GUROBI OPTIMIZATION

2025 Report

State of Mathematical Optimization

Overview

Gurobi is pleased to share the 2025 *State of Mathematical Optimization Report*, our latest look at how organizations are putting optimization to work. This report draws on insights from 473 professionals from commercial organizations across industries—ranging from data scientists and engineers to managers and executives—who shared how they use optimization to tackle real business challenges.

Now in its fifth year, this report explores how businesses are applying mathematical optimization to improve efficiency, cut costs, and make more confident, data-driven decisions in an increasingly uncertain environment.

We hope this report serves as a useful guide for anyone looking to unlock new opportunities by applying mathematical optimization in their organization.

Survey Profile

Team Size

Most respondents (77%) reported that their company has more than one person with "professional experience in applying mathematical optimization technology." The modal response (39%) was two to five team members with such experience.

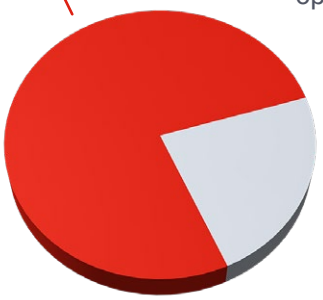
Formal Training

Respondents had diverse backgrounds. Nearly one third of respondents (31%) studied Engineering, followed by Operations Research (27%), Data Science (14%), Computer Science (10%), and Mathematics (9%).

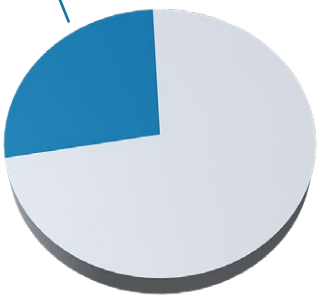
Industry

The most prominent industries represented in the study include Consulting (12%), Power and Utilities (9%), Hardware/Software (8%), and Transportation (7%). The industries using mathematical optimization continue to diversify compared to previous surveys.

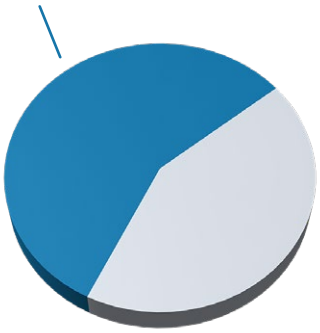
77% have two or more employees with professional experience in applying mathematical optimization technology at their company



27% studied Operations Research



57% are technical practitioners (e.g., developers, data scientists)



Methodology

In order to identify optimization trends in business settings, this report focuses on respondents who are current commercial users and does not include those who identify as "academic" users.

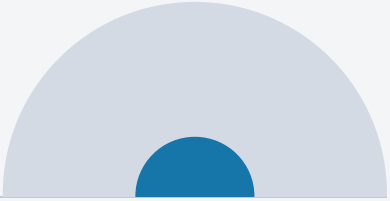
Key findings

No. 1 **97%** reported that the number of applied optimization professionals at their organization was growing or remaining steady.

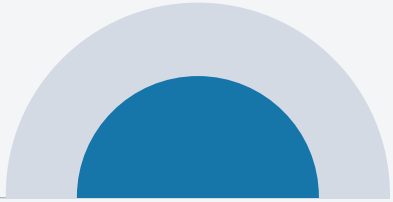
No. 2 **95%** indicated that mathematical optimization was gaining traction or remaining steady with decision-makers at their company.

No. 3 **81%** indicated that their organization combined machine learning and mathematical optimization for at least one project.

No. 4 **31%** shared that they are using or experimenting with generative artificial intelligence (GenAI) or large language models in combination with mathematical optimization.



No. 5 **63%** reported that their optimization work is very critical or absolutely critical to their organization.



Section 01

Mathematical Optimization at Work

From small start-ups to Fortune 500 enterprises, businesses are turning to mathematical optimization to solve their most pressing operational challenges. In a climate where companies are cutting costs, rethinking staffing, and navigating uncertainty, optimization offers a proven way to lower expenses, improve efficiency, and strengthen resilience.

Our survey confirms this momentum: nearly all respondents reported steady or growing demand for optimization talent within their organizations. Executives are no longer seeing optimization as only a lever for operational efficiency—they see it as a direct contributor to the bottom line and an investment that pays for itself.

Mathematical Optimization Skills Remain in High Demand

The U.S. Bureau of Labor Statistics estimates that **U.S. employers will need an additional 28,300 operations researchers and an additional 73,100 data scientists by 2033**, making these two of the top 30 fastest-growing jobs this decade. Alongside the ongoing demand for engineers, these figures reinforce the importance of mathematical optimization as a core capability in the modern workforce.

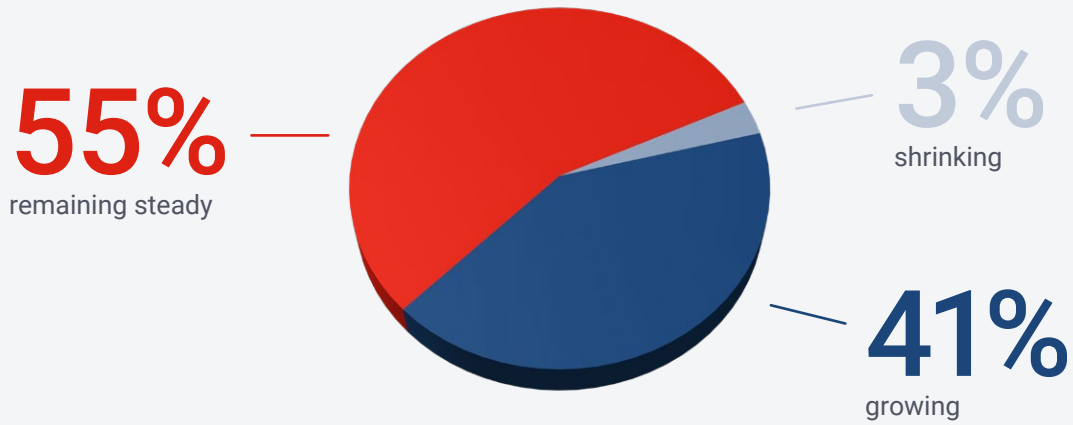
In a year marked by layoffs, hiring pauses, and exploring AI and automation alternatives to traditional staff, demand for applied optimization professionals is still high. This is a testament to the value organizations place on these skills in solving complex challenges and driving performance.

This trend is evident in our survey findings as well. Nearly all respondents (97%) reported that the number of professionals with experience in applying mathematical optimization technology at their organization was either steady or growing at their company.

Optimization talent is one of the few areas still growing in a year of layoffs

A majority (77%) said they work in organizations with more than one optimization professional—up from 68% last year—indicating that teams are not only persisting but expanding. Many (39%) reported teams of two to five professionals, while 13% have more than 21.

Is the number of professionals with experience in applying mathematical optimization technology growing or shrinking?



