Networking
CISCO Academy

Educating Tomorrow's ICT Workforce

The role of generative AI skills in entry-level ICT roles

In collaboration with
Lightcast

Welcome letter from Par

The future of work is not waiting, and, at Cisco, neither are we. Our Learn with Cisco team, inclusive of Cisco Networking Academy, is committed to staying at the forefront of change and working alongside educators around the world to shape what comes next.

For more than 25 years, Cisco Networking Academy is one of the largest and longest-standing IT skills-to-jobs programs in the world. Today, that mission is more urgent than ever. Artificial intelligence (AI) is accelerating the pace of change across every industry, redefining the skills required to compete and succeed. Thriving in this AI-powered era demands a new blend of technical expertise and critical human capabilities, including complex reasoning, creativity, and collaboration.

Instructors are the catalyst for this change. You are the force preparing the next generation of technology leaders. Our research shows that while more than 80% of our instructors recognize AI and machine learning (ML) as critical to the future, only 10% feel fully equipped to teach these subjects today. We hear you, and we are taking action.

In partnership with Lightcast, a leader in labor market analytics, we coauthored this white paper, "Educating Tomorrow's ICT Workforce: The role of generative AI skills in entry-level ICT roles." Using real-world labor market data, we mapped nine essential information and communication technology (ICT) roles across cybersecurity,

networking, IT support, and data science, highlighting where AI is creating opportunity and where human skills remain irreplaceable.

Across Cisco, we see AI adoption accelerating beyond large language models (LLMs) to agentic AI with systems capable of planning, reasoning, and taking action while extending into the physical world through intelligent devices, networks, and infrastructure. This transformation is reshaping industries, workplaces, and entire communities. But as technology evolves, we are equally committed to nurturing the workforce that will drive it. We believe the future must be human-centered to ensure that talent is not just ready to adapt, but empowered to lead, innovate, and fully participate in this new era of opportunity.

We are committed to working alongside you by providing the curriculum, tools, and insights you need to prepare your learners for the future. Cisco's continued investment in Networking Academy, and our broader Learning at Cisco initiatives, reflects our belief that a talented, future-ready workforce is the engine of technology advancement and impact.

We thank you for your continued leadership and commitment to shaping today's workforce for tomorrow's impact.

Par Merat
Vice President, Learning at Cisco

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Executive summary

The rapid advancement of generative AI (GenAI) is catalyzing broad AI adoption in every business and transforming the nature of work, the way tasks are executed, and the required skills. This evolution presents both opportunities and challenges, especially in the ICT sector, where GenAI's proficiency could augment some skills, making them more relevant while also reducing the relevance of other skills. Technological advancements also create new growth opportunities centered around mastering new skills and technologies that will make workers more effective in their current roles.

Cisco Networking Academy is one of the largest and longest-standing IT skills-to-jobs programs in the world. Since 1997, the program has been transforming the lives of learners, educators, and communities through the power of technology, education, and career opportunities. A recent survey revealed that while 87% of Cisco Networking Academy instructors recognize the importance of teaching AI/ML, only 10% feel equipped to do so.[1] To address this, Cisco has partnered with Lightcast to assess GenAI's impact on current skills and new ones required for nine key ICT roles across cybersecurity, networking, IT support, and data science.

The study revealed several key findings:

- **All nine job roles analyzed are expected to experience time-saving benefits from GenAI technology in the near term.** By effectively integrating GenAI into their workflow, workers in these roles may achieve time savings ranging from 15% to 52% in their daily tasks.

- **Many roles exhibit substantial resistance to the adoption of GenAI due to the necessity for human oversight.** Notably, cybersecurity and network engineering roles face significant barriers to short-term task automation adoption, where the consequences of errors in their daily tasks are high.[2] Cybersecurity in particular presents a promising field for aspiring students and professionals, because its high-risk profile will continue to require human supervision and management. Therefore, the application of AI will be more on augmentation than complete task automation.

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1   Results obtained from the Cisco Networking Academy Annual Instructor Survey in fiscal 2025 from 2,274 instructors who were actively teaching.

2   In this research, *short-term* refers to 18–24 months, based on GenAI technologies available as of mid-2024, while *long-term* spans 24–48 months and beyond and considers advances in these technologies, especially in terms of reliability.

- **The short-term impact of GenAI varies across different roles, with automation engineers, developers, and data analysts likely to be the most affected in the near future.** On average, these roles are projected to have about 36% of their current skill sets increase in relevance by GenAI while another 29% of skills decrease in relevance. Roles that require more physically interactive tasks, such as IT Support Specialists and Network Administrators, are expected to feel only mild impacts from GenAI in the near term.

- **GenAI significantly impacts writing and coding skills but currently does not rival humans in interpersonal and complex reasoning skills.** GenAI can aid ICT workers in writing technical documentation and code snippets. However, it lacks the capacity for critical thinking and problem-solving on complex issues that require experience, context, collaboration, and communication across multiple individuals.

- **Across all roles, workers will need to refine their existing value-added skills and acquire emerging GenAI skills to remain competitive.** Unique human skills such as communication, people management, innovation, and domain knowledge will continue to be crucial for validating AI outputs and effectively leveraging the technology in decision-making. For ICT professionals, GenAI skills—such as Prompt Engineering, LLM Architecture, and Retrieval Augmented Generation (RAG)—and the ethical and responsible use of AI are promising areas for upskilling and enhancing productivity.

Based on these findings, high-level recommendations for instructors preparing students for these roles include the following:

1. **Equip students with core professional skills** Foster critical thinking, problem-solving, creativity, and curiosity. Emphasize human agency in working with AI and the importance of verifying AI-generated content.

2. **Integrate AI Literacy across all roles** Incorporate AI Literacy and Prompt Engineering into all ICT programs, adapting topics like LLM Architecture, RAG, and machine learning operations (MLOps) to each role's needs.

3. **Teach both the why and the how of work** Ensure students not only learn how to perform tasks but also understand the reasoning behind their work.

4. **Prioritize responsible AI and ethics** Make education on responsible AI and AI ethics a core focus in all learning programs.

Introduction

The rapid advancement of AI, particularly in the form of GenAI, is revolutionizing the nature of work. GenAI demonstrates capabilities in content generation—including text, images, sound, and code—mirroring several human skills. These advancements have the potential to alter the future landscape of work significantly.

The increasing sophistication of GenAI technologies has sparked both interest in their adoption and concerns regarding the potential displacement of human labor across various job sectors. This concern is relevant in the ICT sector, where the emerging agentic workflow and GenAI's proficiency in code generation, natural language processing, and data augmentation and management could challenge the existing skill sets that define professions in ICT. However, while technological advancements may displace certain skills, they also create new job opportunities, often centered around mastering new technology or undertaking novel tasks. In addition, within each job, GenAI will create opportunities for workers to rethink how tasks are done and shift their focus to new skills.

Cisco Networking Academy is a purpose-driven program dedicated to transforming the lives of students, educators, and communities through the power of technology,

education, and career opportunities. A recent survey of Cisco Networking Academy instructors found that 87% of respondents felt that it is very or extremely important to teach AI/ML as a technical skill. From the same survey, only 10% of the instructors believe they have the expertise to teach the topic.

With this research and report, we intend to equip instructors with the knowledge and resources to better understand the potential impact of GenAI on entry-level ICT jobs and help prepare their students accordingly.

Importance of skills in preparing students for jobs

In the rapidly evolving field of ICT, developing a robust set of skills is crucial for students preparing for entry-level positions. These skills not only encompass technical proficiencies such as programming, network management, and cybersecurity but also include core professional skills (soft skills) like critical thinking and problem-solving, creativity and curiosity, communication and collaboration, and empathy and ethics. Mastery of these competencies ensures that students can adapt to the dynamic nature

of the ICT landscape, troubleshoot issues efficiently, and collaborate effectively within teams. Furthermore, a well-rounded skill set enhances employability, as employers seek candidates who can contribute to projects from day one, minimizing the need for extensive on-the-job training. Ultimately, equipping students with a comprehensive skill set fosters confidence, promotes career readiness, and lays a solid foundation for future professional growth in the ICT sector.

For over 25 years, Cisco Networking Academy instructors have been focused on helping their students develop the skills needed for success in ICT roles. This effort requires identifying the skills that employers need and then providing engaging, hands-on instruction that helps students not only understand a concept but also apply it and gain the requisite skills.

Industry-recognized certifications such as Cisco Certified Network Associate (CCNA), Cisco Certified Support Technician (CCST), and many others can play a critical role in helping students become valued employees. From an instructional standpoint, the certifications set the target for the skills that employers are seeking. And from the employer side, they validate that the candidate has gained the requisite knowledge and skills.

The acceleration of AI adoption, catalyzed by the advent of GenAI, is changing the skills that employers are requesting for ICT job roles. We should expect even more changes in the future. To help instructors better prioritize and focus as they prepare their students for entry-level ICT job roles impacted by GenAI, Cisco Networking Academy has partnered with Lightcast to assess GenAI's impact on skills within nine key entry-level roles covered in the program's curricula:

·   Cybersecurity Analyst
·   Ethical Hacker
·   SOC Analyst - Level 1
·   Network and IT Automation Engineer
·   Network Support Technician
·   Network Administrator
·   IT Support Specialist
·   Data Analyst
·   Python Developer

Leveraging Lightcast's proprietary data extracted from over one billion current and historical job postings, this study identifies skills within each role that may be augmented or face potential displacement due to GenAI. The insights from this analysis aim to guide educators, students, tech professionals, and employers to strategically focus their training and upskilling efforts and stay abreast of GenAI development.
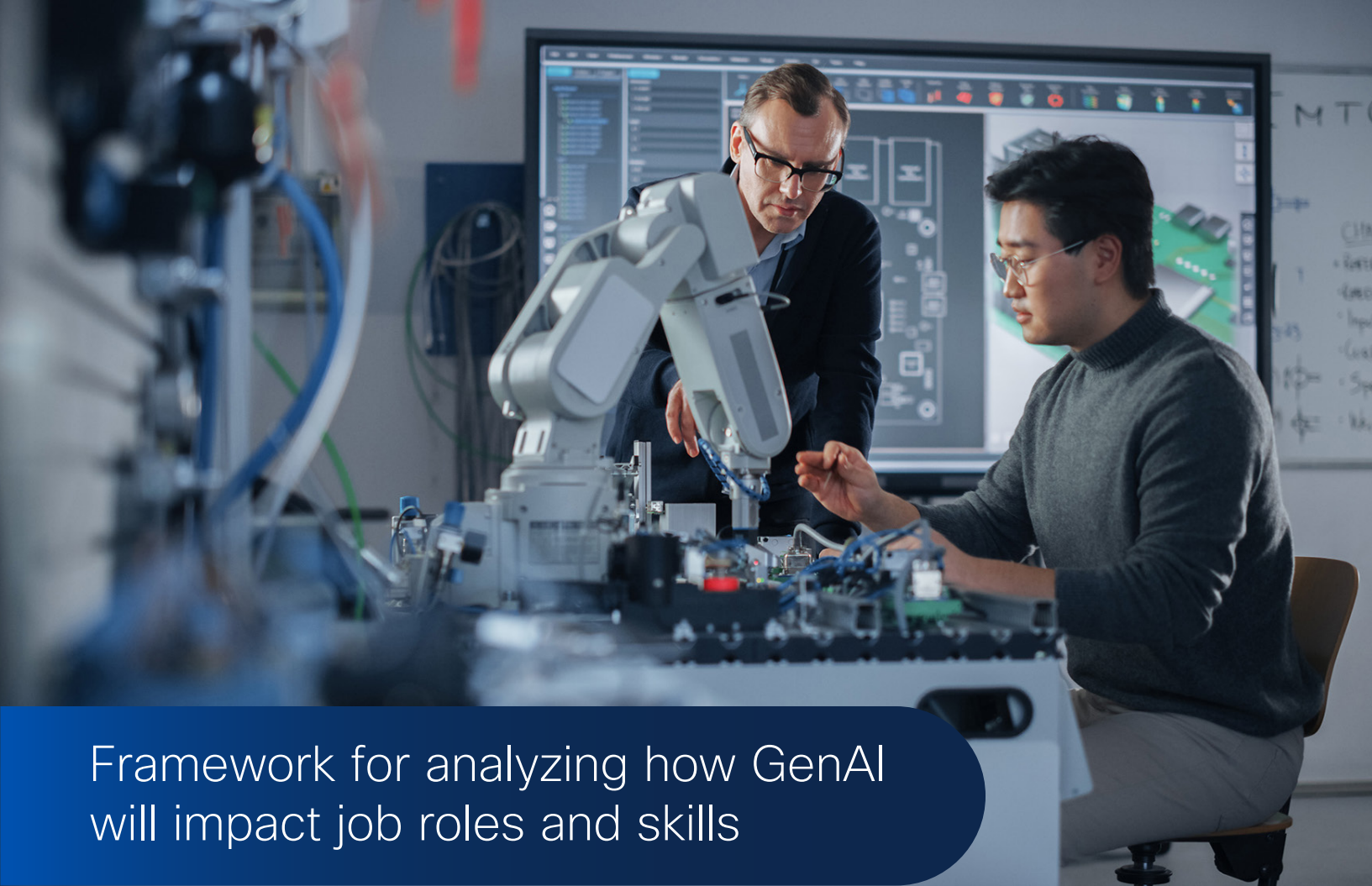
Framework for analyzing how GenAI will impact job roles and skills

We developed an innovative framework to quantify the impact of GenAI at skill and role levels. The process started by identifying principal skills associated with each of the entry-level job roles selected by Cisco Networking Academy using Lightcast's proprietary database of job postings in the United States. A task profile for each role was then curated based on the O*NET tasks for the occupation that best matched the given role.[3]

After finalizing the skill and task profiles, we created a custom mapping to link each of the principal skills into the tasks identified in the previous step. Skills could be used across multiple tasks within a role; for example, the Writing skill could be used in various tasks, including Preparing Reports, Documenting, and Planning.

In the next steps, both OpenAI's GPT-4 model and subject matter experts (SMEs) were utilized to assess the exposure of skills to GenAI and the barriers to its adoption. These assessments were conducted at the task level to quantify the exposure and barriers associated with GenAI's ability to perform the tasks of a given job role. GenAI exposure was estimated considering the potential time savings if workers used LLMs to complete tasks, while barriers to adoption indicated the need for human involvement in those tasks. These measurements were then passed down to all the skills used in each task. Finally, overall skill-level GenAI exposure and adoption barrier metrics were computed by averaging across all tasks. This process helped to quantify the two metrics for skills while contextualizing them within each role.[4]

Based on the exposure and adoption barrier metrics, the impact of GenAI on skills was categorized into one of three categories: *Increasing Relevance*, *Decreasing Relevance*, or *Stable*. Notably, skills that would see *Increasing Relevance* were highly exposed to GenAI but still required substantial human oversight. Those skills categorized as *Decreasing Relevance*, on the other hand, faced the risk of being automated away, because they were highly exposed to the

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3   Among the roles studied in this research, two roles (Network Administrator and Network Support Technician) have rather outdated task profiles on O*NET: the O*NET task profiles for Network Support Technician and Network Administrator were last updated in 2014 and 2017, respectively. To address this, we supplemented these profiles with job responsibilities distilled from the Lightcast job postings database, and subsequently had the final task lists validated by internal SMEs.

4   For instance, Communication faces limited exposure to GenAI for a Network Administrator, because the tasks utilizing this skill are highly interactive in nature; thus, GenAI offers limited help. On the other hand, for a Data Analyst, this skill is needed for a few tasks, such as Generating Reports, where GenAI can help substantially with creating templates and scripting to produce standard recurring reports.

technology yet did not require much human involvement. Skills requiring active human involvement and currently facing less exposure to GenAI capabilities were considered *Stable*, as were skills that did not face significant exposure or substantial barriers to adoption.

Additionally, the overall impact of GenAI on each job role was measured by computing average role-level exposure and adoption barrier metrics, as well as the proportions of the role's skill set that were categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

This analytical framework entailed a few technical limitations, including random variation and potential bias in GPT-generated ratings. To mitigate these issues, multiple GPT-generated results were aggregated and validated with independent ratings by SMEs. Additional methodological details are provided in the appendix.

However, one caveat persisted in this framework: it primarily offered a short-term impact assessment based on current GenAI capabilities. Because GenAI technologies are rapidly evolving, their full potential often remains unknown, even to experts. Consequently, predicting their long-term impacts is exceedingly challenging (Grace et al., 2024). To address this, a thought exercise was proposed to explore the long-term impacts within the framework. It was hypothesized that AI capabilities would eventually expand to master more tasks and skills. However, even if the technology matured, certain tasks, such as those with a high-risk nature, would still require human involvement. As a result, skills required for such tasks would remain resilient and would be augmented, rather than replaced, by GenAI. Further details on this exercise and its findings are elaborated in the "Overall findings" section of this report.

