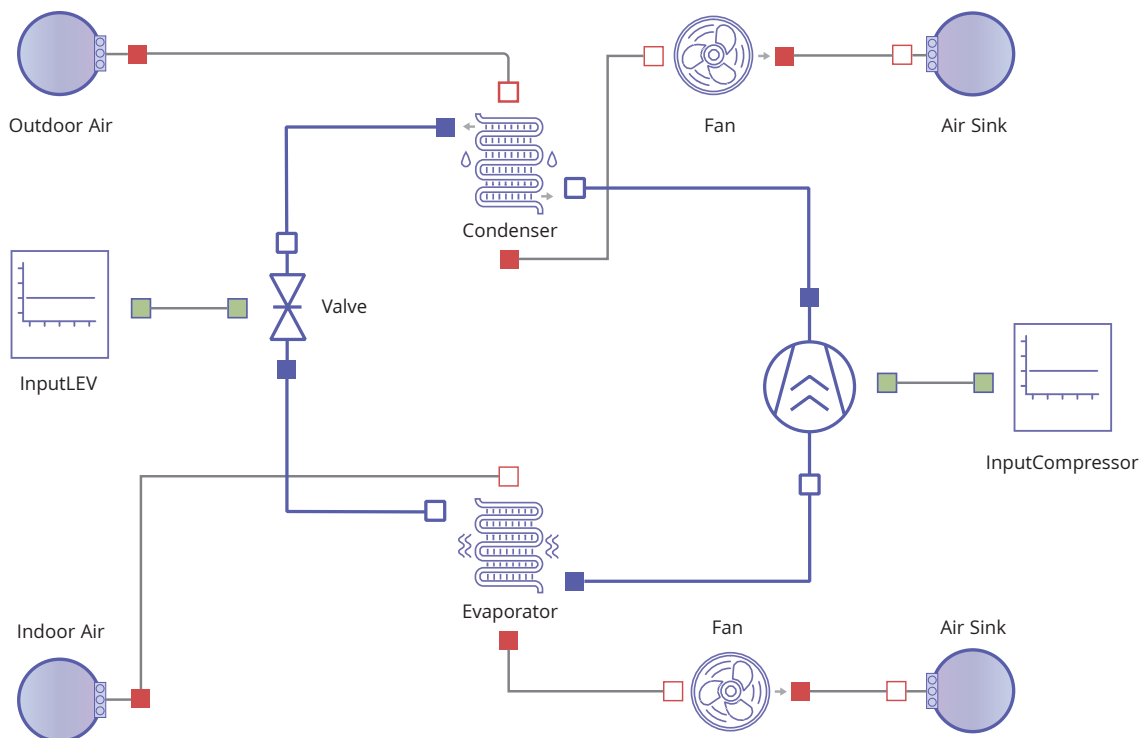


JuliaSim HVAC Library

Integrate physics-based heating, ventilation, air conditioning & refrigeration models with machine learning workflows

JuliaSim HVAC provides a comprehensive suite for the modeling and simulation of complex thermofluid systems via a library of pre-built component and refrigerant models that connect to advanced solvers that are customized to system behavior and are composable with the JuliaSim Scientific Machine Learning ecosystem. Whereas current design workflows use disparate tools for each step such as modeling and simulation, calibration, design optimization, control design, and machine learning, the JuliaSim platform enables all of these and more activities to be completed in one environment. The library integrates with advanced discontinuity-aware solvers in addition to machine learning tools that can be used for automated model calibration to plant data, surrogate modeling for accelerated simulation, discovery of unknown physics and model-based control to enable design and operation of the next generation of HVAC systems. Case studies show a 60 - 570x speed up over alternative tools attained by combining numerical techniques with scientific machine learning.





Model Library

Industry-grade pre-built components:

- Configurable components for Tube-Fin Heat Exchangers, Compressors, Valves, Fans, Conditioned spaces and Pipes
- Drag and drop in GUI for rapid prototyping

Thermodynamic property models:

- Spline-based thermodynamic property models for several refrigerants (such as R32, R1234YF, R290, R152a, R134a, R410A, R717)
- Dry Air and Moist Air



Ecosystem

Multi-domain Simulation

Connect to other domain specific models such as JuliaSim Batteries, Fluids, Media etc. Load and connect to external FMUs and pre-trained surrogate models.

Robust Solvers

Specialized DAE Initialization routines for large-scale models. Robust solvers that handle stiff nonlinear discontinuous dynamics.

Connect to Controls

Integrate with JuliaSim Control for PID, Linear and Nonlinear Model Predictive Control (MPC).

Leverage Machine Learning Workflows

- Integrate with JuliaSim Model Optimizer for automated model calibration unleashing the power of automatic differentiation of the simulator.
- Leverage JuliaSim Digital Echo for model acceleration and smoothing out of irrelevant dynamics using neural surrogates.