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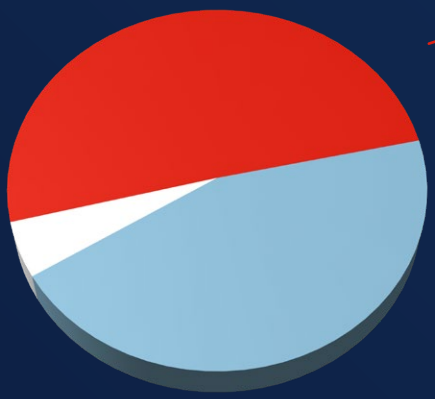
Optimization Continues to Gain Traction with Executives

As organizations expand their optimization teams, business leaders are also increasingly recognizing its value. More than half (51%) of survey respondents reported that mathematical optimization is gaining traction with decision-makers at their company, while another 45% said it has maintained a steady level of support. These results mirror last year's findings, suggesting that executive engagement with optimization is not a passing trend but a sustained pattern.

The perceived importance of optimization is equally strong. Nearly two-thirds (63%) of respondents indicated that their optimization work is very critical or absolutely critical to their organization. Furthermore, almost half (49%) reported that optimization supports ongoing decision-making processes. This demonstrates that optimization is moving beyond isolated projects and becoming an established, recurring element in complex decision making.

Optimization is moving from a technical specialty to an executive priority

Which statement best completes this sentence? Mathematical optimization is...

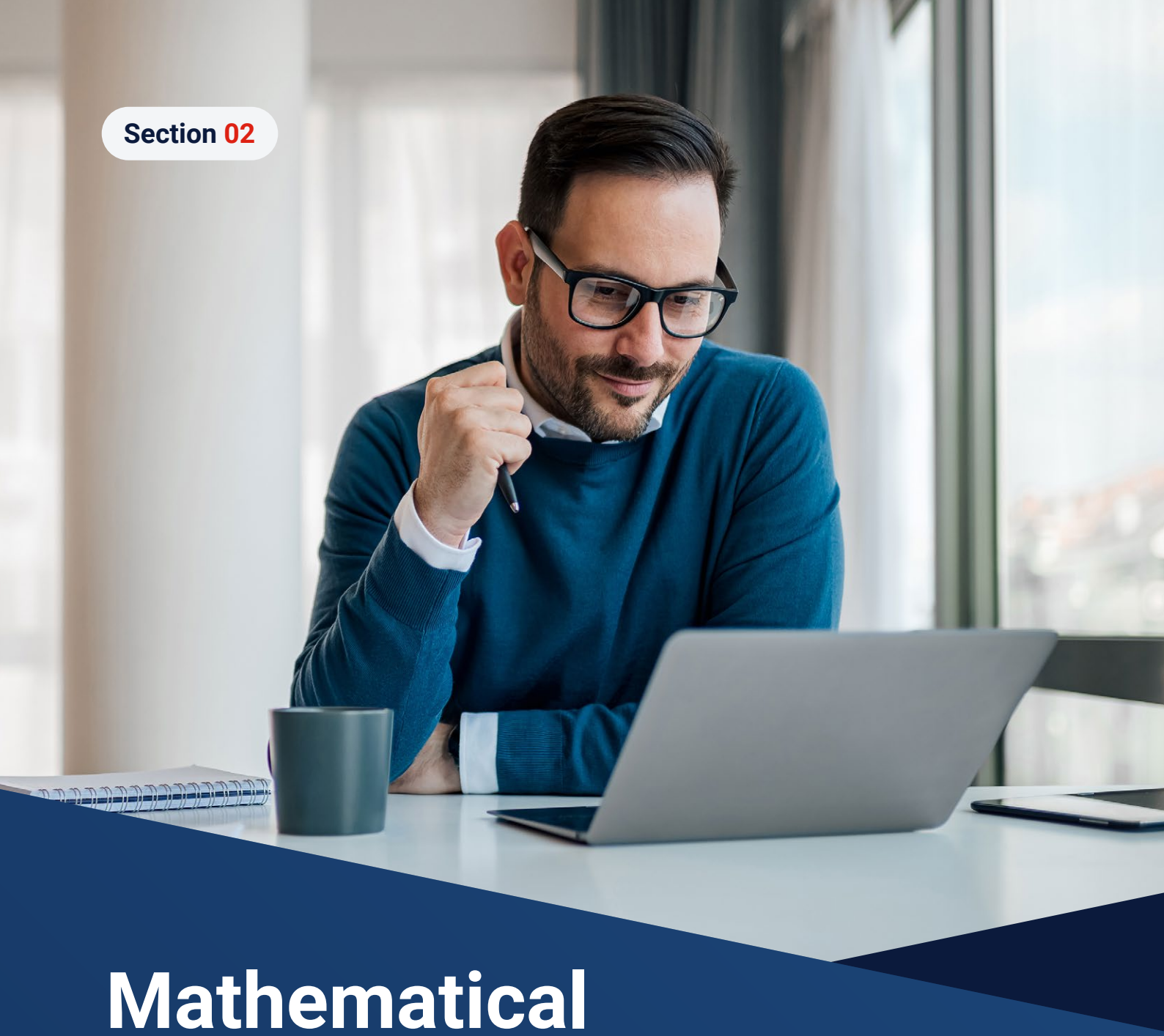


51%
gaining traction within my company among decision-makers

5%
losing traction within my company among decision-makers

45%
steady, neither losing nor gaining traction

Totals may not equal 100% due to rounding.



Section 02

Mathematical Optimization in Action

Organizations use mathematical optimization to inform decisions across all time horizons—from long-term strategy to day-to-day operations. Among survey respondents, planning and logistics emerged as the most common use cases this year, reflecting optimization's central role in coordinating resources, managing supply chains, and aligning operations with broader business objectives.

Python remains the preferred modeling language, with mixed-integer programming as the most frequent model type used, followed by linear and multi-objective problems.

A key trend is the rising use of optimization to minimize costs and reduce waste—highlighting its growing importance for efficiency, sustainability, and resilience in today's business climate.

Planning for Now and the Future

Planning remains the leading use case for mathematical optimization, reported by 56% of survey respondents, followed by logistics (45%), supply chain planning (45%), and production planning (40%). These findings are consistent with previous years and highlight optimization's role in supporting core operational priorities.

Significantly, respondents shared that their firms use mathematical optimization to make decisions across a variety of time scales from strategy (i.e., long-term planning, 63%), to tactics (i.e., weekly/monthly planning, 63%), to operations (i.e., daily/real-time decisions, 69%). This breadth illustrates optimization's adaptability—serving as a common framework for addressing both immediate challenges and longer-term business objectives.