For each job role, we also gathered input from SMEs across the relevant technology domains with knowledge of the capabilities of GenAI tools. They provided estimates of the potential time reduction for each task when using GenAI tools, categorized as *unaffected, reducing time by at most 50%,* or *reducing time by at least 50%*.

Finally, we complemented the quantitative analysis with qualitative inputs from the SMEs across the relevant technology domains. Conversations with these experts offered valuable detailed insights into current GenAI use cases; their perspectives on GenAI's impact on skills and tasks; and recommendations for skill training to facilitate effective adoption of the technology.
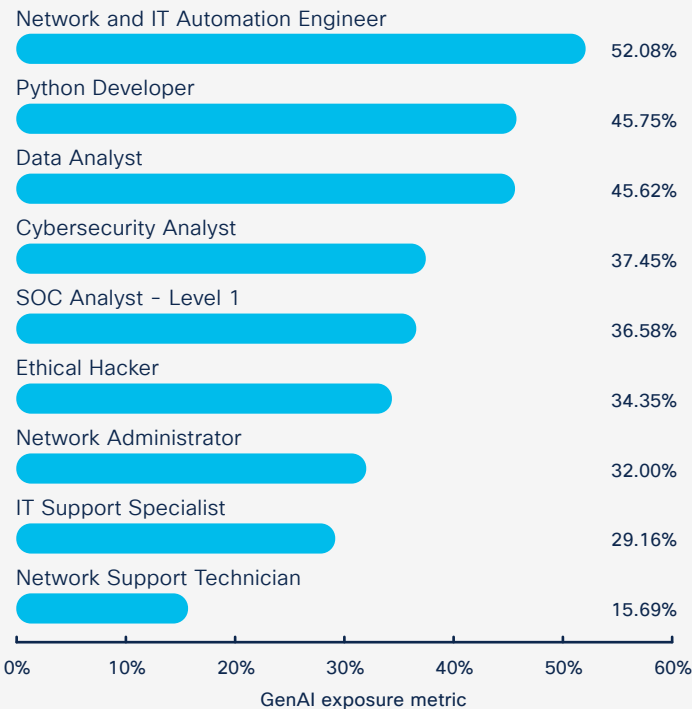
Overall findings

All job roles analyzed will feel the exposure of GenAI in the near term

The quantitative analysis sheds light on the proportion of skills within various job roles that are exposed to GenAI. The results indicate that all job roles in this study are poised to experience exposure to this technology in the near term. Among these roles, Network and IT Automation Engineers, Python Developers, and Data Analysts are projected to be the most affected. The analysis projects that GenAI can help these workers save time by over 40% when augmenting their current skill sets to complete tasks (Figure 1).[5] This heightened impact in these roles results from the emphasis on programming, an area where GenAI can provide significant support, such as through code generation, documentation, testing, and debugging. Conversely, roles that entail more interactive and manual tasks, such as IT Support Specialists, Network Administrators, and Network Support Technicians, are expected to experience a lesser exposure to GenAI over the next 12 months. Despite this, the core skill sets essential to these roles are still expected to see 15%–32% time-saving gains from GenAI.

5   In our framework, GenAI exposure ranges from 0%–75% time saved. The 75% upper bound reflects our conservative conversion of the qualitative label *reducing time by at least 50%*.

Figure 1. Average GenAI exposure by job role

Network and IT Automation Engineer — 52.08%
Python Developer — 45.75%
Data Analyst — 45.62%
Cybersecurity Analyst — 37.45%
SOC Analyst – Level 1 — 36.58%
Ethical Hacker — 34.35%
Network Administrator — 32.00%
IT Support Specialist — 29.16%
Network Support Technician — 15.69%

GenAI exposure metric (0% – 60%)

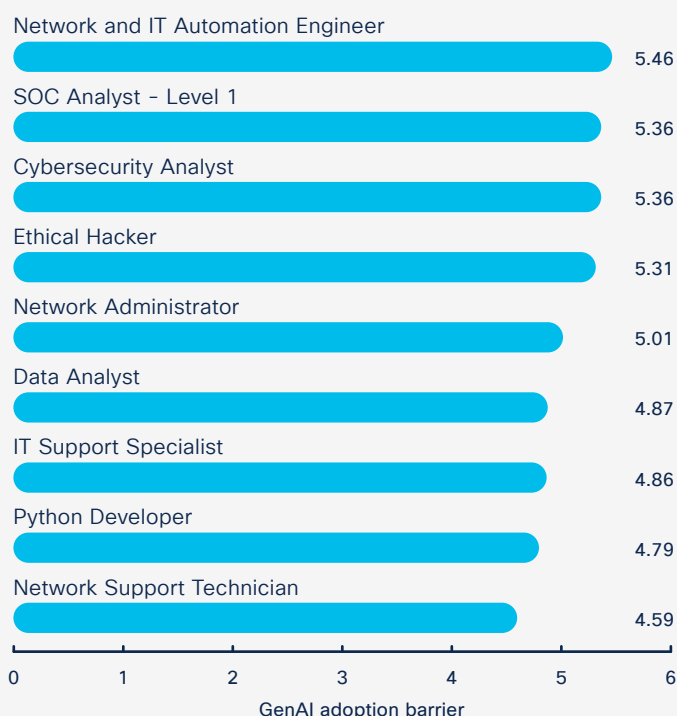*Source: Lightcast GenAI Adoption Barriers Analysis, 2024*

Figure 2 illustrates the extent of the GenAI adoption barrier across roles, quantified on a scale of 1 to 10. The overall barrier score encompasses human-centric work contexts discussed previously, including face-to-face interaction, consequences of errors, frequency of decisions, and the routine nature of tasks. Due to their common focus on technology functions, the roles analyzed here face rather similar adoption barriers. However, the underlying work contexts further reveal the drivers of adoption barriers for each role.

Barriers will slow the adoption of GenAI in some contexts

GenAI capabilities are not the only factor driving the integration of the technology into jobs. Many roles in this analysis will see resistance to full GenAI adoption because they require human oversight.

The GenAI adoption barrier for a skill measures the limitation of relying heavily on GenAI due to the human-centric nature of the tasks requiring that skill. This metric is first assessed on a scale from 1 to 10 at the task level by GPT-4, based on six O*NET work contexts that necessitate significant human involvement: face-to-face interaction, public speaking, responsibility for outcomes of other workers, consequence of errors, frequency of decisions, and lack of routine and structure. A higher requirement for human oversight indicates a higher barrier to GenAI adaptability in the task. The task-level adoption barriers are averaged across tasks to the skill level, with core tasks weighted twice as heavily as supplemental tasks.[6]

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6   According to O*NET's classification, where each task is classified as either core or supplemental.

Figure 2. Average GenAI adoption barrier by job role

Job role	GenAI adoption barrier
Network and IT Automation Engineer	5.46
SOC Analyst - Level 1	5.36
Cybersecurity Analyst	5.36
Ethical Hacker	5.31
Network Administrator	5.01
Data Analyst	4.87
IT Support Specialist	4.86
Python Developer	4.79
Network Support Technician	4.59

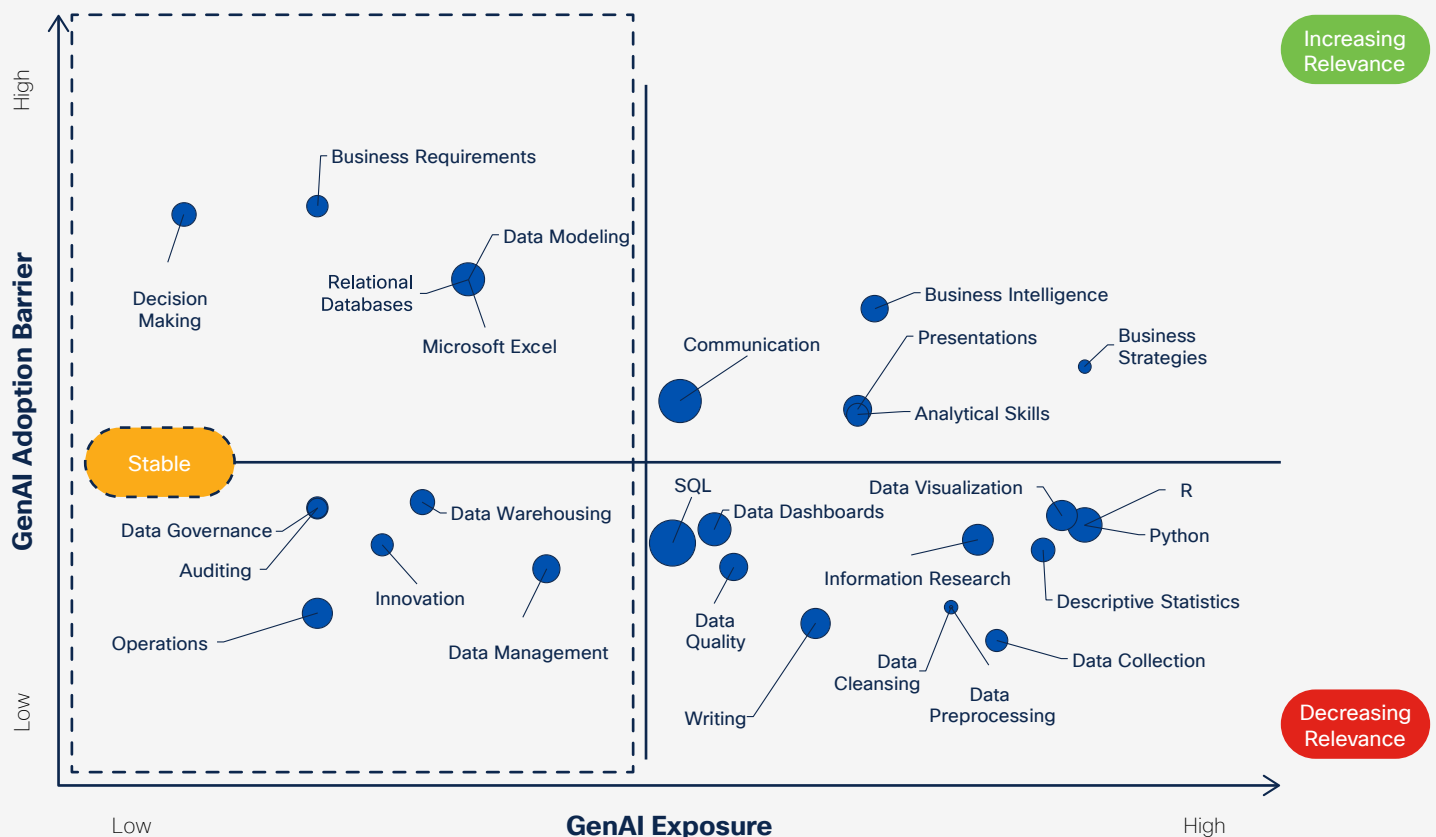*Source: Lightcast GenAI Adoption Barriers Analysis, 2024*

Roles in cybersecurity and networking encounter some of the most substantial barriers to adoption due to the high consequences of errors, level of responsibility for outcomes, and frequency of decisions, scoring between 6 to 8 out of 10 on these components. Consequently, human supervision remains crucial in these roles. Data science roles, such as Data Analyst and Python Developer, face lower adoption barriers. These jobs also score relatively lower than cybersecurity and networking roles in terms of responsibility for outcomes and consequence of errors. Support roles, including Network Support Technician and IT Support Specialist, score the lowest due to many reasons, notably the routine nature of their tasks.

GenAI has short-term transformation potential across job roles

By combining metrics on GenAI exposure and adoption barriers, we reveal a clearer understanding of the impact that GenAI has on skills specific to each job. This impact can be described in terms of skill dynamics. Skills that are highly exposed to GenAI but require human oversight and face significant adoption barriers can be categorized as experiencing *Increasing Relevance,* because we expect that such skills are still performed by the worker and augmented by AI. Conversely, skills that are also highly exposed but require little human intervention face higher risks of being automated, leading to *Decreasing Relevance*. Skills that feel limited exposure to GenAI, given its current stage of development, are categorized as *Stable* regardless of adoption barriers. Figure 3 provides an example of this analysis for the Data Analyst role. Similar charts for each job role can be found in the corresponding job role impact section later in this report.

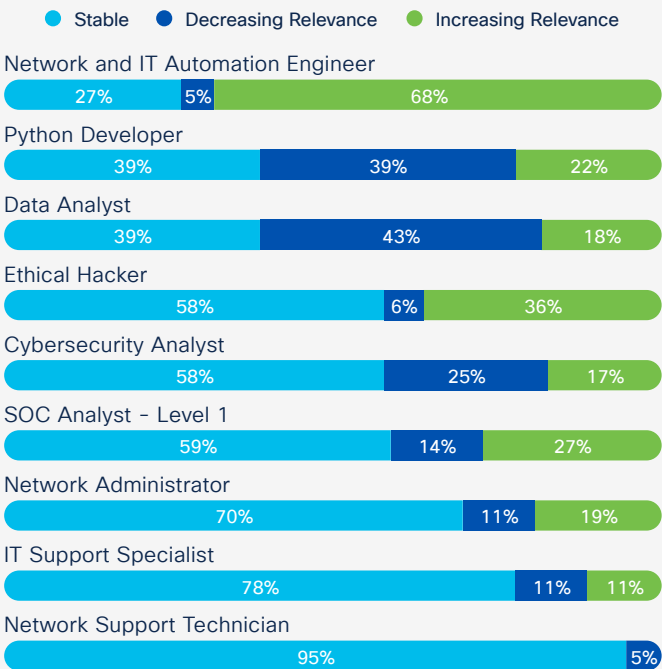**Figure 3. GenAI short-term impact on Data Analyst skills**

NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Short-term GenAI impact varies across the job roles, with automation engineers, developers, and data analysts most impacted in the near future

Using this framework, we can analyze the share of skills in each role that falls into the categories of *Increasing Relevance*, *Decreasing Relevance*, and *Stable* (Figure 4). Roles with a substantial share of their skill sets (more than 50%) experiencing GenAI exposure in the next 12 months include Network and IT Automation Engineer, Python Developer, and Data Analyst. On average, about 36% of their skill sets could see increasing relevance with GenAI. This presents significant opportunities for workers in these roles to leverage GenAI to complete their tasks more efficiently. However, these roles also see, on average, 29% of their skill sets at risk of becoming less relevant with GenAI—particularly skills heavy on coding, an area where GenAI offers strong capabilities.

Figure 4. Percentage of core skills by GenAI impact category | Short-term impact

● Stable ● Decreasing Relevance ● Increasing Relevance

Network and IT Automation Engineer
27% | 5% | 68%

Python Developer
39% | 39% | 22%

Data Analyst
39% | 43% | 18%

Ethical Hacker
58% | 6% | 36%

Cybersecurity Analyst
58% | 25% | 17%

SOC Analyst - Level 1
59% | 14% | 27%

Network Administrator
70% | 11% | 19%

IT Support Specialist
78% | 11% | 11%

Network Support Technician
95% | 5%

Source: Lightcast GenAI Impact Analyses, 2024

In contrast, cybersecurity roles and networking and IT support roles are expected to see lower impact from GenAI. This is due to higher adoption barriers and the inability of GenAI to complete manual and physically interactive tasks. As a result, more than 60% of the skill sets in these roles may remain beyond GenAI's reach in the near term.

GenAI impacts on key skills

To shed light on the general impact of GenAI on key skills in ICT occupations, we analyzed the principal skills. This analysis was completed by identifying the number of times each key skill was categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable* across the nine job roles. Note that skills can mean different things in the context of different roles. This analysis was based on the skills tied to role-specific tasks across the nine roles.

Skills of Decreasing Relevance
Some fundamental skills, including Writing, Information Research, and coding across various programming languages, will face high risk of decreasing relevance in the near term. Writing and coding, as hallmark capabilities of LLMs, are frequently identified as targets for automation. Experts mention that LLMs are particularly useful for producing starter code or a first draft of written text that workers can leverage. The ability of LLMs to provide this "first pass" of going from nothing to something presents a large time-savings across many roles. However, at the current state of the technology, complex tasks such as codebase reorganization, context-specific software development, or curation of written text still require highly skilled workers to create tailored solutions. Information Research is also projected to face decreasing relevance, because this skill is often associated with synthesizing industry trends and insights from disparate sources, a task that GenAI can effectively automate.[7]

Skills of Increasing Relevance
On the other hand, skills with increasing relevance tend to be value-added (such as Presentations, Workflow Management, Automation) or core competencies that are role-specific (such as Help Desk Support, Vulnerability Scanning, Scripting). For instance, if integrated into back-end systems, GenAI can assist Cybersecurity Analysts in Security Monitoring by analyzing system logs and detecting deviations from established security policies and procedures. This would enable the analysts to focus on

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more nuanced, context-specific tasks of risk assessment and risk management, such as discussing program changes and determining data access with users.

