliness
2- Speed
3- Solver independence
4- Access to advanced algorithmic techniques
5- Ease of embedding

User friendliness:

- Syntax that mimics natural mathematical expressions.
- Complete documentation (work in progress (WIP))

Speed:

- Benchmarking has shown that JuMP can create problems at similar speeds to special-purpose modeling languages such as AMPL.
- JuMP communicates with most solvers in memory, avoiding the need to write intermediary files.

Solver independence:

- JuMP uses a generic solver-independent interface provided by the MathOptInterface package, making it easy to change between a number of open-source and commercial optimization software packages ("solvers").
- Currently supported solvers include Artelys Knitro, Bonmin, Cbc, Clp, Couenne, CPLEX, ECOS, FICO Xpress, GLPK, Gurobi, Ipopt, MOSEK, NLopt, and SCS.

Access to advanced algorithmic techniques:

- Including efficient LP re-solves which previously required using solver-specific and/or low-level C++ libraries.

Ease of embedding:

- JuMP itself is written purely in Julia. Solvers are the only binary dependencies.
- JuMP is MPL licensed, meaning that it can be embedded in commercial software that complies with the terms of the license.
- Being embedded in a general-purpose programming language makes it easy to solve optimization problems as part of a larger workflow (e.g., inside a simulation, behind a web server, or as a subproblem in a decomposition algorithm).
    - As a trade-off, JuMP's syntax is constrained by the syntax available in Julia.

Solvers:

Currently supported solvers include Artelys Knitro, Bonmin, Cbc, Clp, Couenne, CPLEX, ECOS, FICO Xpress, GLPK, Gurobi, Ipopt, MOSEK, NLopt, and SCS.

Three advantages of using JuMP for solving Optimization problems over general purpose programming languages:

1 - User friendliness: Syntax that mimics natural mathematical expressions.

2 - Speed: Benchmarking has shown that JuMP can create problems at similar speeds to special-purpose modeling languages such as AMPL.

3 - Access to advanced algorithmic techniques: Including efficient LP re-solves which previously required using solver-specific and/or low-level C++ libraries.