Nearly 7 in 10 organizations now rely on optimization for daily or real-time decisions

What business problems are you currently solving with optimization?*

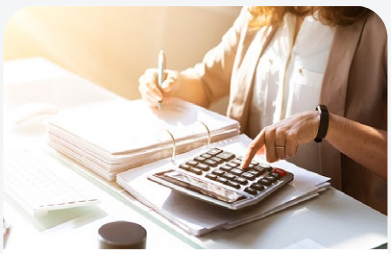
56%
Planning

45%
Logistics

45%
Supply Chain Planning

40%
Production Planning

22%
Energy Grid/Load Balancing



15%
Pricing

**Respondents could select multiple options.*

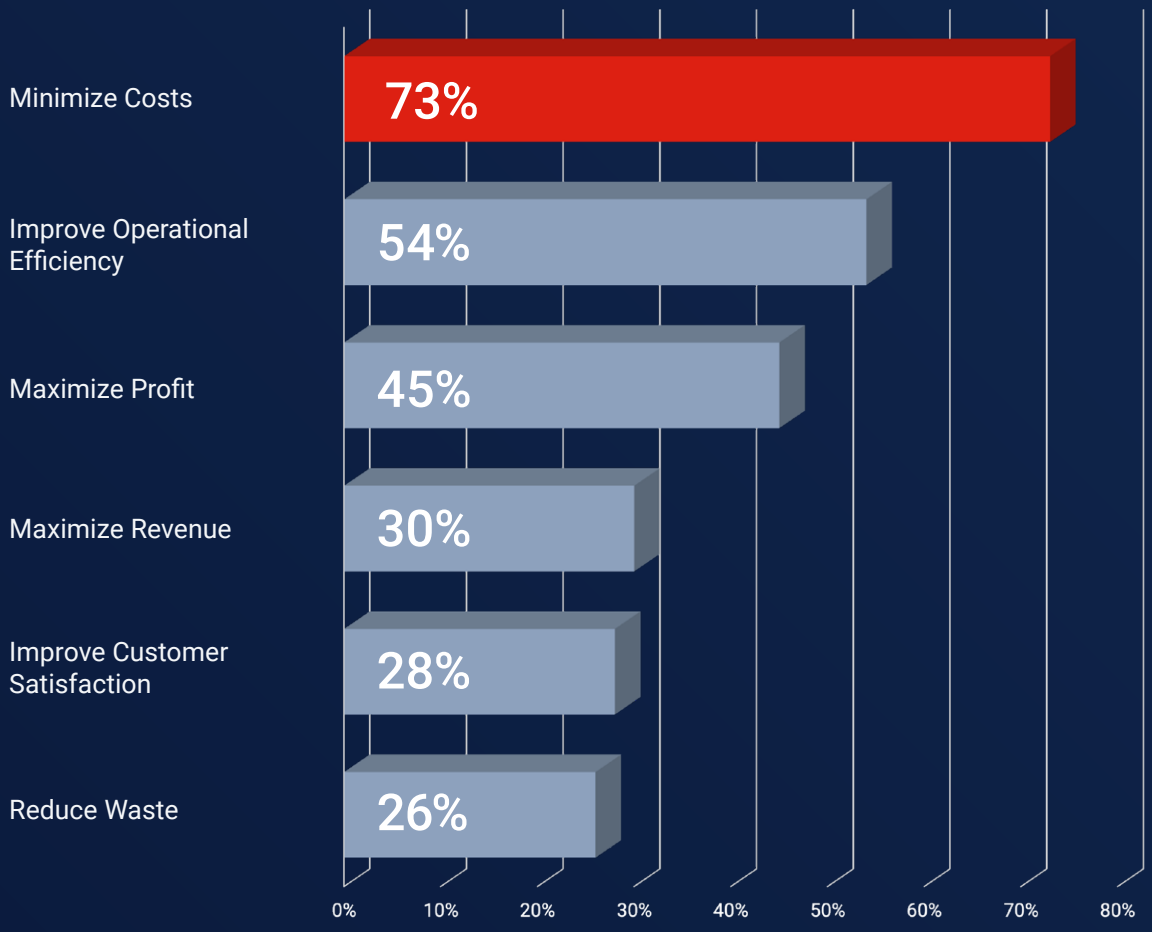
The Impact of Mathematical Optimization

Survey respondents reported a broad range of outcomes from applying mathematical optimization. Nearly three-quarters (73%) said they used it to minimize costs, and more than half (54%) cited improvements in operational efficiency.

Compared to previous years, there was a large increase in respondents reporting that they were minimizing costs and reducing waste. This trend aligns with the global business environment, where many organizations are focused on efficiency and margin protection.

Cost reduction is the leading outcome organizations achieve with optimization.

Which business objectives does mathematical optimization help your company achieve?*



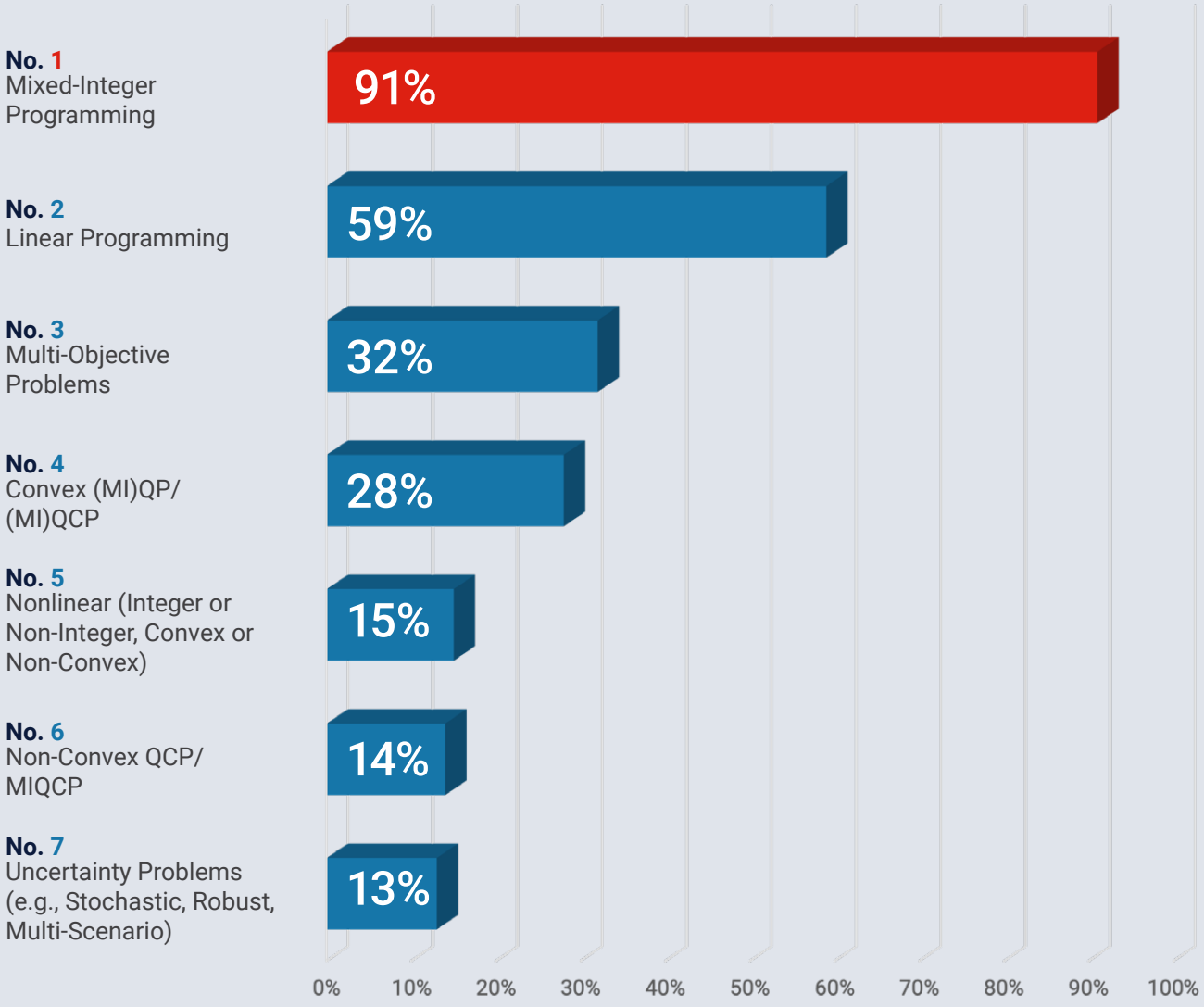
Respondents could select multiple options.