Stable skills

As GenAI continues to advance and automate a wide range of tasks, it becomes increasingly clear that certain human skills remain less affected by this technological progression. Interpersonal abilities and complex reasoning and planning—encompassing Communication, People Management, Innovation, Problem-Solving, and critical thinking—are areas where AI currently struggles to replicate human proficiency. In the field of ICT, these skills represent areas where GenAI is unlikely to make significant inroads in the near future due to the nuanced understanding, empathy, and creative judgment they require. Training in these areas should not be overlooked.

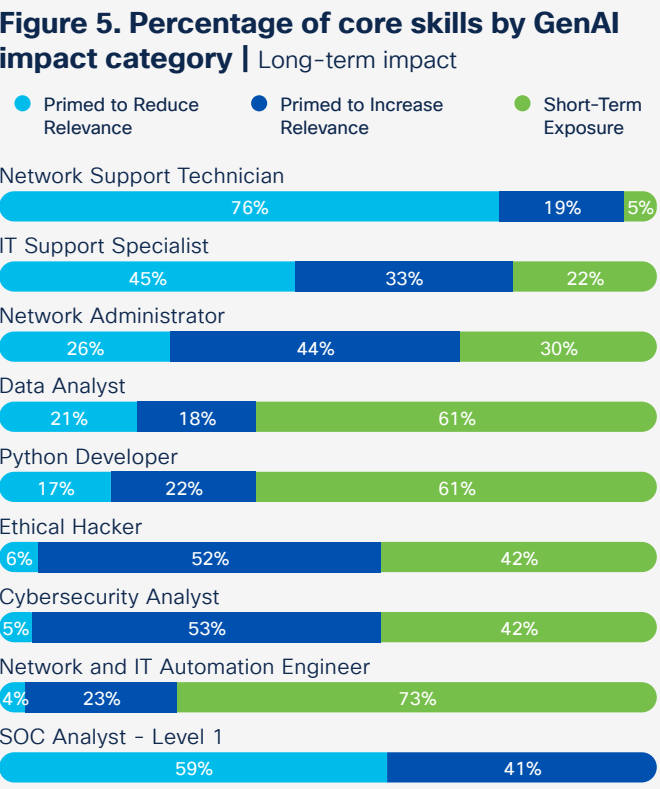## Considering longer-term impacts of GenAI

In its current state of development, GenAI's capabilities are predominantly confined to content generation, thereby mostly impacting cognitive tasks. As previously mentioned, interactive and manual tasks remain the domain of human workers. In the distant future, advancements in AI and robotics may facilitate the automation of the responsibilities currently undertaken by humans in the physical world. For instance, advanced robots could potentially perform tasks such as networking hardware configuration and maintenance. However, even with mature technology, the extent to which it can replace humans in the workplace will depend on the necessity for human oversight of machine-performed tasks.

Consequently, the long-term impact of GenAI on skills is likely to be influenced by human-driven barriers to AI adoption. Some stable skills currently facing minimal short-term exposure to GenAI could eventually be displaced if they pertain to tasks requiring limited human presence. Over time, such skills could become *Primed to Reduce Relevance* and have long-term automation potential. Conversely, other stable skills that are currently shielded from GenAI capabilities but depend on human oversight could, in the future, be complemented or enhanced by evolving technologies. In other words, these skills could be *Primed to Increase Relevance* and have augmentation potential in the long term. Figure 5 shows the percentage

breakdowns of these long-term impacts, in addition to the short-term impact within each role.[8]

This framework for long-term impact indicates that job areas with a high risk profile and liability, such as networking and cybersecurity, will continue to require human expertise for oversight and decision-making. It is estimated that around 20%-60% of the skill sets within these roles could be further augmented by AI advances, gaining their relevance in the distant future. On the other hand, support roles' interactive and manual tasks elude AI's reach at the moment. However, as the technology gets better at handling such tasks in the future, these roles will be more at risk of displacement and becoming less relevant because they face lower consequences of errors and are more routine in nature. For instance, our analysis suggests that about 76% of the current skill set of Network Support Technicians could be taken over by AI when the technology is ready.

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8   For clarity, skills experiencing short-term *Increasing Relevance* or *Decreasing Relevance* are grouped under the category of *Short-Term Exposure*.

Figure 5. Percentage of core skills by GenAI impact category | Long-term impact

● Primed to Reduce Relevance   ● Primed to Increase Relevance   ● Short-Term Exposure

Network Support Technician
76% | 19% | 5%

IT Support Specialist
45% | 33% | 22%

Network Administrator
26% | 44% | 30%

Data Analyst
21% | 18% | 61%

Python Developer
17% | 22% | 61%

Ethical Hacker
6% | 52% | 42%

Cybersecurity Analyst
5% | 53% | 42%

Network and IT Automation Engineer
4% | 23% | 73%

SOC Analyst – Level 1
59% | 41%

Source: Lightcast GenAI Impact Analyses, 2024

Skill training recommendations for entry-level ICT workers

The previously discussed insights underscore important focus areas in skill training for ICT workers in the age of GenAI.

Increase training and focus on uniquely human skills

There is a growing emphasis on enhancing uniquely human skills such as Communication, People Management, Operations, and Innovation. These skills are deemed essential because GenAI still has difficulty replicating human abilities, at least in the near term. Additionally, as GenAI agents become proficient in handling repetitive tasks, experts expect ICT functions to evolve toward more value-added capabilities, with workers demonstrating a higher level of cross-functional collaboration, problem-solving, and strategic thinking layered on top of technical capabilities.

Focus GenAI literacy training on Prompt Engineering for all roles; include LLM Architecture, RAG, and MLOps as needed

There are significant opportunities for workers to boost their productivity through upskilling in GenAI-related areas. For Network and IT Automation Engineers, Python Developers, and Ethical Hackers, proficiency in LLM Architecture, RAG, and MLOps will be indispensable to developing, integrating, and properly deploying LLM applications. Furthermore, all ICT roles will require a good grasp of Prompt Engineering to harness the power of copilots and AI assistants. In particular, experts emphasize using a portfolio of prompting techniques such as chain-of-thought and system prompt; combining system prompts with examples (few-shot learning); and experimenting with LLM parameters using tools such as ChatGPT Playground. They mention that properly leveraging GenAI through intelligent conversations will turn the technology into an augmenting force and free workers to tackle more challenging problems, acting as an accelerant to workers' productivity.

Double down on ensuring that students understand the why and the how behind their work

As experts noted, GenAI technologies should not make decisions; they should help humans make decisions. As such, many ICT workers will not only need to stay current with GenAI technologies and capabilities, but also need to double down on understanding the *why* behind their work, grasping *how* insights become solutions, and determining *how* those solutions tie back to solve nuanced business needs. Understanding the foundational problem will enable workers to determine how best to leverage AI tools effectively.

Another recurring theme that emerged from both quantitative and qualitative analyses is the need for human validation of AI-generated output. Currently, GenAI technology is prone to hallucinations due to models being trained on insufficient or inaccurate data sources; limited critical thinking abilities; and a tendency to reproduce biases in training data. The ability to validate the accuracy of automated output from GenAI is crucial for its successful integration into workflows—meaning that workers will need to maintain their core domain skills to properly interpret and handle output from LLMs. As one expert noted, it is difficult to get AI involved if you do not understand the foundational task or technology that you are trying to augment. This is particularly important because the risk of foundational skill erosion can loom large if workers rely too much on AI for basic tasks.

Teach ethics and how to use AI responsibly

As the technology permeates many daily tasks in ICT, it is important that workers are grounded with responsible AI principles. Companies will need to make sure that their workforce is adequately trained on safety, security, privacy, and intellectual property policies related to AI usage.

Summary of overall findings

The reality of AI has begun to take shape and is bound to disrupt how we do our work. For ICT functions, GenAI is poised to automate and enhance numerous tasks, potentially rendering certain skills obsolete. For instance, skills such as writing reports, collating information, and coding are likely to be taken over by GenAI. However, despite its advancements, our analysis suggests that current GenAI is not capable of fully replacing humans, even in the most impacted professions such as developers, engineers, and data analysts. In every single role that we analyzed, there are still many opportunities to leverage GenAI, enabling workers to tackle more complex, value-added problems. Furthermore, in high-risk domains such as cybersecurity and networking, human supervision of AI applications will remain important for years to come. These fields represent promising career paths for aspiring ICT professionals.

Job Transformation Canvas framework

The remainder of this report is broken down into the three job domains: cybersecurity, networking and IT support, and AI and data science. For each domain, we provide an overview of the analysis, followed by an analysis for each job role within that domain.

For each job analyzed, we present the data according to the Job Transformation Canvas framework. This framework is organized around three sections: job role, AI impact, and training recommendations.

The job role section contains basic information about the job role:

- **Job role description:** Outlines the duties and responsibilities expected of the person in the role.
- **Principal tasks:** Describes the most important tasks associated with the job role.
- **Principal skills:** Lists essential skills necessary for the job role, including both technical and soft/professional skills vital for effectively executing the role's primary tasks.

The AI impact section details the impact of AI on the roles and skills:

- **GenAI impact:** Provides an overarching narrative about how AI will change the job at a macro level. Includes a summary label of *low*, *medium*, or *high*.
- **Key insights:** Dives deeper into specific findings that are supported by data and narratives. Serves to substantiate the claims made in the "GenAI impact" section with evidence and detailed analysis, providing concrete takeaways.
- **Skill impact:** Notes the increasing or decreasing relevance of current skills and identifies new skills that may be required.

Finally, the training recommendations section provides a link to Cisco-recommended training designed to prepare students for the specific job role. These listings include the skills that students will develop in each course.

Cybersecurity domain

GenAI will exert a dual influence on the cybersecurity domain, impacting both the execution of existing tasks and the overall security profile of organizations. This will result in additional tasks for cybersecurity workers.

Analysis indicates that GenAI will similarly impact all three cybersecurity roles under discussion, with approximately 40% of their skill sets seeing either increasing relevance or decreasing relevance in the near future. Among these roles, Cybersecurity Analysts are projected to be the most immediately affected, with 25% of core skills expected to see decreasing relevance and 17% becoming more relevant with GenAI. In contrast, Ethical Hackers and SOC Analysts – Level 1 face a lower percentage of skills with decreasing relevance (around 10% on average) and have greater potential for skills with increasing relevance (on average 31%).

Experts in cybersecurity anticipate that within the next year, new responsibilities will emerge for security workers in identity management and defense functions. These workers will need to acquire an understanding of GenAI mechanisms, potential malicious applications, and strategies for adapting processes and protocols to defend against GenAI-enabled threats. Looking further ahead, experts predict that new tasks will emerge within governance, risk, and compliance (GRC) functions within the next one to three years. Security professionals will utilize RAG techniques to access the most current compliance standards and assess potential security vulnerabilities.

Despite the significant potential for AI integration, the cybersecurity domain will continue to require substantial human oversight to mitigate risks associated with errors in security operations, which can have severe consequences. Therefore, AI applications in this field will necessitate ongoing human guidance and monitoring to remain effective tools, positioning cybersecurity as one of the ICT areas most resistant to displacement by GenAI in the long term.

As the utilization of GenAI in cybersecurity tasks becomes more prevalent, the boundaries between security and other ICT functions may blur. Security professionals have already begun and will increasingly leverage data science methodologies to enhance their work efficiency. Simultaneously, IT teams will become more adept at assuming security-centric responsibilities using GenAI. This trend may lead to a convergence and overlap of roles among traditional cybersecurity, data science, and IT teams.

Recommendation for adapting training programs

Going forward, training programs in cybersecurity should focus on new skills related to integrating GenAI into workflows. Cybersecurity Analysts will need to understand LLM Architecture to safeguard AI-based applications against adversarial attacks. SOC Analysts - Level 1 will need strong Prompt Engineering skills to leverage LLMs to support some of their daily tasks. Ethical Hackers will need to stay up to date on new GenAI technologies and capabilities so they can understand how attackers might leverage them to exploit vulnerabilities.

Cybersecurity Analyst

Job role description

Cybersecurity Analysts are responsible for developing and implementing security measures to protect computer systems and networks. They monitor for security breaches, investigate violations, and update security systems to prevent future incidents. They also conduct risk assessments, document security policies and procedures, and educate users about security best practices.

Principal tasks

- Develop plans to safeguard computer files against accidental or unauthorized modification, destruction, or disclosure and to meet emergency data processing needs.
- Monitor current reports of computer viruses to determine when to update virus protection systems.
- Encrypt data transmissions and erect firewalls to conceal confidential information as it is being transmitted and to keep out tainted digital transfers.
- Perform risk assessments and test data processing systems to ensure functioning of data processing activities and security measures.

- Modify computer security files to incorporate new software, correct errors, or change individual access status.
- Review violations of computer security procedures and discuss procedures with violators to ensure violations are not repeated.
- Document computer security and emergency measures policies, procedures, and tests.
- Confer with users to discuss issues such as computer data access needs, security violations, and programming changes.
- Monitor use of data files and regulate access to safeguard information in computer files.
- Coordinate implementation of computer system plan with establishment personnel and outside vendors.
- Train users and promote security awareness to ensure system security and to improve server and network efficiency.
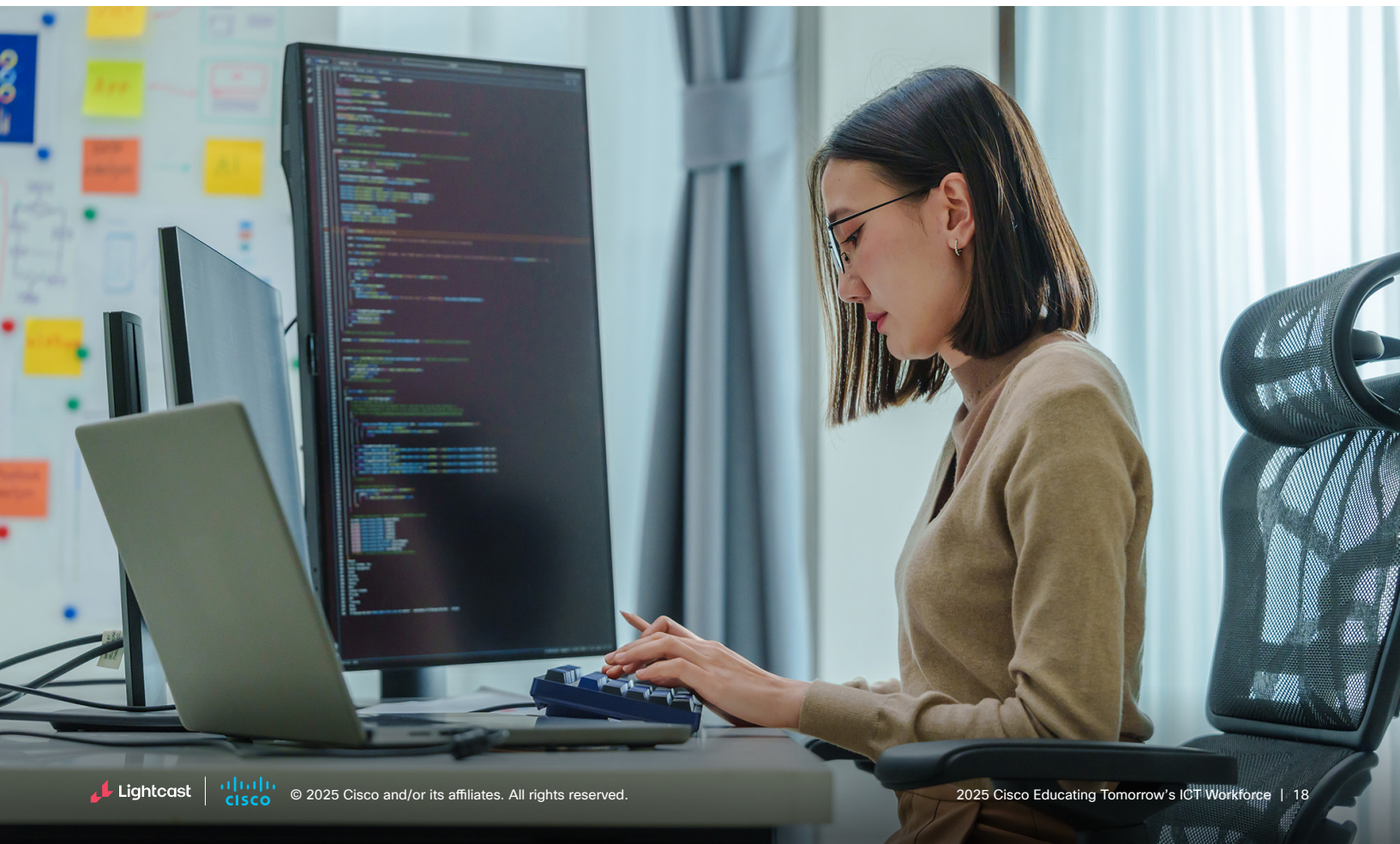
Principal skills

- Communication
- Vulnerability Management
- Incident Response
- Security Controls
- Risk Analysis
- Security Policies
- Information Research
- Risk Management
- Operating Systems
- Firewall
- Security Information and Event Management (SIEM)
- Writing
- Investigation
- Information Systems Security
- Cyber Threat Intelligence
- Governance
- Planning
- Coordinating
- Information Assurance
- Project Management
- Security Requirements Analysis
- Network Security
- Presentations
- Authorization (Computing)
- Continuous Monitoring
- Vulnerability Assessments
- Scripting
- Vulnerability Scanning
- Penetration Testing
- Access Controls
- Configuration Management
- Security Awareness
- Risk Mitigation
- Encryption
- Malware Analysis
- Training and Development

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Medium

GenAI will drive a significant shift in the focus of Cybersecurity Analysts. Cybersecurity Analysts will need to adopt new skills related to Prompt Engineering, LLM Architecture, and RAG while enhancing existing skills in Information Assurance, Risk Management, and Security Policies. They should be aware of skills that have the highest potential of being automated (such as Writing and Malware Analysis) and seek to pivot toward skills that require human oversight, critical thinking, and decision-making. Looking ahead, direct human involvement will still be crucial for over half of the Cybersecurity Analyst skills to ensure the effective application and monitoring of GenAI tools. The emphasis will be on understanding and integrating GenAI technologies, ensuring Cybersecurity Analysts can effectively defend against advanced threats and enhance their operational efficiency.

