



GUROBI
9.5

Enterprise Features & Even Better Performance

Gurobi Version 9.5



GUROBI 9.5

The world's fastest solver just keeps getting better. Gurobi 9.5 includes new enterprise features, product enhancements, and an even faster compute engine—with impressive performance improvements across all supported problem types.



**Learn more about our
latest release**



Even Faster Performance

Compared to the Gurobi 9.1 release, Gurobi 9.5 has boosted its speeds across the board.

	PROBLEM TYPES	OVERALL SPEED-UP (>1s)	HARD MODELS (>100s)
LP	• Concurrent	14%	54%
	• Primal Simplex	23%	43%
	• Dual Simplex	20%	43%
	• Barrier	18%	56%
MIP	• MIP	15%	27%
	• Convex MIQP	30%	68%
	• Convex MIQCP	33%	78%
	• Non-Convex MIQCP	3.0x	7.5x



New Features and Enhancements

Customers will discover over a dozen enhancements across the product, such as powerful new heuristics for non-convex quadratic models, norm constraints, deterministic work measures, memory limit parameters, and more user control of IIS computation, as well as improvements to callbacks and tuning.

Gurobi Optimizer

NLP Heuristic for Non-Convex Quadratic Models

We have added a non-linear barrier solver for quickly finding feasible solutions to non-convex quadratic models.

Lazy Constraints in the NoRel Heuristic

Lazy constraints are now supported in the NoRel heuristic. You will receive solution callbacks and be given the opportunity to cut off those solutions with lazy constraints.

New Callback for Exiting the NoRel Heuristic

The new **Proceed** callback method allows you to smoothly transition from the NoRel heuristic to the MIP search.

Web License Service (WLS)

The new [Web License Service](#) enables Gurobi on containerized environments (e.g., Docker, Kubernetes). Predefined images are available on Docker Hub.

Work Metric

We now include a deterministic work measure to enable exact reproducibility of a solver run.

Memory Limit

The new **MemLimit** parameter allows you to terminate optimization when the memory used by the optimization exceeds the specified value.

New Cut Type - Lift-and-Project Cuts

This release includes a new cut type: lift-and-project cuts. The new **LiftProjectCuts** parameter provides some control over the generation of these cuts.

New Simplex Warm Start Options

Several new options are available for starting simplex from a previous solution. Options are chosen using the new **LPWarmStart** parameter.

Writing Dualized Models

The new .DUA and .DLP file formats allow you to write the dual formulation of an LP problem.

Norm General Constraint

Add norm constraints to your MIP model, with support for 0-, 1-, 2-, and infinity norms.

New Parameters and Attributes

In addition to the attributes and parameters directly tied to the new features above, there are three additional new attributes:

MaxVio: New attribute that gives the maximum (unscaled) constraint violation for the computed solution.

ConcurrentWinMethod: New attribute that indicates which algorithm prevailed in a concurrent LP solve.

PoolIgnore: New attribute to select variables that should be ignored when checking whether two solutions differ in the solution pool.

IIS Force Flags

You now have more control over the Irreducible Infeasible Subsystem (IIS) algorithm. Specifically, you can indicate that certain constraints or bounds should be forced into the IIS, even if the resulting subsystem is not minimal. Similarly, you can exclude constraints or bounds from the IIS.

IIS Callbacks

New IIS callbacks allow you to programmatically track the progress of the IIS algorithm.

SOS Encoding Options

SOS constraints can now be formulated in multiple different ways internally, which can sometimes give better performance.

Tuning Tool Enhancements

We added a number of additional controls to our tuning tool, including control over termination and control over how runtimes from multiple trials are aggregated.

Improvements in gurobipy

Type hints are now available for most of the gurobipy classes and functions. Moreover, indexing MVar and MConstr objects is now more consistent with numpy.

Universal2 Port for Mac

Supports both Apple silicon and Intel x64 processors.

Compute Server and Cluster Manager

Web License Service (WLS)

The new [Web License Service](#) also enables Gurobi Compute Server and Cluster Manager to run on containerized environments (e.g., Docker, Kubernetes). Predefined images are available on Docker Hub.

Integration with LDAP Repositories for Centralized User Management

LDAP support allows enterprise-grade Compute Server deployments using an industry-standard directory service for user authentication and authorization.

Amazon Web Services DocumentDB 4.0 Database Support:

The Cluster Manager now supports [AWS DocumentDB 4.0](#) as a back-end database. This expands your options when deploying the Cluster Manager on an AWS environment.

API Key Management

The Cluster Manager supports the ability to disable/enable keys, set a description, and download and track API keys for improved security.

Account Management

The Cluster Manager now provides system accounts, password policies, read-only role usage and the ability to disable/enable accounts for improved user management.

Usability

The Cluster Manager now provides contextual help, settings management, permalinks, and job metrics for enhanced usability.

Python Support

Gurobi Optimizer 9.5 also showcases the company's continued support for Python—the most popular programming language in the world—with an improved Python interface and support for Python 3.10.

“ Even though the Gurobi Optimizer is the fastest mathematical optimizer in the world, we're not going to rest on our laurels. We will keep pushing to improve and innovate because we're passionate about mathematical optimization and the difference it makes in solving real-world problems.

DR. TOBIAS ACHTERBERG
VP OF R&D, GUROBI OPTIMIZATION

SOLVE YOUR MOST COMPLEX CHALLENGES

Get Started with Gurobi

See why we're trusted by more than 2,500 companies across more than 40 industries.



TRY GUROBI FREE FOR 30 DAYS

Get a free, full-featured, commercial evaluation license for 30 days. This offer also includes:

- Free parameter tuning services
- Access to Gurobi's world-class technical support
- Two free hours of one-on-one consulting services



FREE FOR ACADEMIC USE

We make it easy for students, faculty, and researchers to work with mathematical optimization. Whether for use in class or research, academics can use Gurobi Optimizer at no cost. All the same Gurobi features and performance, with no limits on model size.



GET GUROBI FOR FREE AFTER GRADUATION-PLUS EXPERT SUPPORT

Through our *Take Gurobi With You* program, you can continue to get free, unrestricted access to Gurobi for up to two years after graduation. What's more, you get around-the-clock access to our team of PhDs—people who can work alongside you to troubleshoot and tune your models.

Our specialists are here to help you
succeed with mathematical optimization.

info@gurobi.com
www.gurobi.com