Solving Optimization Problems at Scale

Mathematical optimization practitioners use a number of different programming languages to solve a variety of problems. In spite of language flexibility, the vast majority (81%) prefer to program in Python, followed by C++ (14%) and R (13%).

The most commonly reported problems that respondents solve with mathematical optimization were mixed-integer programming (MIP) (91%), followed by linear programming (59%), and multi-objective problems (32%). Compared with last year, each category showed slight increases, indicating steady growth not only in adoption but also in the breadth of applications. While MIP continues to serve as the workhorse of optimization, the data suggest that teams are increasingly exploring more complex and specialized problem types as they mature in their use of the technology.

Which types of problems do you solve most often with mathematical optimization?*



Respondents could select multiple options.

Leveraging Artificial Intelligence

Artificial intelligence has become an important complement to mathematical optimization. The majority of survey respondents (81%) reported combining machine learning and optimization for at least one project, indicating that this practice has become a standard part of applied optimization work.

GenAI is also beginning to enter the picture: 31% of respondents reported already using or experimenting with large language models alongside optimization. While still at an earlier stage, this adoption rate suggests that optimization professionals are quick to explore emerging AI tools as part of their toolkits.

An Established Approach: Machine Learning and Mathematical Optimization

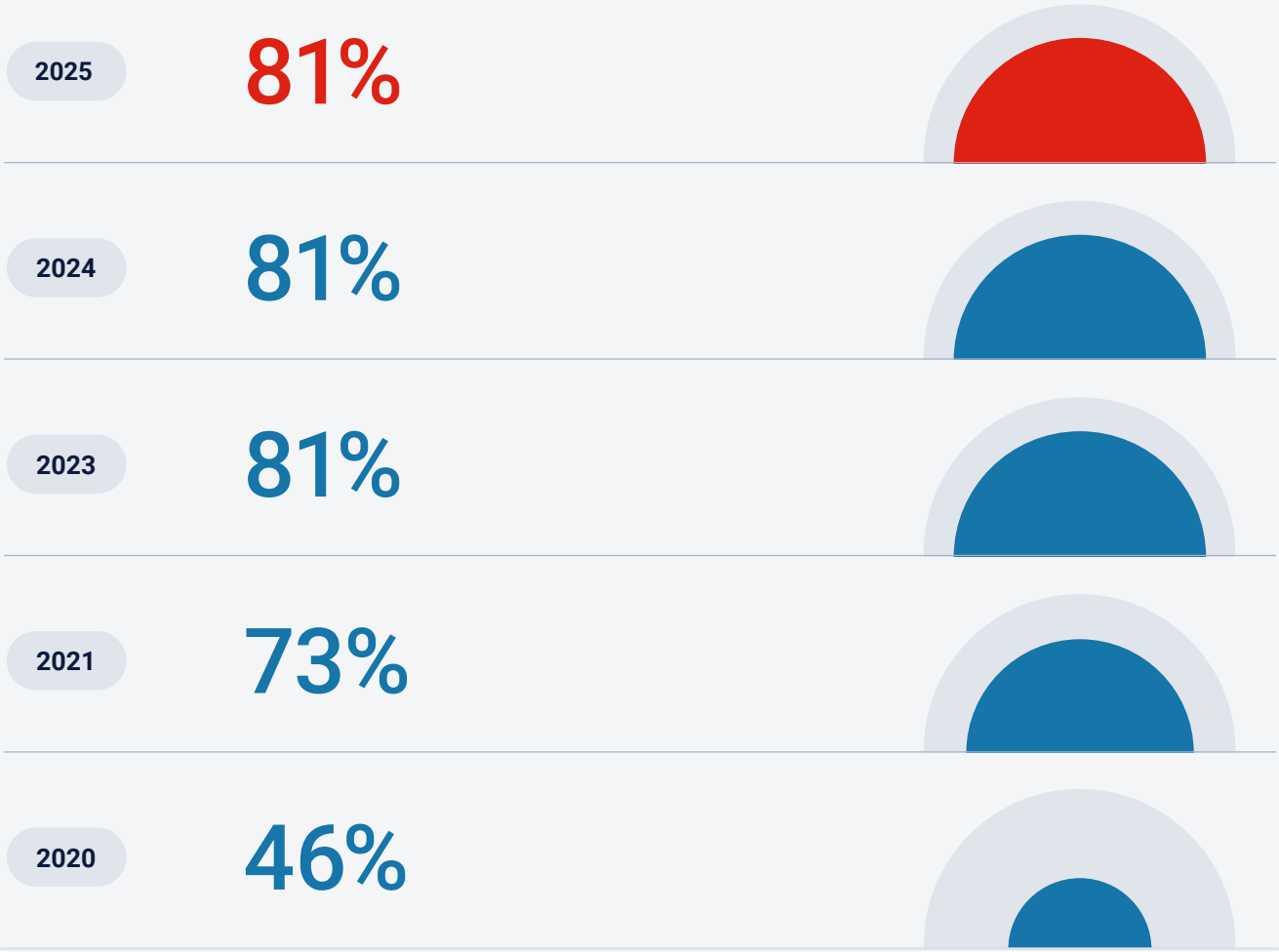
The broader demand for AI skills continues to rise. According to the Federal Reserve Bank of Atlanta, nearly 628,000 U.S. job postings in 2024 (1.7% of all vacancies) required at least one AI skill—up from just 0.5% in 2010.

Within optimization, machine learning has already become a well-established complement. In 2020, fewer than half of survey respondents (46%) reported combining machine learning and optimization. Adoption accelerated quickly, and by 2023 it reached 81%—a level that has now held steady for three consecutive years.

This stability indicates that the use of machine learning in optimization projects is no longer an emerging trend, but a standard practice for most applied optimization teams.

Machine learning has become a standard complement to optimization — no longer an experiment.