Figure 6 shows the analysis of GenAI's short-term impact on Cybersecurity Analyst skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- 42% of the skills will likely be impacted by GenAI in the near term, of which 17% could see increasing relevance to boost efficiency.
- In the long run, another 5% of skills could see decreasing relevance, but security concerns will still require direct human involvement in 53% of skills, which could be augmented with advanced GenAI.
- Cybersecurity Analysts will need to have a good understanding of LLM Architecture and GenAI capabilities to protect against new GenAI-powered attacks, as well as leverage GenAI for defense.
- In real-time monitoring and incident management, GenAI can be integrated into systems to analyze system logs, user activities, and network traffic in real time. It can automatically identify potential security incidents and categorize them based on severity, type, and exploited vulnerability, prioritizing critical violations for prompt review. The systems can automate personalized communication to violators, providing immediate feedback on the specific nature and potential impact of their violation.
- In security documentation, GenAI can automate the generation of initial drafts for security policies and procedures based on industry standards, regulations, and best practices, customized to reflect organizational specifics.
- Providing hands-on guidance for LLMs and understanding the integration and security concerns of GenAI technologies is critical for successful deployment.

Skill impact

- **New Skills:** Agentic Frameworks, Agentic Workflow, AI Literacy, LLM Architecture, Prompt Engineering, Responsible AI, Retrieval Augmented Generation (RAG)
- **Increasing Relevance:** Information Assurance, Risk Management, Risk Mitigation, Security Policies, Security Requirements Analysis, Vulnerability Scanning
- **Decreasing Relevance:** Authorization (Computing), Continuous Monitoring, Cyber Threat Intelligence, Information Research, Malware Analysis, Network Security, Security Controls, Security Information and Event Management (SIEM), Writing
- **Stable:** Access Controls, Communication, Configuration Management, Coordinating, Encryption, Firewall, Governance, Incident Response, Information Systems Security, Investigation, Operating Systems, Penetration Testing, Planning, Presentations, Project Management, Risk Analysis, Scripting, Security Awareness, Training and Development, Vulnerability Assessments, Vulnerability Management

Figure 6. GenAI short-term impact on Cybersecurity Analyst skills
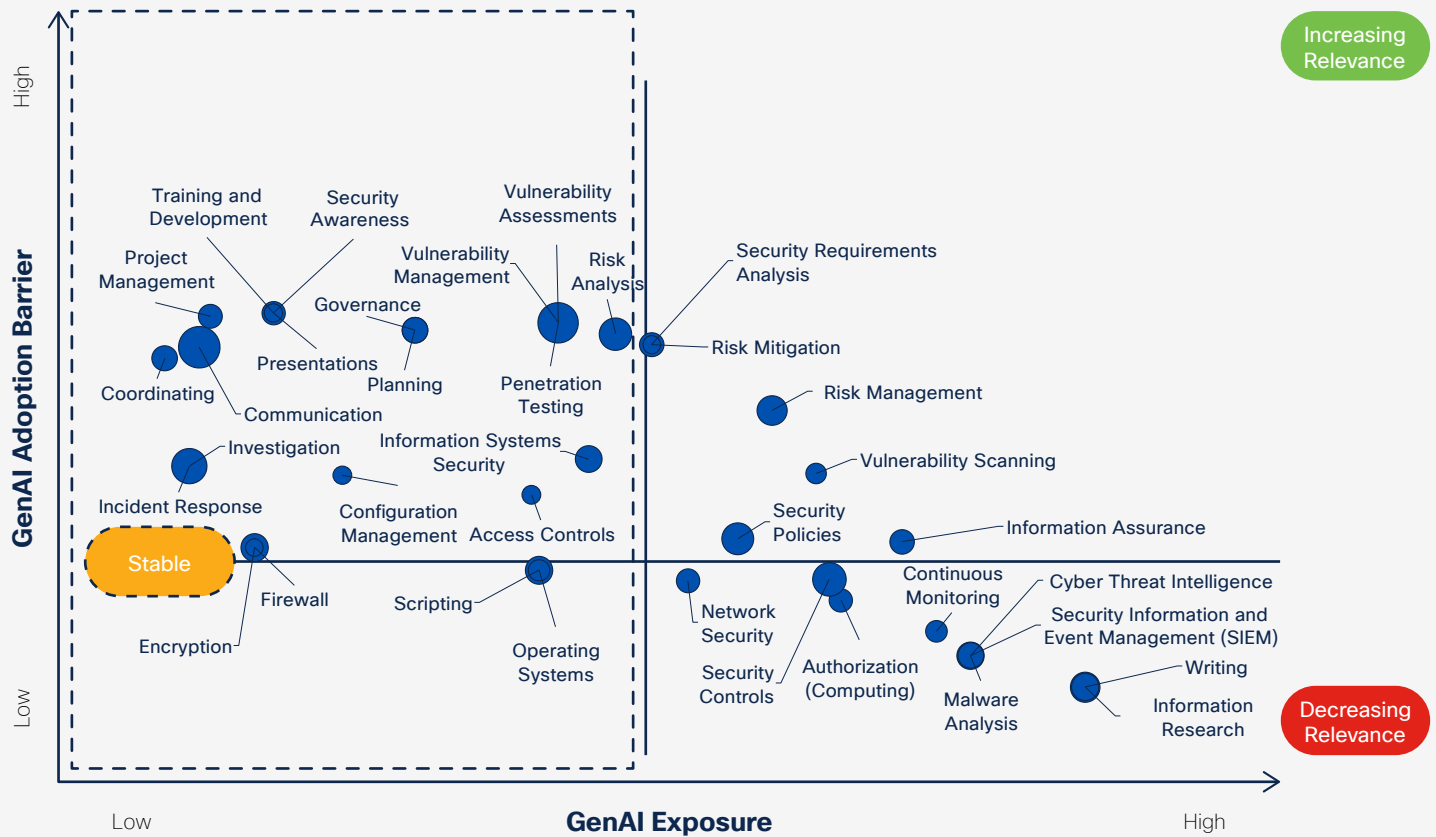
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Cybersecurity Analyst job role, please see NetAcad.com/ AItraining.

Ethical Hacker

Job role description

Ethical Hackers assess and audit the security of servers, systems, and networks to identify vulnerabilities. They develop and execute tests simulating cyber threats and design security solutions to known vulnerabilities, all while adhering to ethical guidelines and authorized parameters. They also investigate security incidents, maintain knowledge of hacking trends, and deliver specialized security awareness training.

Principal tasks

- Assess the holistic security of servers, systems, or network devices, including vulnerability to temperature, vandalism, or natural disasters, ensuring a comprehensive understanding of physical and environmental security.
- Collect stakeholder data to evaluate risk and to develop mitigation strategies.
- Conduct network and security system audits, using established criteria.
- Configure information systems to incorporate principles of least functionality and least access.
- Design security solutions to address known device vulnerabilities.

- Develop and execute tests that simulate the techniques of known cyber threat actors.
- Develop infiltration tests that ethically exploit device vulnerabilities, adhering to authorized testing methodologies and ethical hacking guidelines.
- Develop presentations on threat intelligence.
- Develop security penetration testing processes, such as wireless, data networks, and telecommunication security tests.
- Discuss security solutions with IT teams or upper management.
- Evaluate vulnerability assessments of local computing environments, networks, infrastructures, or enclave boundaries.
- Gather cyber intelligence to identify vulnerabilities.
- Identify new threat tactics, techniques, or procedures used by cyber threat actors.
- Identify security system weaknesses, using ethical hacking techniques.
- Investigate security incidents, using computer forensics, network forensics, root cause analysis, or malware analysis.
- Maintain up-to-date knowledge of hacking trends.
- Prepare and submit reports describing the results of security fixes.
- Test the security of systems by conducting authorized assessments to identify vulnerabilities, attempting

to gain access to networks, web-based applications, or computers while strictly adhering to ethical guidelines and authorized parameters.
- Update corporate policies to improve cybersecurity.
- Write audit reports to communicate technical and procedural findings and recommend solutions.
- Perform targeted social engineering assessments to evaluate human vulnerabilities and awareness.
- Deliver specialized security awareness training tailored to the organization's unique threats and vulnerabilities.

Principal skills

- Ethical Hacking
- Vulnerability Management
- Penetration Testing
- Cybersecurity Knowledge
- Communication
- Information Research
- Writing
- Operations
- Offensive Security
- Vulnerability Assessments
- Risk Analysis
- Open Web Application Security Project (OWASP)
- Social Engineering
- Presentations
- Test Tools
- Security Requirements Analysis
- Process Improvement
- Gap Analysis
- Network Infrastructure
- Personnel Procedures
- NIST 800-53
- Information Processing
- White-Box Testing
- Metasploit
- Application Security
- People Management
- Security Controls
- Scripting
- Web Applications
- Python
- Automation
- Vulnerability Scanning
- Burp Suite

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Medium

GenAI will significantly impact Ethical Hackers' skill sets, with 42% of skills facing near-term increasing or decreasing relevance and another 6% possibly at risk of becoming automated over time. Key areas like Vulnerability Scanning and threat monitoring stand to benefit from AI-powered tools, enabling automatic detection of vulnerabilities and assessing risks to servers and networks. However, human supervision remains crucial in half of the skill set, requiring Ethical Hackers to understand and integrate GenAI technologies effectively. The job's focus will shift toward leveraging GenAI to identify vulnerabilities efficiently. Additionally, while some skills like Process Improvement and Security Requirements Analysis will be augmented, others like Writing and Information Research face

displacement risks. This underscores the need for Ethical Hackers to adapt to emerging AI technologies and evolving job demands to remain effective in their roles.

Figure 7 shows the analysis of GenAI's short-term impact on Ethical Hacker skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- In the near term, approximately 42% of Ethical Hacker skills will be impacted by GenAI, with a potential augmentation of 36% to enhance efficiency.
- In Vulnerability Scanning, GenAI-powered tools or agents can automatically scan servers, systems, and network devices for known vulnerabilities. By continuously updating their databases with the latest threat intelligence, these tools can identify potential weaknesses before they are exploited, aiding Ethical Hackers in their vulnerability assessment processes.
- Another 6% of skills may become automated over time. Human supervision will remain necessary in 52% of skills, which could benefit from augmentation with GenAI.
- Ethical Hackers will need to stay abreast of new GenAI technologies and capabilities and learn how to leverage them to exploit vulnerabilities. They will need to understand integration concepts to identify potential areas of vulnerability. They may not need technical expertise, but they will need deep expertise in what GenAI technologies are capable of and where any weaknesses may lie.

Skill impact

- **New Skills:** Agentic Framework, Agentic Workflow, AI Literacy, LLM Architecture, MLOps, Prompt Engineering, Responsible AI, Retrieval Augmented Generation (RAG)
- **Increasing Relevance:** Application Security, Automation, Burp Suite, Metasploit, Offensive Security, Penetration Testing, Presentations, Process Improvement, Python, Scripting, Security Requirements Analysis, Vulnerability Scanning
- **Decreasing Relevance:** Information Research, Writing
- **Stable:** Communication, Cybersecurity Knowledge, Ethical Hacking, Gap Analysis, Information Processing, Network Infrastructure, NIST 800-53, Open Web Application Security Project (OWASP), Operations, People Management, Personnel Procedures, Risk Analysis, Security Controls, Social Engineering, Test Tools, Vulnerability Assessments, Vulnerability Management, Web Applications, White-Box Testing

Figure 7. GenAI short-term impact on Ethical Hacker skills
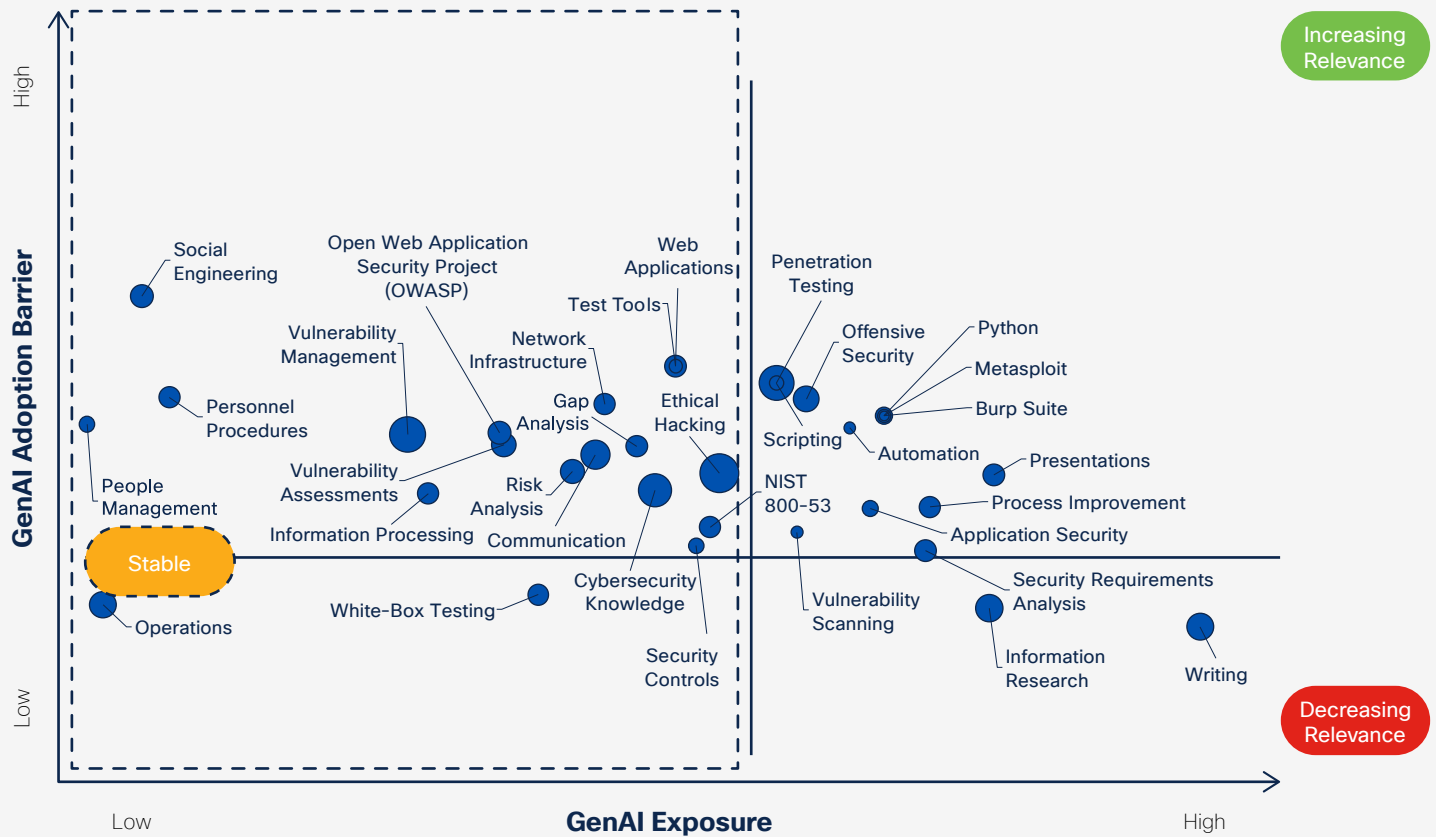
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Ethical Hacker job role, please see NetAcad.com/AItraining.

SOC Analyst – Level 1

Job role description

A SOC Analyst – Level 1 is responsible for monitoring and analyzing security events and incidents within an organization's network. They respond to alerts, perform initial investigations, and escalate issues as needed, while also maintaining and implementing security measures to protect against threats.

Principal tasks

- Develop and implement immediate operational plans for safeguarding computer files against unauthorized access or breaches.
- Monitor current reports of computer viruses to determine when to update virus protection systems.
- Monitor and respond to alerts related to encryption and firewall events to ensure the concealment of confidential information and prevent digital threats.
- Perform risk assessments and execute tests of the data processing system to ensure functioning of data processing activities and security measures.

- Review violations of computer security procedures and engage with violators to ensure violations are not repeated.
- Engage with users during incident response and security violations to address immediate access issues and concerns.
- Monitor use of data files and regulate access to safeguard information in computer files.
- Coordinate activities within incident response and ongoing monitoring to ensure the effective implementation of security measures.
- Continuously monitor security alerts, logs, and events, focusing on indicators of compromise, anomalous activities, and known attack patterns to identify potential security incidents.
- Analyze and categorize incidents.
- Understand criteria for incident escalation, ensuring a comprehensive grasp of when and how to escalate issues to higher levels or other teams within the organization.

Principal skills

- Incident Response
- Security Information and Event Management (SIEM)
- Cybersecurity Knowledge
- Operations
- Communication
- Investigation
- Triage
- Cyber Threat Intelligence
- Vulnerability Management
- Firewall
- Endpoint Detection and Response
- Malware Analysis
- Coordinating
- Network Security
- Standard Operating Procedure
- Incident Management
- Troubleshooting
- Customer Service
- Intrusion Detection and Prevention
- Penetration Testing
- Log Analysis
- Security Controls

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Medium

GenAI will significantly impact SOC Analyst – Level 1 skill sets, leading to increasing or decreasing relevance of certain skills tasks and the emergence of new skills. SOC Analysts – Level 1 will need to shift from skills with predicted decreasing relevance (Endpoint Detection and Response, Malware Analysis) to human-centric skills that could see increasing relevance when augmented by GenAI (Intrusion Detection and Prevention, Network Security, Triage, Firewall, Incident Management). Analysts will need to adapt by developing expertise in working with GenAI systems, such as Prompt Engineering, LLM Architecture, and RAG skills, and implementing Agentic Workflow. Concurrently, they will need to maintain and enhance their human-centric skills that are essential for critical security operations and decision-making.

Figure 8 shows the analysis of GenAI's short-term impact on SOC Analyst – Level 1 skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- In the foreseeable future, approximately 41% of the SOC Analyst – Level 1 skill sets are expected to be highly affected by GenAI, with a potential 27% of skills (SIEM, Cyber Threat Intelligence) seeing increased relevance.
- In impact assessment and escalation guidance, AI algorithms can predict and categorize the potential impact of an incident on business operations, reputation, and compliance. LLM-integrated systems can provide entry-level SOC Analysts with security criteria to decide whether to escalate the incident and prioritize incidents based on their severity and urgency.
- In the long run, the high consequences of security errors will still require workers to actively engage in the remaining 59% of skills. Advanced GenAI could be employed to enhance these human-involved tasks.
- SOC Analysts – Level 1 will need to understand Prompt Engineering and how to translate AI-generated output into action.

Skill impact

- **New Skills:** Agentic Workflow, AI Literacy, LLM Architecture, Prompt Engineering, Responsible AI, Retrieval Augmented Generation (RAG)
- **Increasing Relevance:** Cyber Threat Intelligence, Incident Response, Intrusion Detection and Prevention, Log Analysis, Network Security, Security Information and Event Management (SIEM)
- **Decreasing Relevance:** Endpoint Detection and Response, Malware Analysis, Security Controls
- **Stable:** Communication, Coordinating, Customer Service, Cybersecurity Knowledge, Firewall, Incident Management, Investigation, Operations, Penetration Testing, Standard Operating Procedure, Triage, Troubleshooting, Vulnerability Management

Figure 8. GenAI short-term impact on SOC Analyst – Level 1 skills
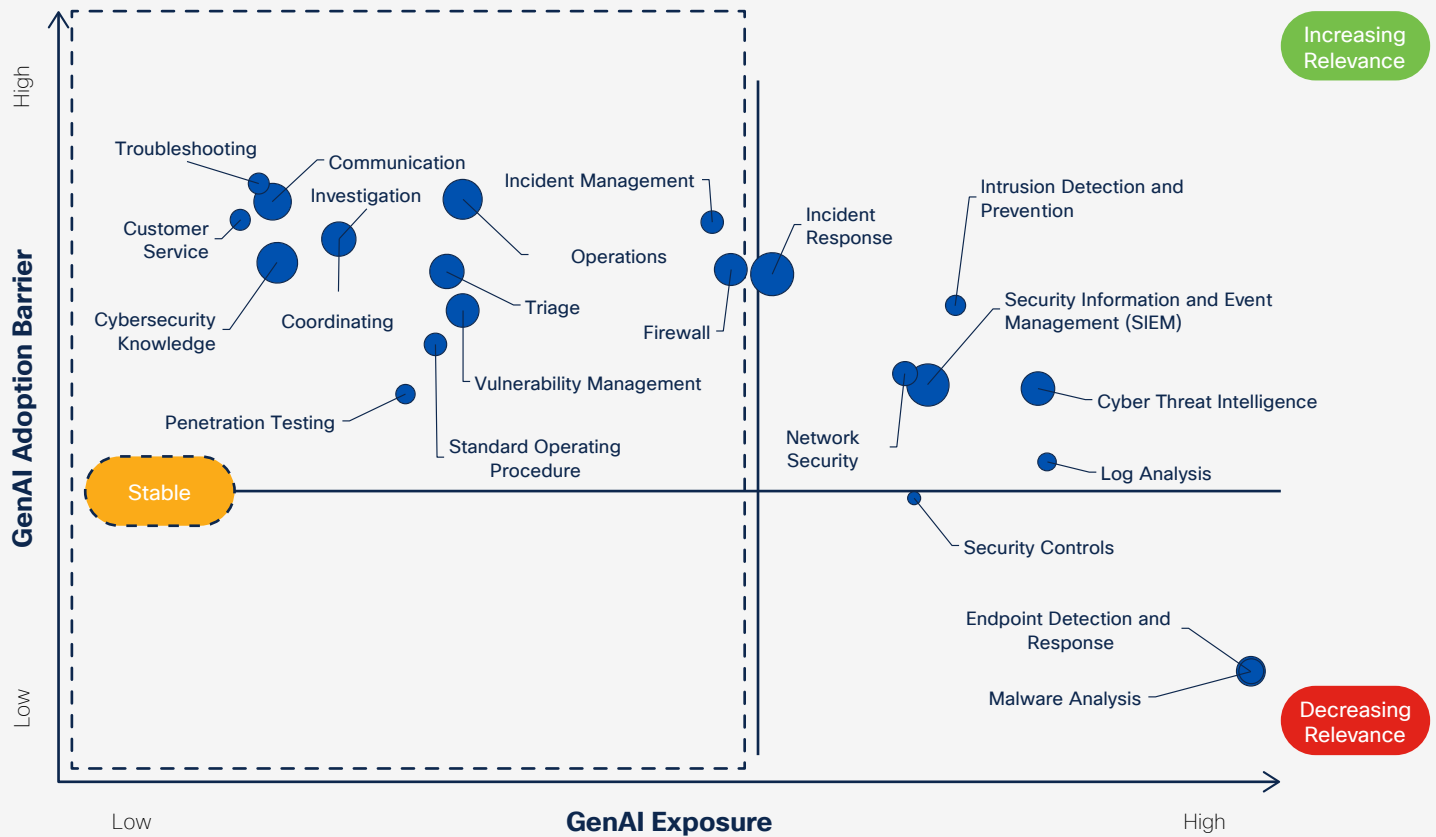
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the SOC Analyst – Level 1 job role, please see NetAcad.com/AItraining.

Networking and IT domain

Among all networking roles analyzed, Network and IT Automation Engineers are expected to experience the most significant immediate impact from GenAI. Approximately 73% of their skill sets are predicted to be impacted, with 68% of skills increasing in relevance and 5% decreasing in relevance. This is primarily due to the substantial automation component inherent in their tasks, for which GenAI can effectively generate scripts and code snippets. Conversely, Network Administrators and Network Support Technicians both require many interactive or manual tasks that currently fall outside the scope of GenAI's capabilities. While not directly within the networking domain, the IT Support Specialist role shares a similar interactive nature with these two network support roles. Consequently, IT Support Specialists are only minimally affected, with 22% of their skill sets being impacted by current GenAI capabilities.

Early applications of GenAI in networking include automating email responses to issues, tracking issues, generating documentation of issue resolution, and integrating or embedding GenAI technologies into the network to monitor and identify potential issues. In IT support, GenAI is being used for question handling, initial response writing, real-time case status summarization, and resolution summarization. AI assistance is likely the next phase of networking and IT support. For example, Cisco AI Assistant simplifies tasks in configuring and managing both security and networking equipment and functions.

While the analysis indicates that the immediate impact of GenAI on the skill sets of Network Administrators, Network Support Technicians, and IT Support Specialists will be relatively mild, we anticipate that all three roles will experience substantial effects in the long term. These roles involve a significant amount of routine work, making them particularly prime for technology adoption. As GenAI technologies evolve, 76% of the skill sets of Network Support Technicians, 26% of the skill sets of Network Administrators, and 45% of the skill sets of IT Support Specialists are projected to face the risk of decreasing relevance.

Recommendation for adapting training programs

Workers entering the networking and IT support fields should possess a basic understanding of GenAI technology, such as LLMs and GPT models and their capabilities. It is also imperative that training programs prepare networking and IT support students for the next wave of GenAI augmentation: AI assistants. Workers will need to be equipped with strong Prompt Engineering skills to effectively utilize AI assistants, particularly in tasks such as configuring and managing firewalls.

Training programs for Network and IT Automation Engineers should incorporate materials on new workflows related to Configuration Management, Network Automation, Network Monitoring, and Scripting skills that will be augmented by GenAI. These engineers can generate scripts for network monitoring and process automation, as well as debug and analyze existing scripts to identify and address issues. Additionally, there is a growing demand for Network and IT Automation Engineers skilled in RAG pipelines to enhance information retrieval from internal documentation. While incorporating these new aspects, it is crucial for training programs to maintain core networking skills and technologies in the curriculum, because they will be vital for these professionals to properly interpret and validate LLM-generated output.

Conversely, the curricula for Network Support Technicians and IT Support Specialists should deprioritize training content centered around Issue Tracking and Writing. GenAI can aid greatly in the process of writing technical documentation and automating ticket generation, both of which have low barriers to adoption and are thus likely to be displaced by GenAI. Instead, training content for these support roles should focus on troubleshooting high-complexity cases as well as validating output from AI assistants on lower-complexity issues. Experts indicate that effective resolutions to complex cases will be crucial as a training data source for next-generation AI-powered applications.

Network and IT Automation Engineer

Job role description

A Network and IT Automation Engineer is responsible for designing, implementing, and maintaining automated solutions to optimize network and IT operations. They collaborate with teams to select and integrate appropriate automation technologies, ensuring stability, security, and scalability of systems. Their role involves evaluating emerging technologies, developing automated testing and security measures, and establishing standards to meet organizational requirements. Additionally, they create application-specific automation scripts, monitor network performance, and implement continuous integration/continuous deployment (CI/CD) pipelines to streamline software delivery and infrastructure changes. Overall, their work aims to enhance efficiency, reliability, and responsiveness within network and IT environments.

Principal tasks

- Verify stability, interoperability, portability, security, or scalability of network and IT automation architecture.
- Collaborate with engineers or software developers to select and implement appropriate automation solutions or ensure the compatibility of automated components.
- Identify system data, hardware, or software components required to meet user needs.
- Communicate with staff or clients to understand specific system requirements.
- Automate testing to verify proper functioning of software patches and fixes.
- Develop and implement automated security measures.
- Design, document, and direct automated deployment processes.
- Develop automated systems for monitoring network performance, detecting anomalies, and triggering automated responses.
- Evaluate current or emerging technologies for network and IT automation, considering factors such as cost, portability, compatibility, or usability.
- Establish functional or system standards to address operational requirements, quality requirements, and design constraints.
- Investigate system component suitability for specified purposes and make recommendations regarding component use.
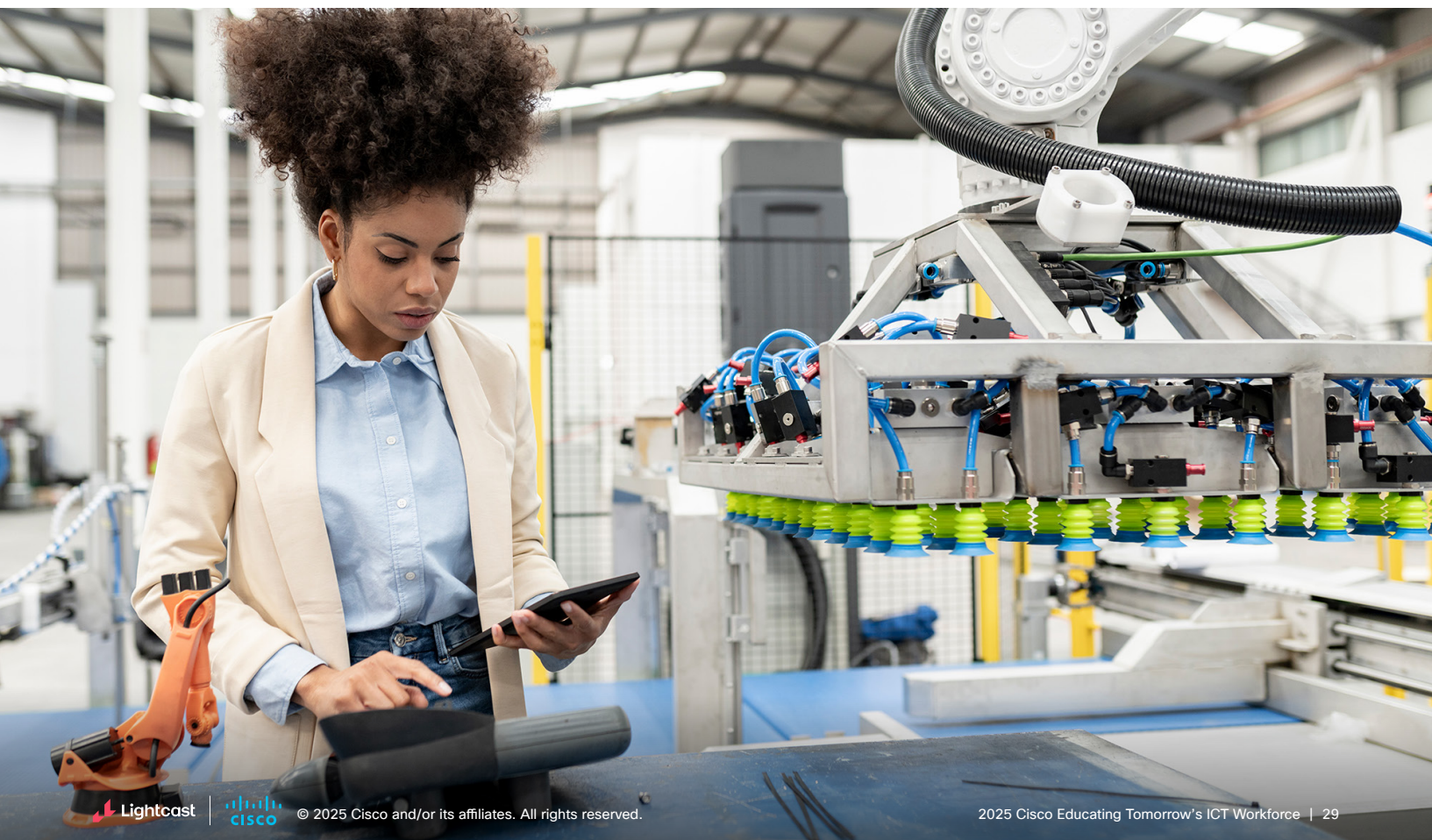
- Complete models and simulations, using automated tools, to analyze or predict system performance under different operating conditions.
- Develop efficient and effective network automation controllers.
- Evaluate existing systems to determine effectiveness and suggest changes to meet organizational requirements.
- Develop and maintain automated solutions for configuring and managing network devices.
- Develop application-specific automation scripts and software.
- Implement CI/CD pipelines and collaborate with DevOps teams to automate software delivery and infrastructure changes.