Organizations that have at least one project that combines machine learning and optimization



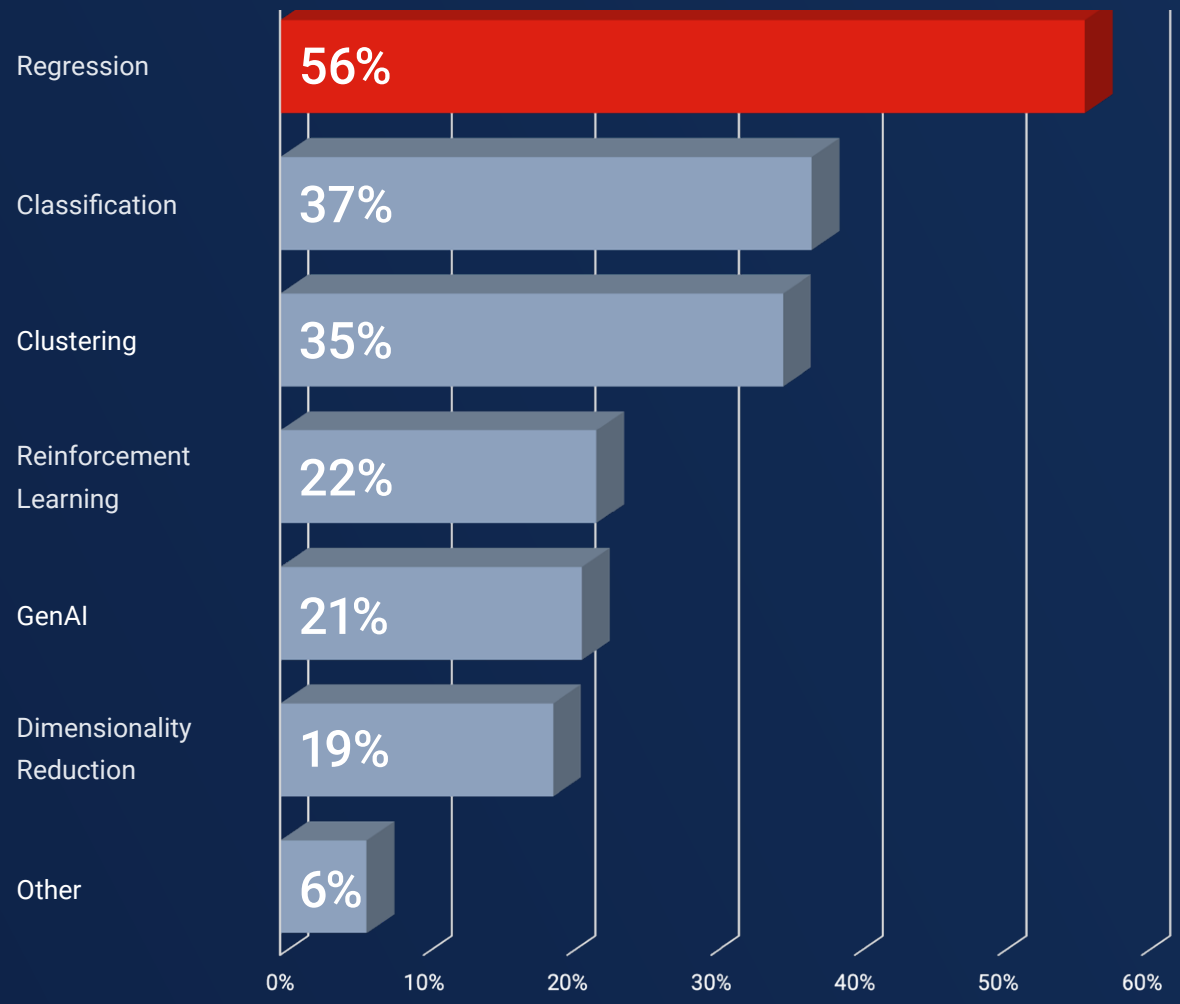
Machine Learning Techniques

This year, the most common machine learning techniques our respondents reported using in combination with mathematical optimization were regression (56%), classification (37%), and clustering (35%). These findings are similar to previous years, as the top three techniques remain the same.

Respondents also reported some use of advanced techniques, including reinforcement learning (22%) and GenAI (21%). While traditional methods remain dominant, these results show early exploration of newer approaches.

The most commonly used machine learning tools reported by our respondents were Scikit Learn (50%), PyTorch (37%), and TensorFlow (35%), reflecting both the accessibility of widely used ML libraries for common tasks and the growing role of deep learning frameworks.

Which machine learning techniques are being used in concert with mathematical optimization?*



Respondents could select multiple options.

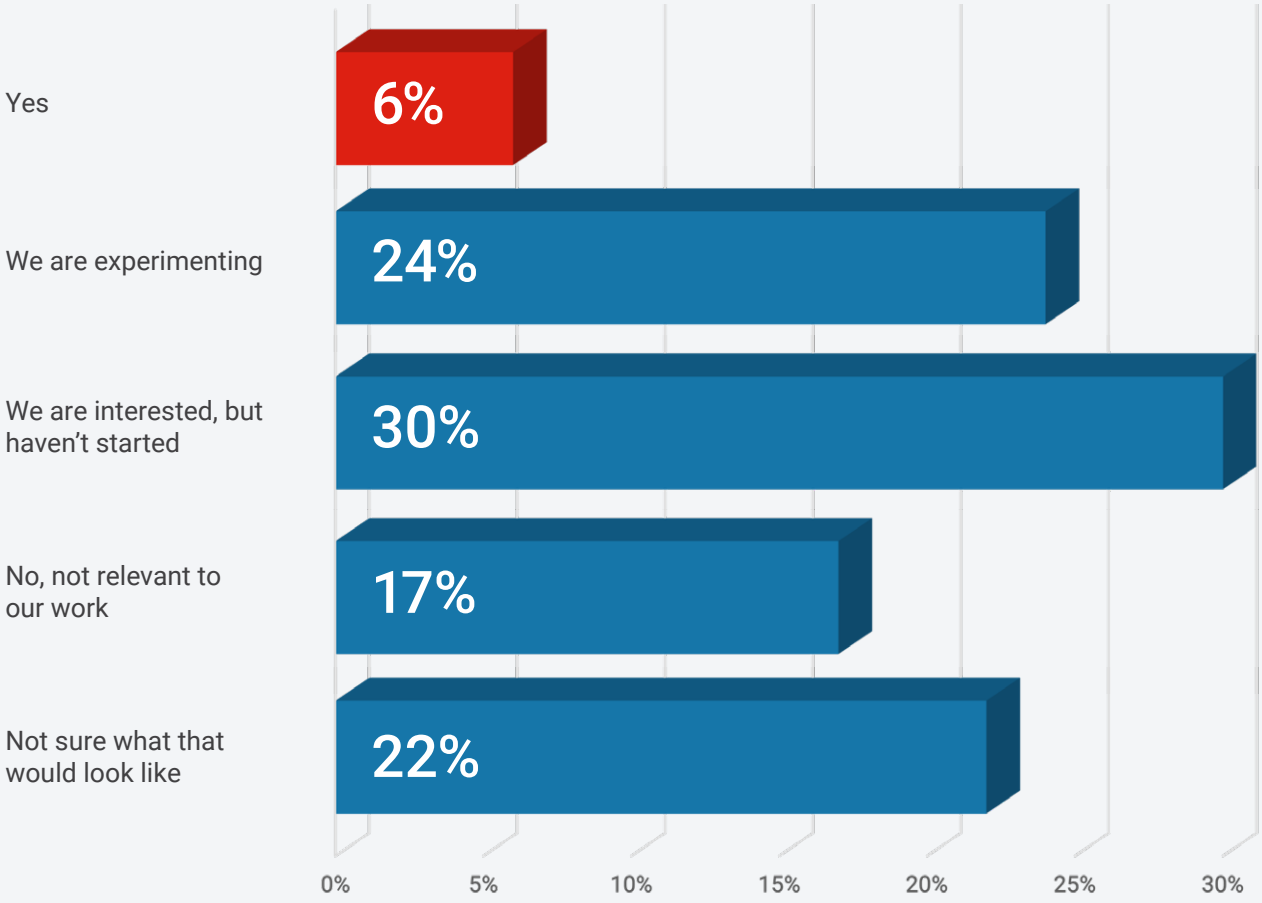
A Newcomer: The Rise of GenAI

While machine learning is now a well-established complement to optimization, GenAI is still in its early stages. This year's survey found that 6% of respondents are already combining optimization and GenAI, and another 24% are experimenting.

Interest is significant: 30% of respondents said they are interested but have not yet started, while 22% are unsure how the technologies might work together. Taken together, these results suggest that GenAI remains at an exploratory stage for most organizations. For many teams, the priority is still to understand what role, if any, it should play alongside established approaches like machine learning.

GenAI is still exploratory: few use it today, many are watching closely.

Are you combining mathematical optimization and GenAI or large language models?



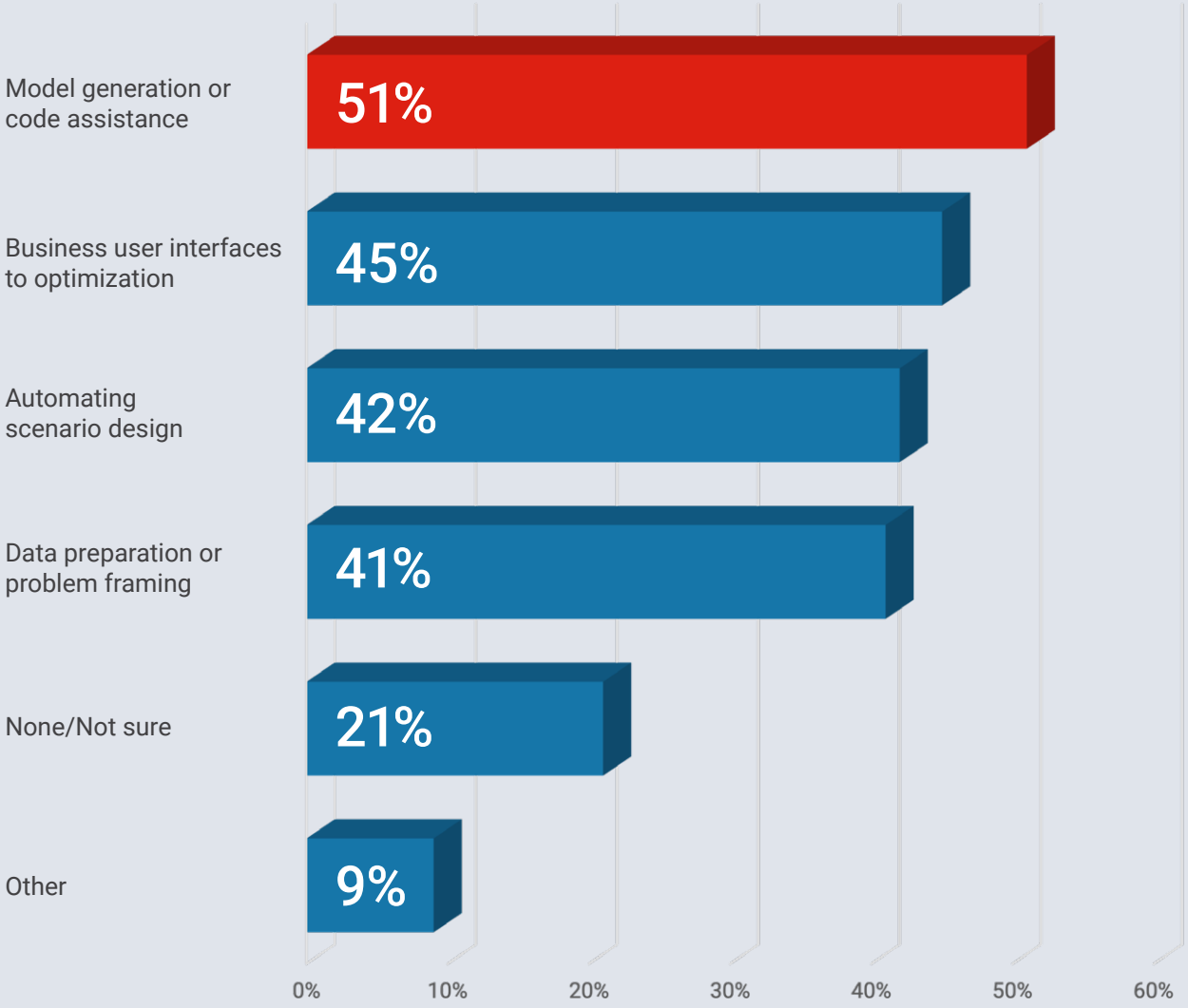
Totals may not equal 100% due to rounding.

How Applied Optimization Professionals Leverage GenAI

When asked where GenAI might add value, respondents most often pointed to support tasks rather than core optimization itself. The top potential use cases were model generation or code assistance (51%), business user interfaces to optimization (45%), automating scenario design (42%), and data preparation or problem framing (41%).

At the same time, one in five respondents (21%) said they were unsure or did not see relevant applications yet—highlighting that the role of GenAI in optimization remains exploratory and uneven across organizations.

Which use cases do you believe could benefit from combining GenAI and optimization?*



Respondents could select multiple options.