Principal skills

- Automation
- Network Automation
- People Management
- Communication
- Scripting
- Network Engineering
- CI/CD
- Operations
- Network Infrastructure
- Troubleshooting
- DevOps
- Operating Systems
- Innovation
- Network Security
- Network Monitoring
- Workflow Management
- Planning
- Software Development
- Scalability
- Networking Hardware
- Configuration Management
- Test Automation

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: High

With the advent of GenAI, the role of Network and IT Automation Engineers will shift toward utilizing Prompt Engineering to interact effectively with AI tools, as well as building RAG capabilities to further automate and optimize workflows. Leveraging GenAI to automate routine tasks and initial development efforts will allow these engineers to focus more on complex problem-solving, strategic planning, and innovation. Maintaining and developing a deep understanding of business use cases to ensure the successful application of automated solutions will be an area for workers in this role to focus on.

Figure 9 shows the analysis of GenAI's short-term impact on Network and IT Automation Engineer skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- 73% of the skills will be impacted by GenAI in the near term, of which 68% could see increasing relevance to boost efficiency.
- GenAI can help Network and IT Automation Engineers streamline processes and enhance efficiency, including summarizing data sheets, finding solutions that align with predefined requirements, and generating starter code or component pieces to reduce initial coding effort. If integrated in the appropriate systems, LLMs can help with path verification, test development, and execution.
- In the long run, another 4% of skills could see decreasing relevance, but the need for a deep understanding of the business use case will still require direct human involvement in 23% of skills, which could be augmented with advanced GenAI.
- Network and IT Automation Engineers will need strong Prompt Engineering skills to effectively interact with AI assistants. They will also need to understand how GenAI can be leveraged in generating scripts and code snippets for automation.
- Network and IT Automation Engineers are going to play a vital role in building RAG capabilities to automate work.

Skill impact

- **New Skills:** AI Literacy, LLM Architecture, MLOps, Prompt Engineering, Responsible AI, Retrieval Augmented Generation (RAG)
- **Increasing Relevance:** Automation, CI/CD, Configuration Management, DevOps, Network Automation, Network Engineering, Network Infrastructure, Network Monitoring, Network Security, Networking Hardware, Scalability, Scripting, Software Development, Troubleshooting, Workflow Management
- **Decreasing Relevance:** Test Automation
- **Stable:** Communication, Innovation, People Management, Operating Systems, Operations, Planning

Figure 9. GenAI short-term impact on Network and IT Automation Engineer skills
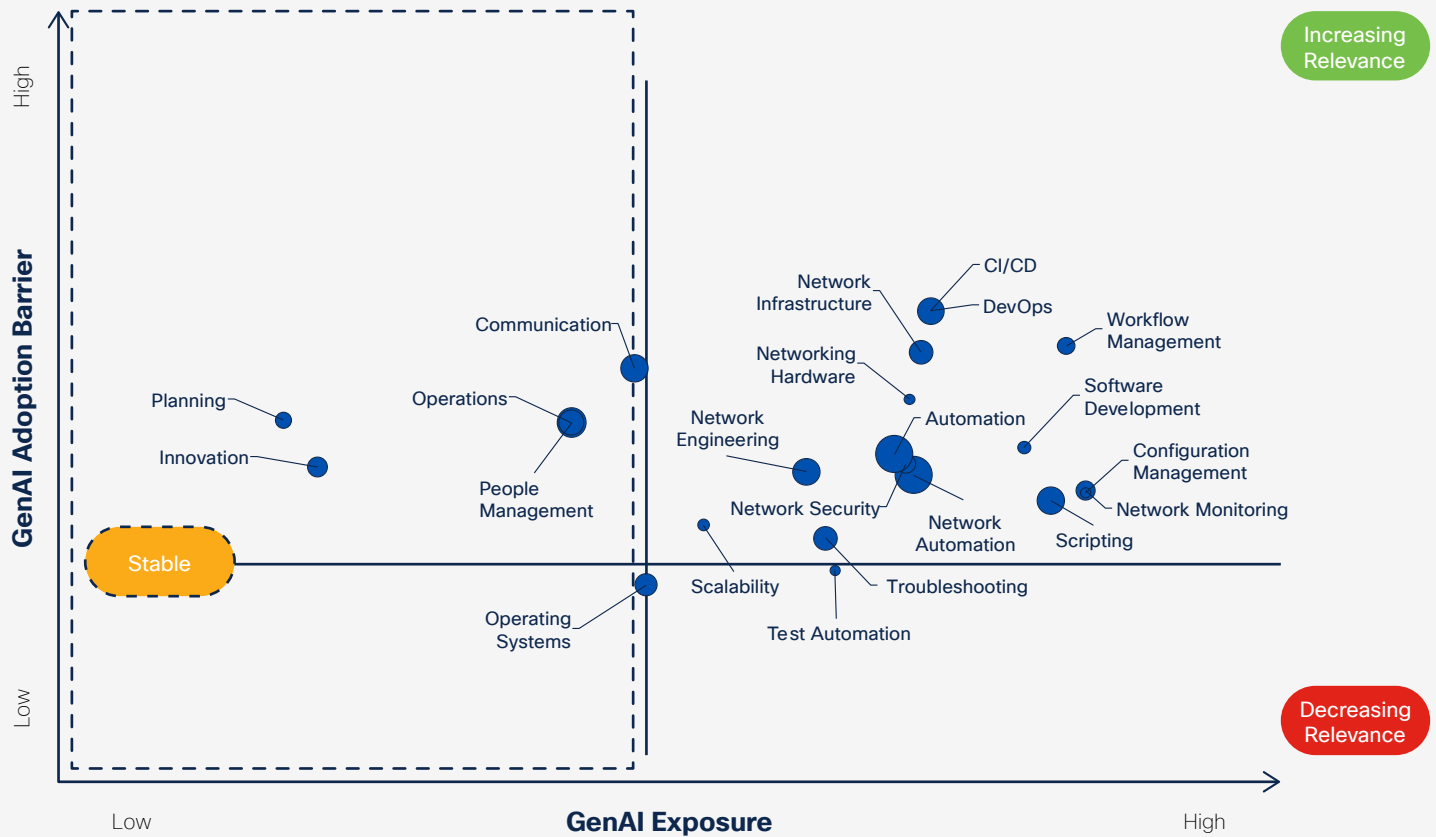
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Network and IT Automation Engineer job role, please see NetAcad.com/AItraining.

Network Administrator

Job role description

Network Administrators install, configure, and maintain an organization's network infrastructure, including routers, switches, and wireless access points. They monitor network performance, troubleshoot issues, and ensure security by managing access controls and applying updates. Additionally, they develop disaster recovery plans, provide technical support, train users, and document network configurations. They also stay updated on technological advancements and ensure compliance with organizational policies and legal regulations.

Principal tasks

- Install and configure network equipment, including routers, switches, and wireless access points.
- Develop plans and execute procedures for disaster recovery and backup.
- Diagnose, troubleshoot, and resolve hardware, software, or other network and system problems.
- Manage access controls and network permissions for users.
- Regularly monitor the health and performance of the network, troubleshoot connectivity and performance problems, and provide ongoing optimization of the network.
- Analyze equipment performance records to determine the need for repair or replacement.
- Assist users with network-related inquiries and provide technical support to users for network-related issues.
- Perform routine network maintenance tasks and apply software updates, patches, and firmware upgrades.
- Provide basic IT-related training on network use and security practices to internal or external users.
- Create and maintain detailed documentation related to network configurations.
- Gather data pertaining to customer needs, and use the information to identify, predict, interpret, and evaluate system and network requirements.
- Coordinate with vendors and with company personnel to facilitate purchases.
- Ensure that all network activities are compliant with organizational policies and legal regulations.
- Maintain an inventory of parts for emergency repairs.
- Keep abreast of technological advancements and integrate relevant updates into the network infrastructure.
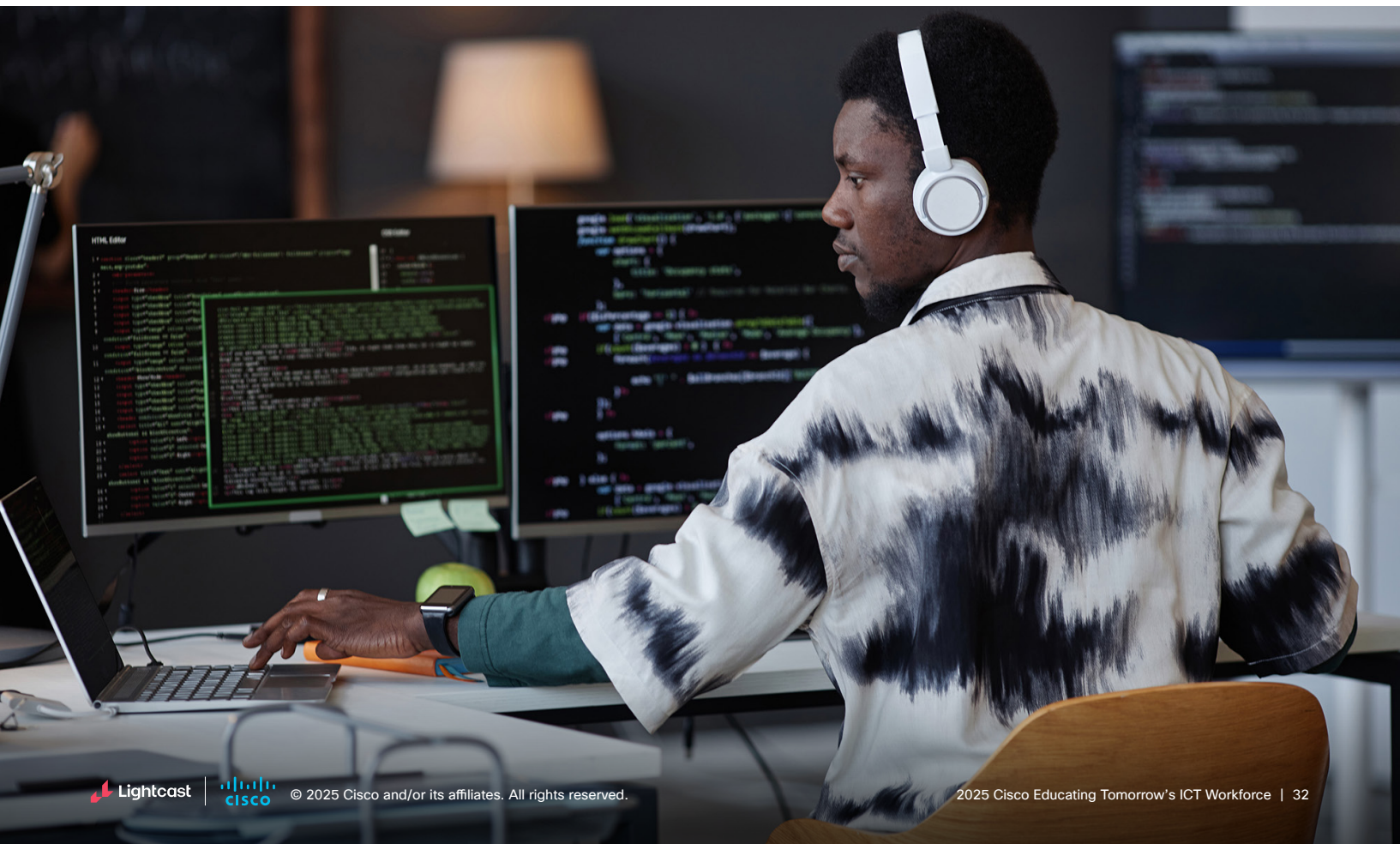
Principal skills

- Troubleshooting
- Network Switches
- Communication
- People Management
- Local Area Networks
- Networking Hardware
- Problem-Solving
- Operating Systems
- Network Security
- Network Infrastructure
- Information Technology Knowledge
- Planning
- Network Performance Management
- Network Routing
- Customer Service
- Technical Support
- System Administration
- Backup Devices
- Network Monitoring
- Disaster Recovery
- Information Research
- Network Protocols
- Detail Oriented
- Writing
- Coordinating
- Help Desk Support
- Auditing

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Low

GenAI will impact 30% of Network Administrator skills in the near term, with 19% seeing increasing relevance to boost efficiency. Long term, another 26% of skills could see decreasing relevance, but 44% will still need human involvement due to their interactive and manual nature. Early GenAI use cases in network administration include documentation; help desk support; network performance monitoring; configuration generation and validation; and disaster recovery. Network Administrators will need to develop AI Literacy and Prompt Engineering to enhance traditional skills such as Help Desk Support, Information Technology Knowledge, Problem-Solving, and Technical Support. Skills related to Network Infrastructure, Performance Management, and Writing may be automated. The job focus will shift toward higher-level tasks requiring human judgment, leveraging GenAI for routine tasks and necessitating continuous learning and adaptation to new AI technologies.

Figure 10 shows the analysis of GenAI's short-term impact on Network Administrator skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- 30% of the skills will be impacted by GenAI in the near term, of which 19% could see increasing relevance to boost efficiency.
- In the long run, another 26% of skills could see decreasing relevance, but the nature of the role's interactive and manual tasks will still require direct human involvement in 44% of skills.
- Early use cases of GenAI include documentation, help desk support, and integrating or embedding GenAI technologies into the network to monitor network performance.
- LLMs can be integrated in systems to generate configurations, validate existing configurations, analyze logs, monitor performance, and detect potential network and system problems to invoke disaster recovery protocols.
- Network Administrators will need to cultivate awareness of GenAI technologies, as well as be equipped with strong Prompt Engineering skills to effectively interact with AI assistants.