Section 04

Trends to Watch

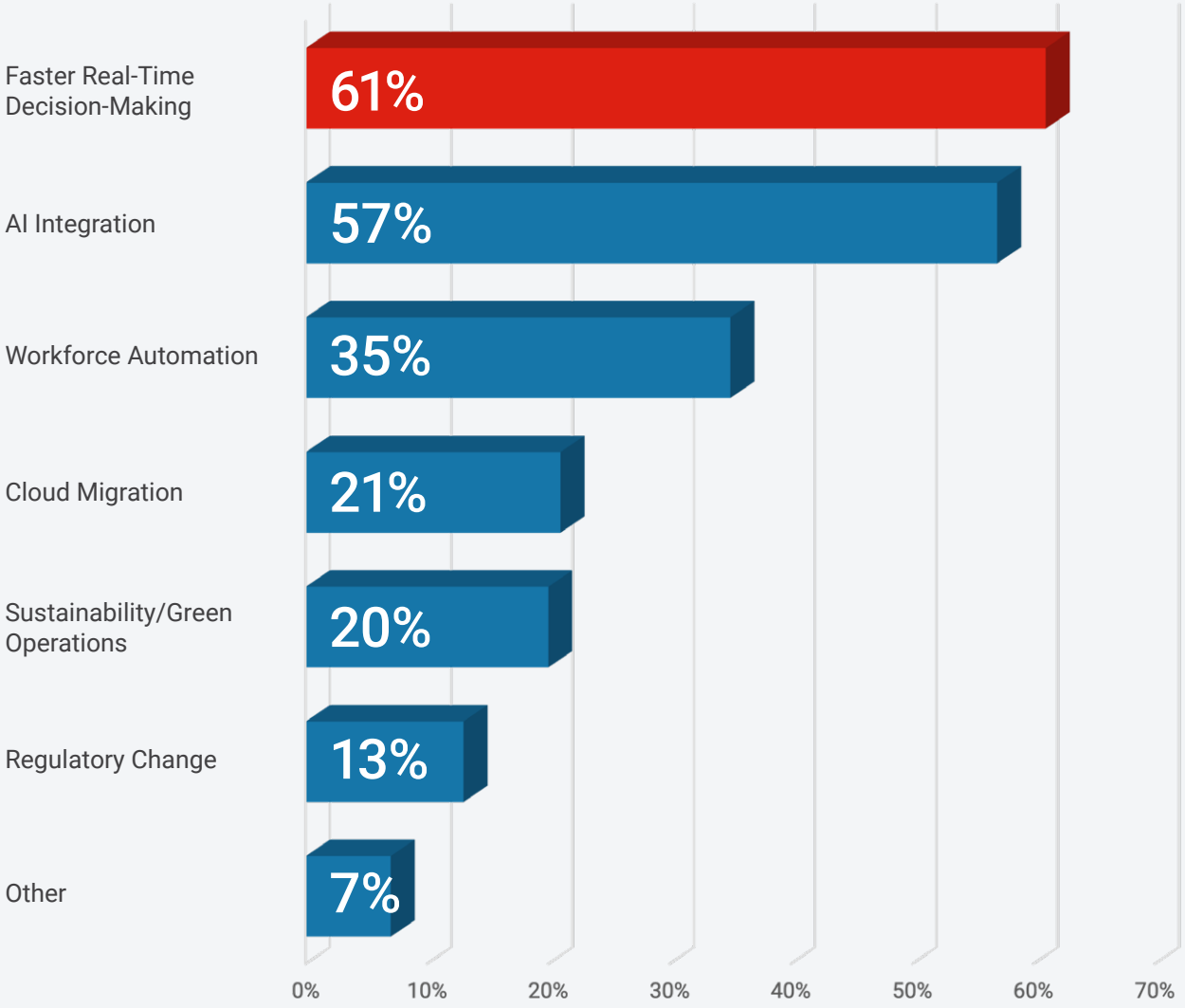
This year, we expanded our questions beyond respondents' current reality. We wanted to hear from them on the trends they believe will shape their work going forward. Most (61%) respondents believe that faster, real-time decision-making is the trend that most impacts their work. In addition, teams will continue to adopt technology, with 62% planning to increase the use of optimization software, and 41% believing that GenAI will play a significant role in decision-making.

The Need for Speed

When we asked respondents what trends most impacted their optimization work, most (61%) said the demand for faster, real-time decision-making. This is not a surprise, given that 69% of respondents said that their organizations use mathematical optimization for daily or real-time decisions. This reinforces two major themes of this report: businesses need applied optimization professionals, and they need a fast solver.

Other major trends include AI integration (57%), workforce automation (35%), cloud migration (21%), sustainability/green operations (20%). Optimization is increasingly expected to support decisions that are not only faster, but also more connected to broader technological and organizational shifts.

Which trends are most impacting your optimization work?*



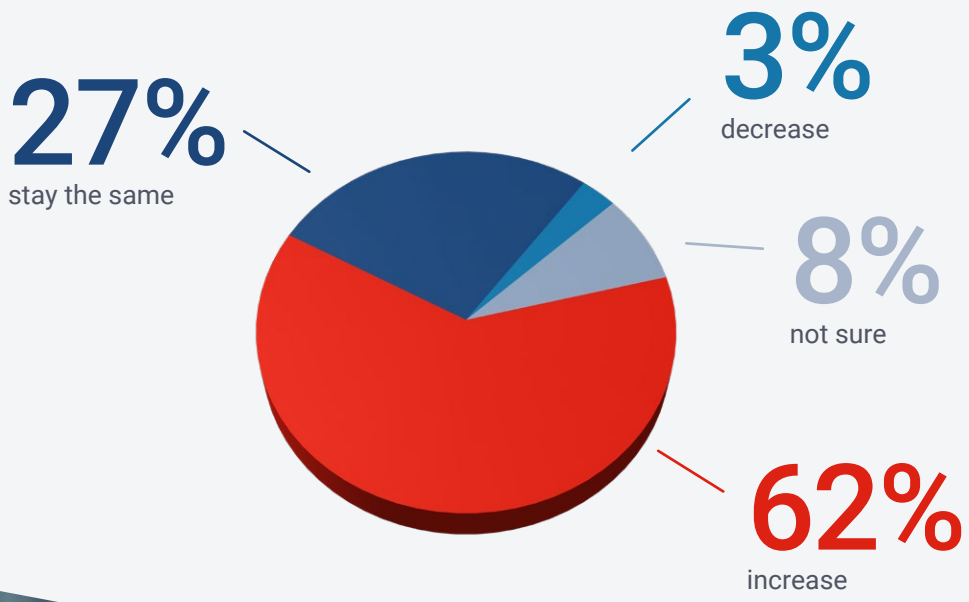
Respondents could select multiple options.

Increased Use of Technology

Most respondents (62%) reported that their organizations plan to increase their use of optimization software in the next 12 months. Another 27% expect usage to remain steady, while only 3% anticipate a decline.

These findings align with broader trends identified in the survey: as teams grow and optimization becomes more embedded in decision-making, organizations are allocating resources to expand their use of the technology across strategic, tactical, and operational levels.

Do you plan to increase or decrease your use of your optimization software in the next 12 months?