Skill impact

- **New Skills:** AI Literacy, Prompt Engineering, Responsible AI
- **Increasing Relevance:** Help Desk Support, Information Research, Information Technology Knowledge, Problem-Solving, Technical Support
- **Decreasing Relevance:** Network Infrastructure, Network Performance Management, Writing
- **Stable:** Auditing, Backup Devices, Communication, Coordinating, Customer Service, Detail Oriented, Disaster Recovery, Local Area Networks, Network Monitoring, Network Protocols, Network Routing, Network Security, Network Switches, Networking Hardware, Operating Systems, People Management, Planning, System Administration, Troubleshooting

Figure 10. GenAI short-term impact on Network Administrator skills
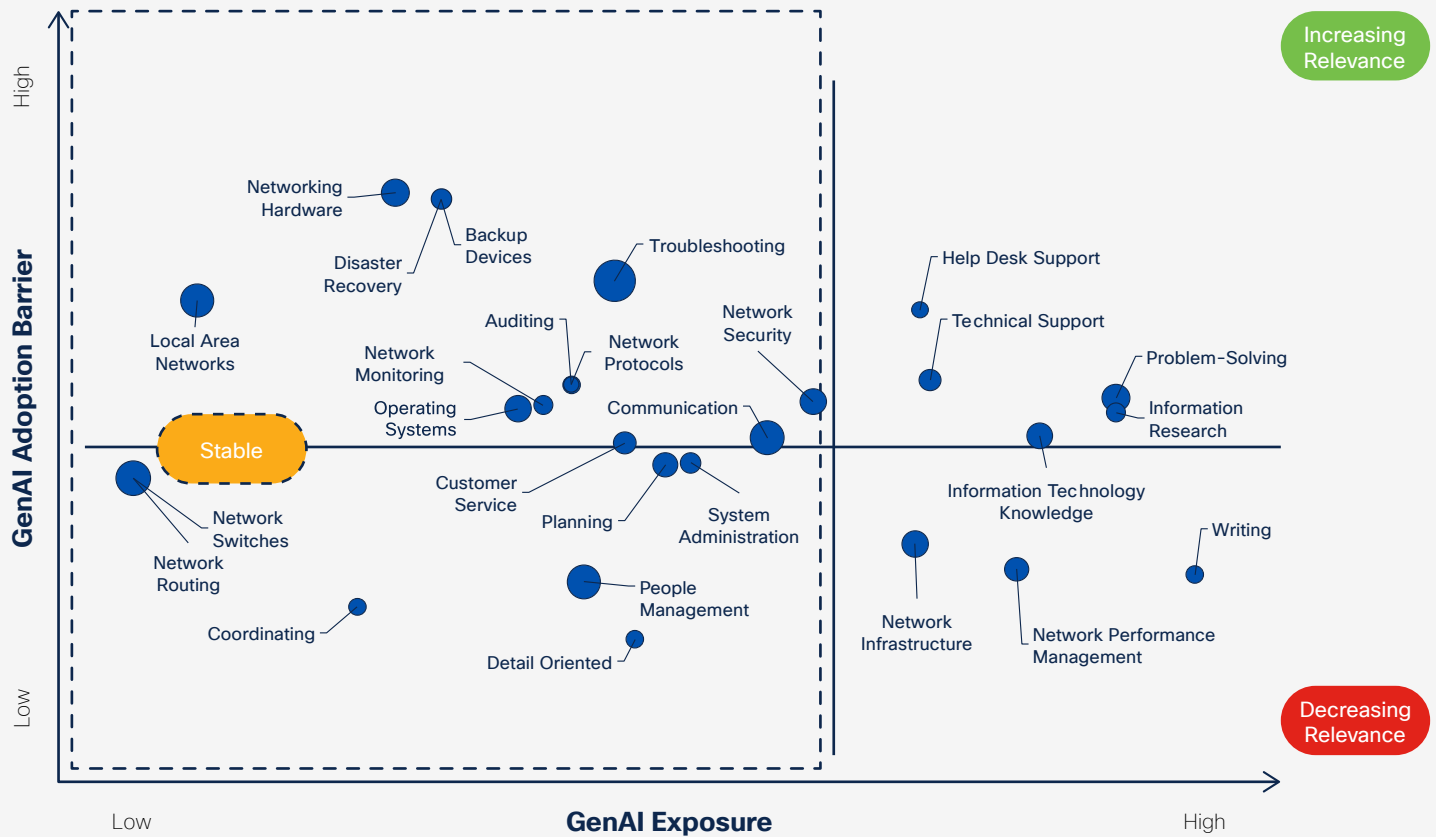
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Network Administrator job role, please see NetAcad.com/AItraining.

Network Support Technician

Job role description

Network Support Technicians ensure the effective operation and security of computer networks by conducting regular updates, monitoring performance, and responding to alerts. They provide technical support and training to users, perform routine maintenance and repairs, and handle the installation and configuration of network hardware and software. Additionally, they document technical solutions, manage compliance with security standards, and generate reports to keep stakeholders informed about network status and issues.

Principal tasks

- Conduct regular updates and patching of software and systems, checking for vulnerabilities to maintain security and functionality.
- Utilize network monitoring tools to evaluate and analyze network performance and respond to network alerts.
- Document technical solutions and troubleshooting procedures to resolve issues.
- Install network software, including security or firewall software.
- Provide technical support for computers and associated networks, including troubleshooting and resolving hardware, software, and network issues.
- Provide direct support to users, including on-site and remote assistance.
- Perform routine maintenance and standard repairs on network equipment such as routers, switches, modems, cables, and peripheral devices.
- Install and configure hardware or software systems or components, ensuring integration with existing network systems.
- Install or repair network cables, including fiber optic.
- Create or update technical documentation for network installations or changes to existing installations.
- Train users in procedures related to network applications or related systems.
- Test repaired items to ensure proper operation.
- Install and configure wireless networking equipment.
- Generate reports on network status, incident management, and resolution outcomes to keep stakeholders informed.
- Utilize ticketing systems to log, track, and manage issues. Review the trouble ticket queue to identify issues that need to be addressed and provide timely updates in the ticketing system of the work performed.
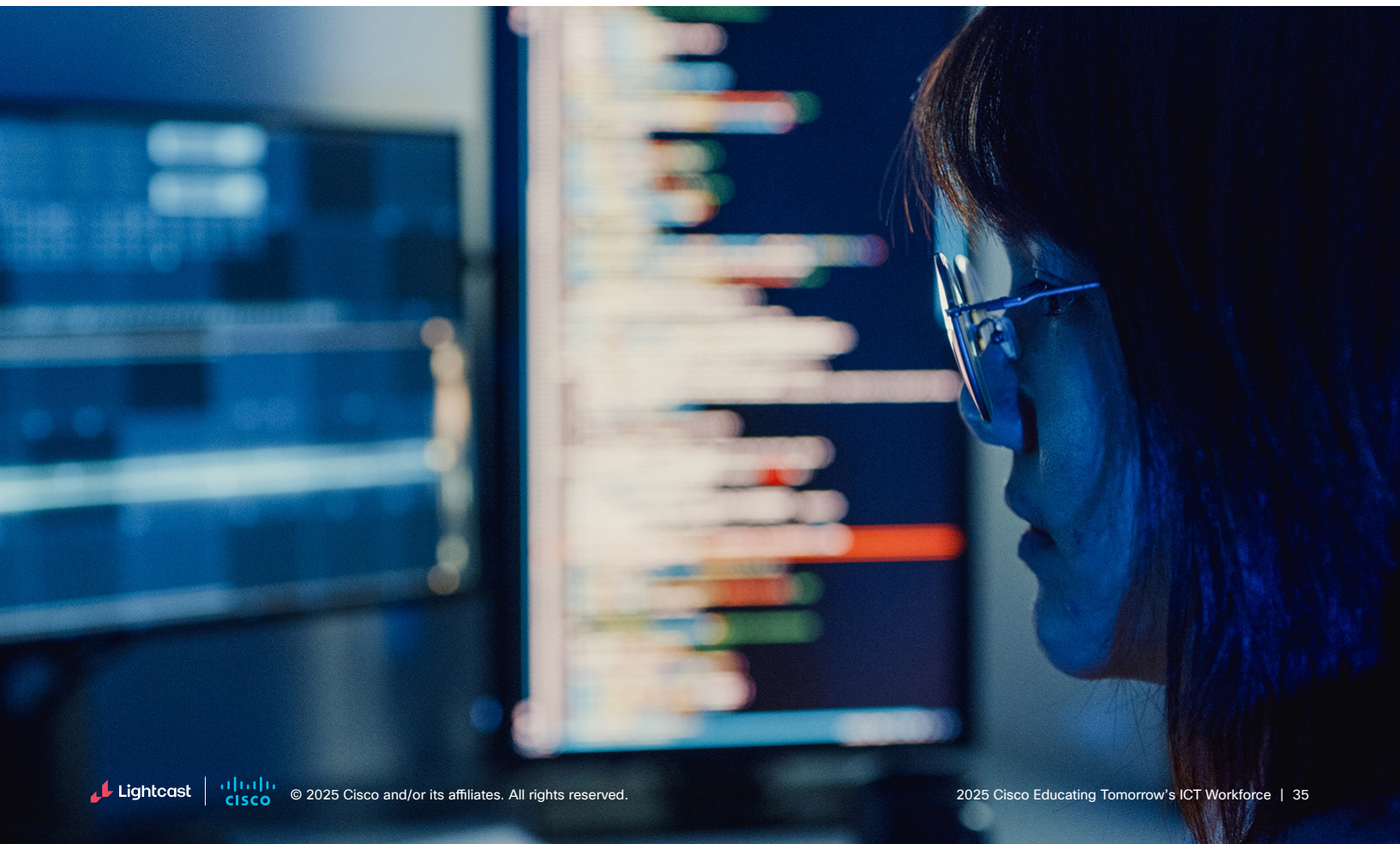
- Create or revise user instructions, procedures, or manuals.
- Monitor and manage compliance with relevant security standards, ensuring that network activities meet required security benchmarks.

Principal skills

- Communication
- Customer Service
- Task Management
- Network Switches
- Local Area Networks
- Computer Networks
- Networking Hardware
- Wide Area Networks
- Detail Oriented
- Operating Systems
- Technical Support
- Firewall
- Network Infrastructure
- Network Support
- Help Desk Support
- Network Routing
- Writing
- Peripheral Devices
- Computer Hardware
- Issue Tracking
- Network Monitoring

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Low

GenAI will have a limited impact on the skill sets of Network Support Technicians in the near term, because the role still involves many interactive and manual tasks. In the long run, AI technology maturity can significantly impact this role by automating away many manual and repetitive tasks. Currently, routine tasks like email responses, issue tracking, and documentation can be automated. Advanced GenAI integration could extend to test building, network monitoring, and security compliance. The job focus will shift from routine tasks to managing GenAI technologies in the workflows, requiring technicians to develop AI Literacy and Prompt Engineering skills to interact effectively with AI assistants.

Figure 11 shows the analysis of GenAI's short-term impact on Network Support Technician skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- 5% of the skills will be impacted by GenAI in the near term.
- Due to the low barriers of adoption, in the long run another 76% of skills could see decreasing relevance as GenAI technologies advance. However, the nature of the role's interactive and manual tasks will still require direct human involvement in 19% of skills.
- Early use cases of GenAI include automating email responses to issues, issue tracking, and generating documentation of issue resolution. If integrated in the appropriate systems, LLMs can build tests for quality assurance of repaired items or assist with network monitoring and security compliance.
- Network Support Technicians will need to cultivate awareness of GenAI technologies, as well as be equipped with strong Prompt Engineering skills to effectively interact with AI assistants.

Skill impact

- **New Skills:** AI Literacy, Prompt Engineering, Responsible AI
- **Decreasing Relevance:** Writing
- **Stable:** Communication, Computer Hardware, Computer Networks, Customer Service, Detail Oriented, Firewall, Help Desk Support, Issue Tracking, Local Area Networks, Network Infrastructure, Network Monitoring, Network Routing, Network Support, Network Switches, Networking Hardware, Operating Systems, Peripheral Devices, Task Management, Technical Support, Wide Area Networks

Figure 11. GenAI short-term impact on Network Support Technician skills
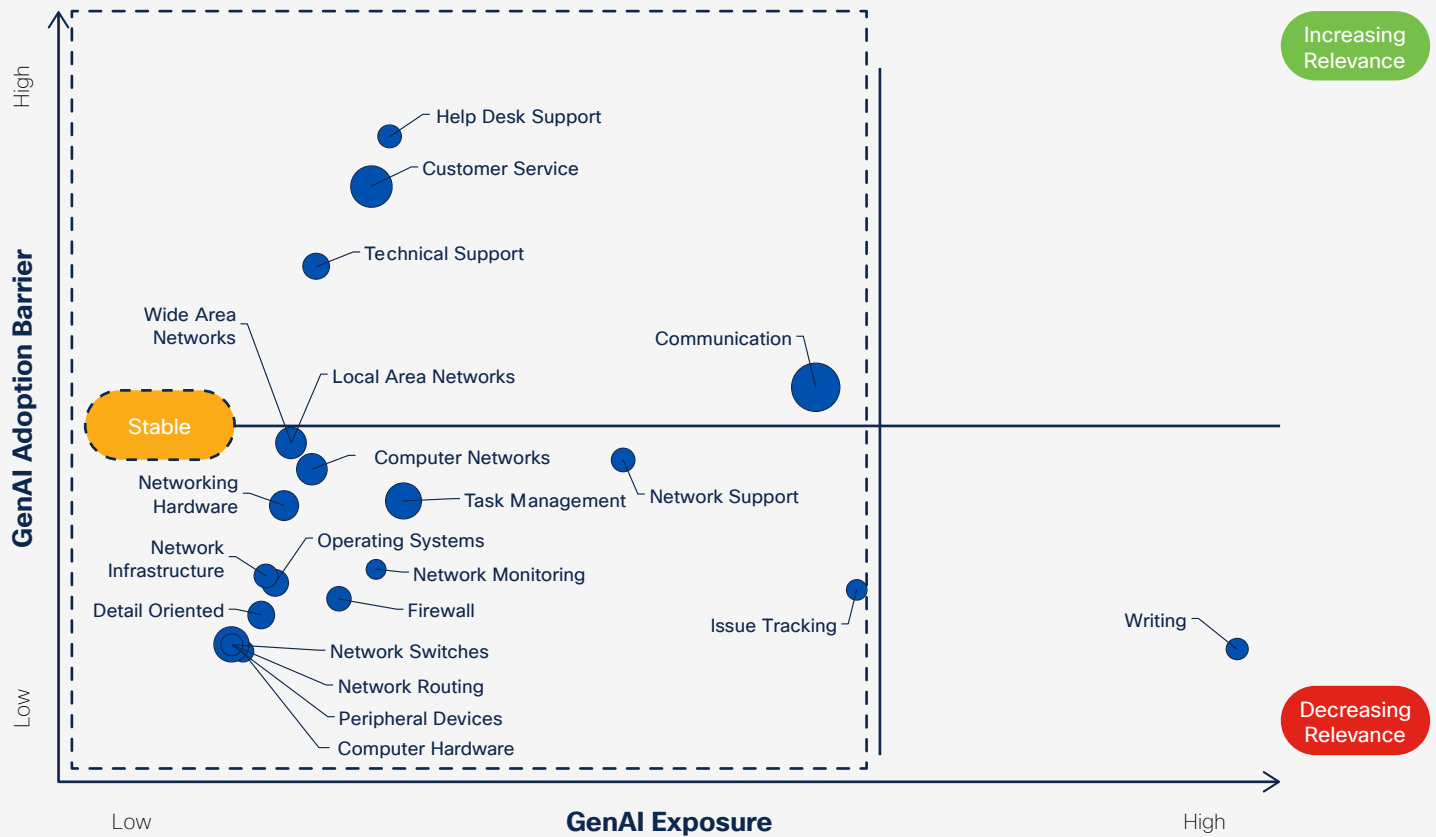
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Network Support Technician job role, please see NetAcad.com/AItraining.

IT Support Specialist

Job role description

IT Support Specialists monitor and maintain computer systems, install and set up equipment and software for users, and troubleshoot technical issues. They collaborate with staff to determine system requirements and maintain records of transactions and activities. They also evaluate and recommend software or hardware improvements, develop training materials, and supervise workers on special projects.

Principal tasks

- Oversee the daily performance of computer systems.
- Set up equipment for employee use, performing or ensuring proper installation of cables, operating systems, or appropriate software.
- Read technical manuals, confer with users, or conduct computer diagnostics to investigate and resolve problems or to provide technical assistance and support.
- Answer user inquiries regarding computer software or hardware operation to resolve problems.
- Install and perform minor repairs to hardware, software, or peripheral equipment, following design or installation specifications.
- Confer with staff, users, and management to establish requirements for new systems or modifications.
- Enter commands and observe system functioning to verify correct operations and detect errors.
- Maintain records of daily data communication transactions; problems and remedial actions taken; or installation activities.
- Refer defective products or major hardware or software problems to vendors or technicians for service.
- Prepare evaluations of software or hardware and recommend improvements or upgrades.
- Develop training materials and procedures or train users in the proper use of hardware or software.
- Inspect equipment and read order sheets to prepare for delivery to users.
- Read trade magazines and technical manuals, or attend conferences and seminars to maintain knowledge of hardware and software.
- Conduct office automation feasibility studies, including workflow analysis, space design, or cost-comparison analysis.

- Hire, supervise, and direct workers engaged in special project work, problem-solving, monitoring, and installation of data communication equipment and software.
- Modify and customize commercial programs for internal needs.

Principal skills

- Troubleshooting
- Communication
- Customer Service
- Problem-Solving
- Help Desk Support
- Technical Support
- Task Management
- Operating Systems
- Information Technology Knowledge
- Operations
- Microsoft Office
- Detail Oriented
- Writing
- Computer Hardware
- Peripheral Devices
- Interpersonal Communications
- Issue Tracking
- Information Research
- Planning
- Leadership
- Project Management
- Organizational Skills
- Microsoft Windows
- Network Troubleshooting
- End-User Training and Support
- Automation
- Windows Servers

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Low

GenAI is having a moderate impact on the skill sets of IT Support Specialists, with a potential 11% of skills becoming less relevant and another 11% becoming more relevant in the near future. However, the analysis suggests that as GenAI evolves, up to 45% of IT Support Specialist skills could eventually be automated, particularly those involving low stakes and repetitive tasks. GenAI will increasingly assist with tasks such as question handling, initial responses, case status summarization, knowledge article recommendation, software patching, resolution summarization, and lower-complexity ticket resolution. This shift will likely see IT Support Specialists leveraging AI tools for efficiency and accuracy in problem-solving and customer support, while focusing more on high-complexity cases and validating output from GenAI on lower-complexity issues. Understanding the integration capabilities of GenAI into existing systems will also be important for this role.