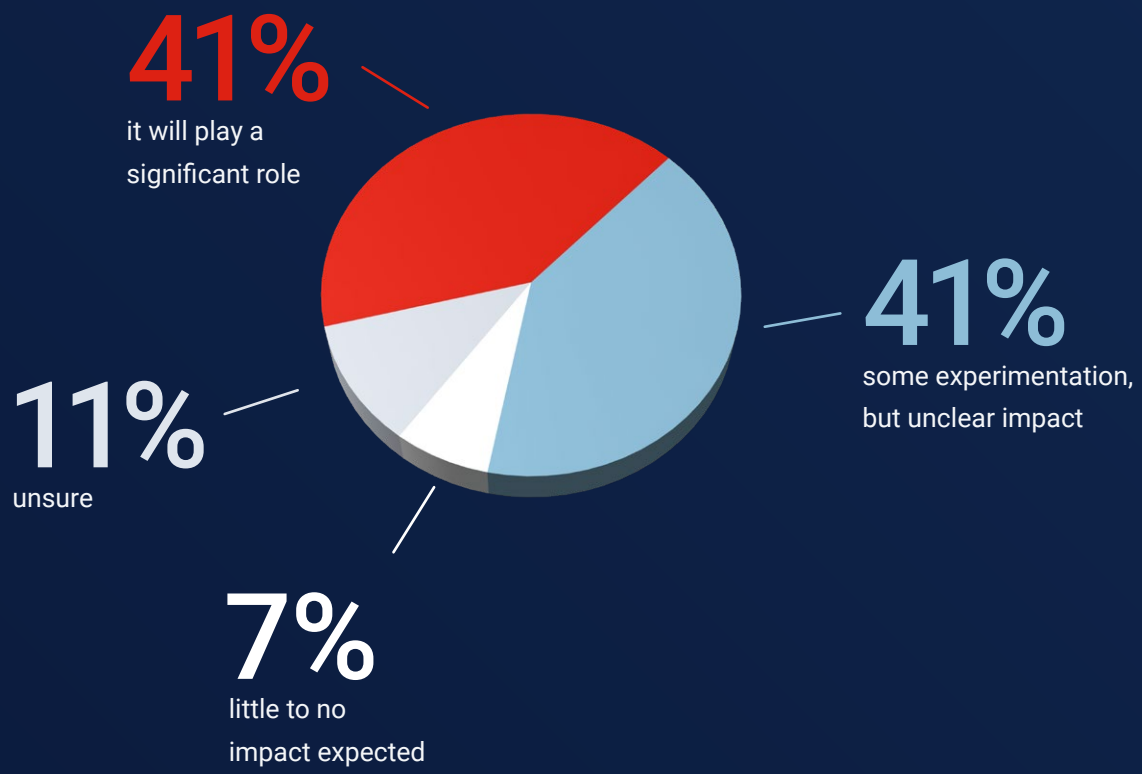


Uptake of GenAI

When asked about the role of GenAI in their organization's decision-making over the next 1–2 years, respondents expressed both openness and uncertainty. Forty-one percent expect it to play a significant role, while another 41% anticipate some experimentation but remain unclear about its ultimate impact.

Only a small share (7%) expect little or no impact, though 11% said they were unsure. Overall, these responses suggest that while most organizations are exploring how GenAI might fit into their decision processes, its role is still being defined.

How do you see GenAI impacting your organization's decision-making processes over the next 1–2 years?



Section 05

The Gurobi Difference

Respondents reported switching to Gurobi for a variety of reasons, including Gurobi's speed, support, Python API, and ability to solve a wide range of problem types. These results suggest that, as organizations embed optimization more deeply into daily and real-time decision-making (reported by 69% of respondents), they place a premium on performance and reliability. The factors driving solver choice reflect the qualities that practitioners consider essential to demonstrating the value of optimization within their organizations.

Reasons for Switching to Gurobi

A majority of survey respondents (53%) reported switching to Gurobi from another commercial or open-source solver. Those that switched shared that their top frustration with their previous solver was performance (49%).

Speed continues to be the leading driver for choosing Gurobi, with 81% of respondents citing it as a reason for switching. The second most common factor is Gurobi's customer support (48%), followed closely by its ability to handle a wide range of problems (44%).

Other important reasons include the Python API (37%) and numerical robustness (28%).

#1: Speed

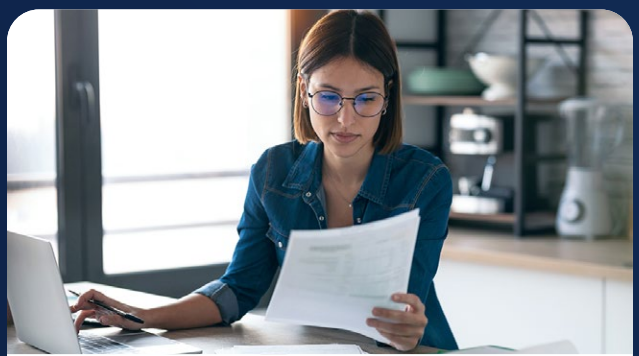
Gurobi delivers the fastest solver speed in the industry.

#2: Support

The Gurobi Experts Team delivers technical support and guidance within hours, not days.

#3: Problem Types

Gurobi supports a full range of problem types, including LP, MIP, MIQP, MIQCP, non-convex, and more.



#4: Gurobi Python API

Our Python API makes it easier to build optimization models.

How Gurobi Impacts Decisions

After adopting Gurobi, many organizations reported broadening and deepening their use of optimization. Forty-one percent of respondents said they expanded into new use cases, while 21% embedded optimization into core decision-making systems.

These findings suggest that solver choice can influence not only technical performance but also the extent to which optimization becomes part of an organization's daily decision processes.

The Expanding Reach of Optimization

Mathematical optimization continues to gain traction with decision-makers. As teams leverage mathematical optimization to advance their organizations' goals, we believe business leaders will allocate more precious budget resources to hiring talent and applying teams' skills to new business units.

For example, many respondents (41%) reported that supply chain challenges motivated their search for an optimization solution. As global economic drivers reshape trade relationships and supply chains, mathematical optimization will become even more crucial for helping businesses navigate changes in the short, medium, and long term.

Looking Forward

What's Next for Optimization?

This year's findings point to strong momentum in mathematical optimization. We see clear growth signals across the market. Organizations are:

- expanding optimization teams;
- ranking optimization as increasingly critical to their operations; and
- expecting broader solver usage in the years ahead.

This confirms that optimization is moving from a niche to a core capability across industries.

The future of optimization will depend not only on innovation but also on accessibility—making optimization relevant, compelling, and easy to apply alongside other fast-moving technologies like GenAI. Optimization has the opportunity to stand out as the discipline that turns predictions and insights into real, defensible decisions.

How Gurobi Is Investing in the Future of Optimization

At Gurobi, we're investing to help realize this future:

- Gurobot lowers barriers to entry by giving teams a simple, conversational way to learn, troubleshoot, and engage with optimization.
- The Gurobi Innovation Lab partners with customers to experiment, apply new technologies, and co-create solutions to critical business problems.
- The Gurobi Engineering MIP School (GEMS) develops the next generation of optimization talent, ensuring organizations have the skills to capture the full value of these tools.

The next chapter of optimization is about both scale and relevance—helping more people unlock its power to drive smarter, faster, and more confident decisions.

Experience Gurobi for Yourself

Our 30-day evaluation license includes:

- Free benchmarking services
- Free model tuning services
- Free access to our world-class technical guidance and support

Visit gurobi.com/free-trial to get started!

Academics: You may qualify for a free, full-featured Gurobi license. Explore our academic program at gurobi.com/academia.