Figure 12 shows the analysis of GenAI's short-term impact on IT Support Specialist skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- 11% of the IT Support Specialist skill set could become less relevant, while another 11% could become increasingly more relevant in the near future.
- The low stakes of consequences and the repetitive nature of IT Support Specialist tasks suggest that 45% of skills in this profession could eventually be automated with advancement in AI. As GenAI evolves, the remaining 33% of skills that require human presence could see increasing relevance.
- AI assistance will become more frequent in IT support. Early use cases include question handling, initial response writing, real-time case status summarization, knowledge article recommendation, software patching, resolution summarization, and lower-complexity ticket resolution.
- LLM-integrated back-end systems and logs can assist with system performance monitoring. Vision-based AI models could assist in physical inspection of equipment.
- Case resolution will be difficult to automate due to wide-ranging symptoms and unique customer environments.
- IT Support Specialists will shift their focus to high-complexity cases, while validating output from GenAI assistants on lower-complexity issues. They will also need to understand the integration capabilities of GenAI technologies into existing systems to regulate access to such tools for other employees.

Skill impact

- **New Skills:** AI Literacy, LLM Architecture, Prompt Engineering, Responsible AI, Retrieval Augmented Generation (RAG)
- **Increasing Relevance:** Communication, Customer Service, Help Desk Support
- **Decreasing Relevance:** Issue Tracking, Troubleshooting, Writing
- **Stable:** Automation, Computer Hardware, Detail Oriented, End-User Training and Support, Information Research, Information Technology Knowledge, Interpersonal Communications, Leadership, Microsoft Office, Microsoft Windows, Network Troubleshooting, Operating Systems, Operations, Organizational Skills, Peripheral Devices, Planning, Problem-Solving, Project Management, Task Management, Technical Support, Windows Servers

Figure 12. GenAI short-term impact on IT Support Specialist skills
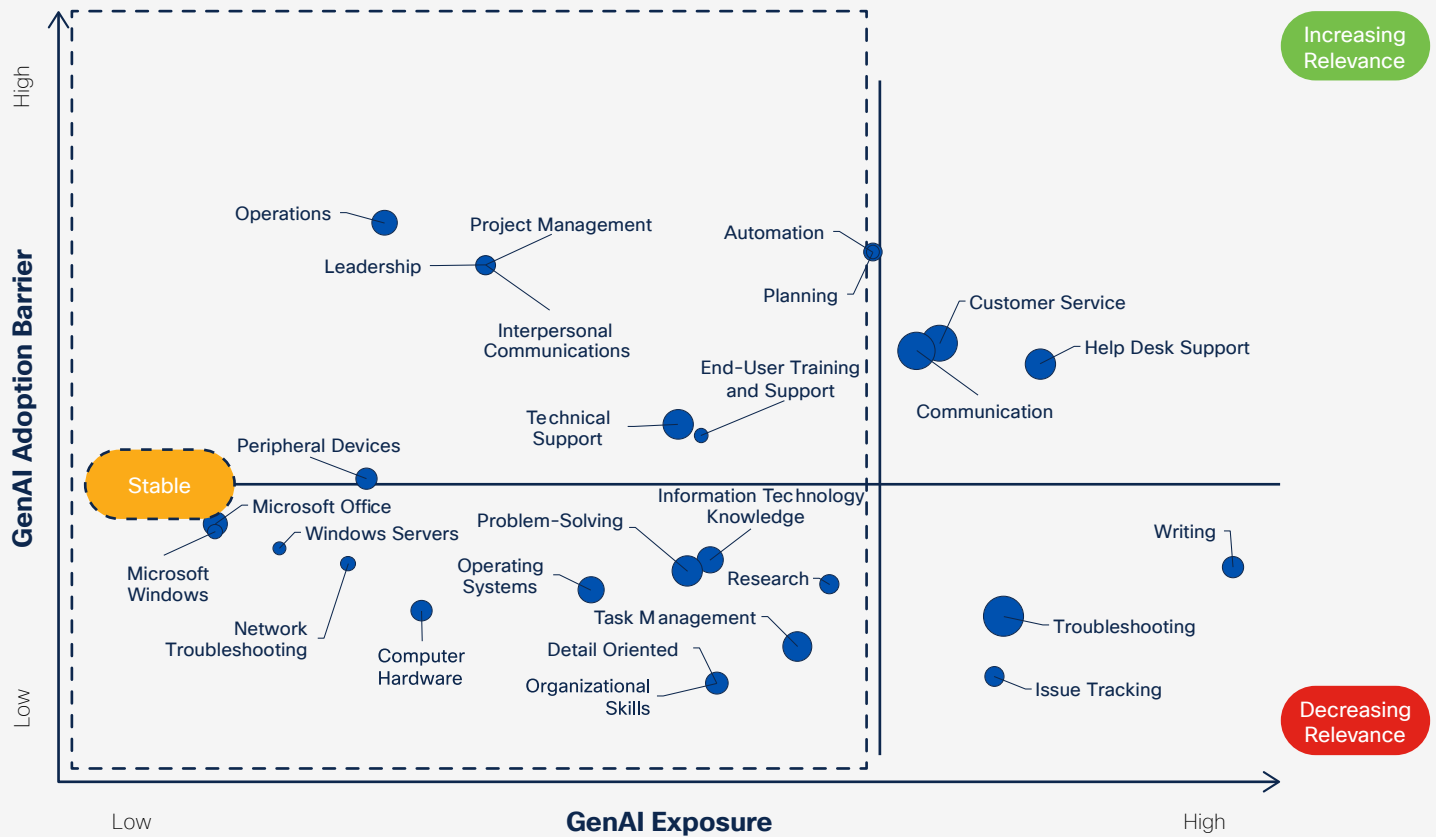
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the IT Support Specialist job role, please see NetAcad.com/AItraining.

AI and data science domain

Data science jobs are expected to be significantly transformed by GenAI. Our analysis reveals that 39% of Python Developer skills are projected to see decreasing relevance, with an additional 22% of skills potentially seeing increasing relevance. This role predominantly involves coding, an area where GenAI can provide substantial assistance.

Data Analysts are also expected to experience considerable impact from GenAI, with 61% of their skill sets projected to be affected. Specifically, 18% of skills could see increasing relevance, while 43% are at risk of decreasing relevance. Data Analysts typically engage in analyzing, synthesizing, and visualizing large datasets, often through standardized or templatized processes— tasks well suited for GenAI augmentation.

In the distant future, this impact is only expected to grow because GenAI will become increasingly capable of more advanced skills in modeling and analytics, such as mathematics, data governance, problem-solving, and decision-making. Our analysis suggests that an additional 21% of Data Analyst skills may become less relevant over time. For Python Developers, another 17% of their skills may be further automated away as GenAI evolves.

Currently, GenAI is being used in various data science applications, including code generation (for example, text to SQL), dashboard creation, data analysis, data preprocessing, training data generation, model development and fine-tuning, automated test case creation, and documentation. Thanks to these capabilities,

experts emphasize GenAI's current strength in multiplying productivity and supporting decision-making. However, they also caution against its tendency to hallucinate and produce inaccurate results. Therefore, it is crucial for data science professionals to validate LLM-generated outputs when integrating the technology in their workflows. Consequently, foundational coding and analytical skills remain essential for effectively implementing and verifying GenAI outputs.

Recommendation for adapting training programs

Looking ahead, training programs for data science professionals must evolve. Mastery of Prompt Engineering will be critical for both roles to leverage GenAI tools, such as copilots, to enhance efficiency. The curricula for Python Developers may shift focus from proficiency in multiple programming languages to key concepts like object-oriented programming. Additionally, this role will need to understand LLM Architecture and how to develop GenAI applications for business functions.

As GenAI alleviates many code-intensive tasks, data science professionals will need to cultivate advanced skill sets to provide added value to businesses. Emphasis on problem-solving, strategic thinking, and understanding customer needs will become increasingly important. It is essential for professionals entering the field to grasp the underlying purpose of their work and the associated business use cases. Furthermore, domain expertise and a deep understanding of ML models will be vital for validating GenAI-recommended solutions.

Data Analyst

Job role description

Data Analysts synthesize and analyze data to generate reports for stakeholders, providing insights and recommendations based on current trends. They maintain a library of reusable assets, create business intelligence tools, and ensure timely delivery of analytical information. Additionally, they collect, validate, and update data while staying updated on industry advancements. They collaborate with stakeholders to define meaningful key performance indicators (KPIs) aligned with organizational goals.

Principal tasks

- Generate standard or custom reports summarizing data for review by executives, managers, clients, and other stakeholders.
- Synthesize current trend data to support recommendations for action.
- Maintain library of model documents, templates,or other reusable knowledge assets.
- Create business intelligence tools or systems, including design of related databases, spreadsheets, or outputs.

- Manage timely flow of analytical information to users.
- Collect data from available industry reports, public information, field reports, or purchased sources.
- Maintain or update data analysis tools, databases, dashboards, systems, or methods.
- Provide training sessions to enhance data literacy among stakeholders, enabling them to interpret and leverage data for informed decision-making.
- Provide technical support for analytical reports, dashboards, or other tools.
- Identify and analyze industry or geographic trends with business strategy implications.
- Continuously monitor and assess new tools and techniques in the data analysis field, ensuring the adoption of best practices and staying abreast of industry advancements.
- Create or review technical design documentation to ensure the accurate development of reporting solutions.
- Analyze technology trends to identify markets for future product development or to improve sales of existing products.
- Create and implement procedures to validate the accuracy and reliability of data.
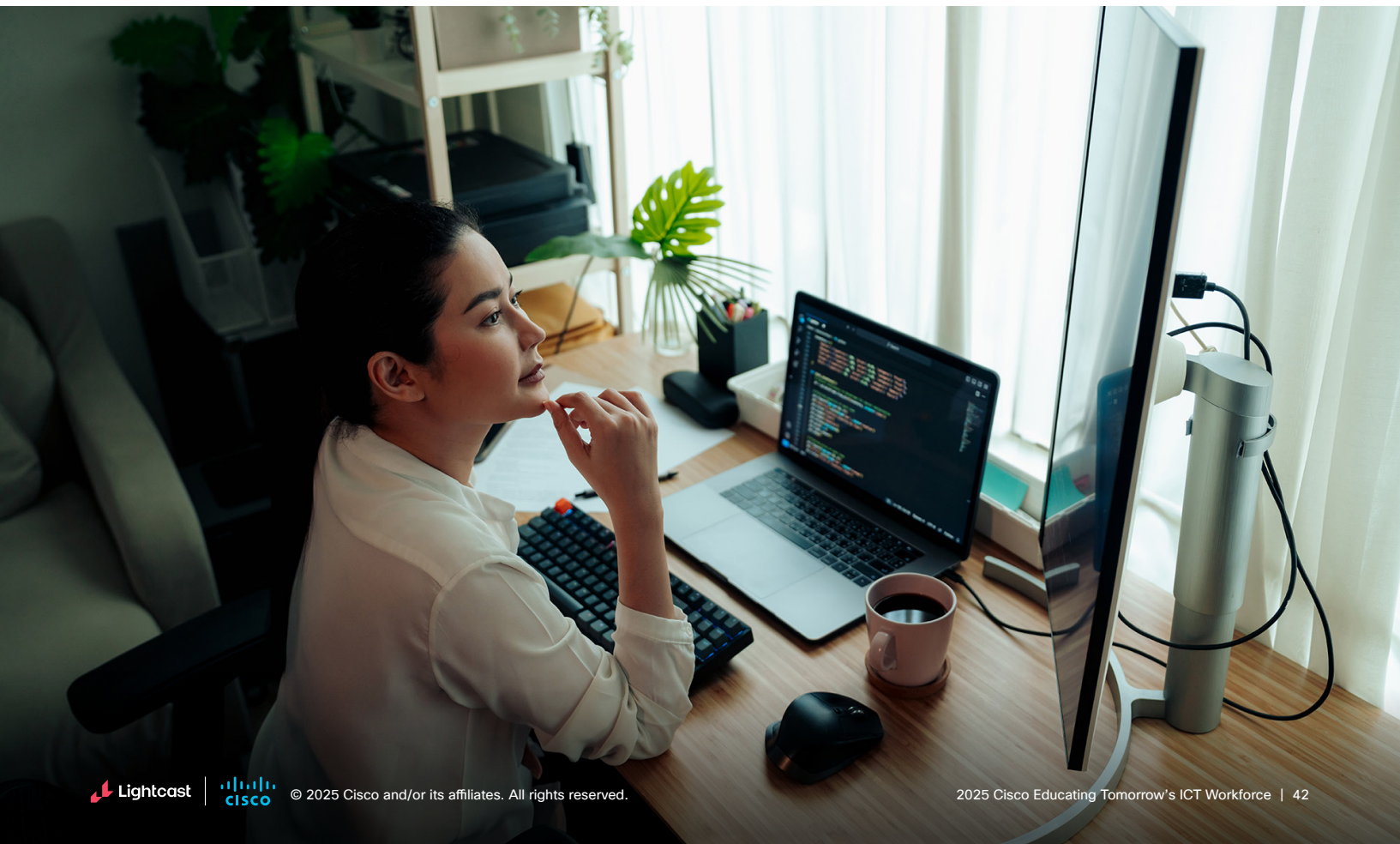
- Clean and preprocess data before analysis, ensuring data quality and relevance.
- Explore datasets using statistical and visual methods to identify patterns, trends, and outliers.
- Develop scripts or programs to automate repetitive data-related tasks, enhancing efficiency and reducing manual effort in data analysis workflows.
- Collaborate with stakeholders to define and establish meaningful KPIs based on data insights, aligning with organizational goals.
- Document specifications for data analysis reports, dashboards, or other outputs.

Principal skills

SQL	Business Intelligence
Communication	Data Warehousing
Python	Decision-Making
Microsoft Excel	Descriptive Statistics
Data Dashboards	Analytical Skills
Information Research	Innovation
Data Visualization	Data Collection
Operations	Data Governance
Writing	Business Requirements
Data Modeling	Auditing
Presentations	Relational Databases
Data Quality	Data Cleansing
Data Management	Business Strategies
R	Data Preprocessing

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Medium

GenAI is poised to impact 61% of Data Analyst skills in the near term, with another 18% likely to see increasing relevance and 21% decreasing relevance in the long term. The role of Data Analysts is shifting toward leveraging GenAI for enhanced efficiency and insight generation, while still requiring human oversight and validation, especially in critical areas where errors could have significant consequences. Key areas include effective Prompt Engineering and understanding LLM Capabilities and Biases. This shift will require Data Analysts to focus more on complex, strategic, and analytical skills, such as Auditing, Decision-Making, and Innovation, while routine data tasks that require coding could be automated or augmented.

Figure 13 shows the analysis of GenAI's short-term impact on Data Analyst skills, categorized as *Increasing Relevance, Decreasing Relevance,* or *Stable*.

Key insights

- 61% of the skills will likely be impacted by GenAI in the near term, of which 18% could see increasing relevance.
- In the long run, another 21% of skills could see decreasing relevance, but the high consequence of errors associated with this work will still require direct human involvement in 18% of skills, which could see increasing relevance.
- Data Analysts will need to understand effective Prompt Engineering, because GenAI technologies can be very helpful in their work of validating data and analyzing, synthesizing, and visualizing results from large datasets.
- GenAI is particularly useful as an analytics and search tool for textual data analysis. However, experts emphasize human validation and review of AI-generated insights, especially for tasks requiring high accuracy.
- Understanding the biases of LLMs and having domain knowledge will be critical for these workers, because they will need to be able to interpret, validate, and effectively implement GenAI outputs in the context of their business use cases.

Skill impact

- **New Skills:** AI Literacy, LLM Capabilities and Biases, Prompt Engineering, Responsible AI
- **Increasing Relevance:** Analytical Skills, Business Intelligence, Business Strategies, Communication, Presentations
- **Decreasing Relevance:** Data Cleansing, Data Collection, Data Dashboards, Data Preprocessing, Data Quality, Data Visualization, Descriptive Statistics, Information Research, Python, R, SQL, Writing
- **Stable:** Auditing, Business Requirements, Data Governance, Data Management, Data Modeling, Data Warehousing, Decision-Making, Innovation, Microsoft Excel, Operations, Relational Databases

Figure 13. GenAI short-term impact on Data Analyst skills
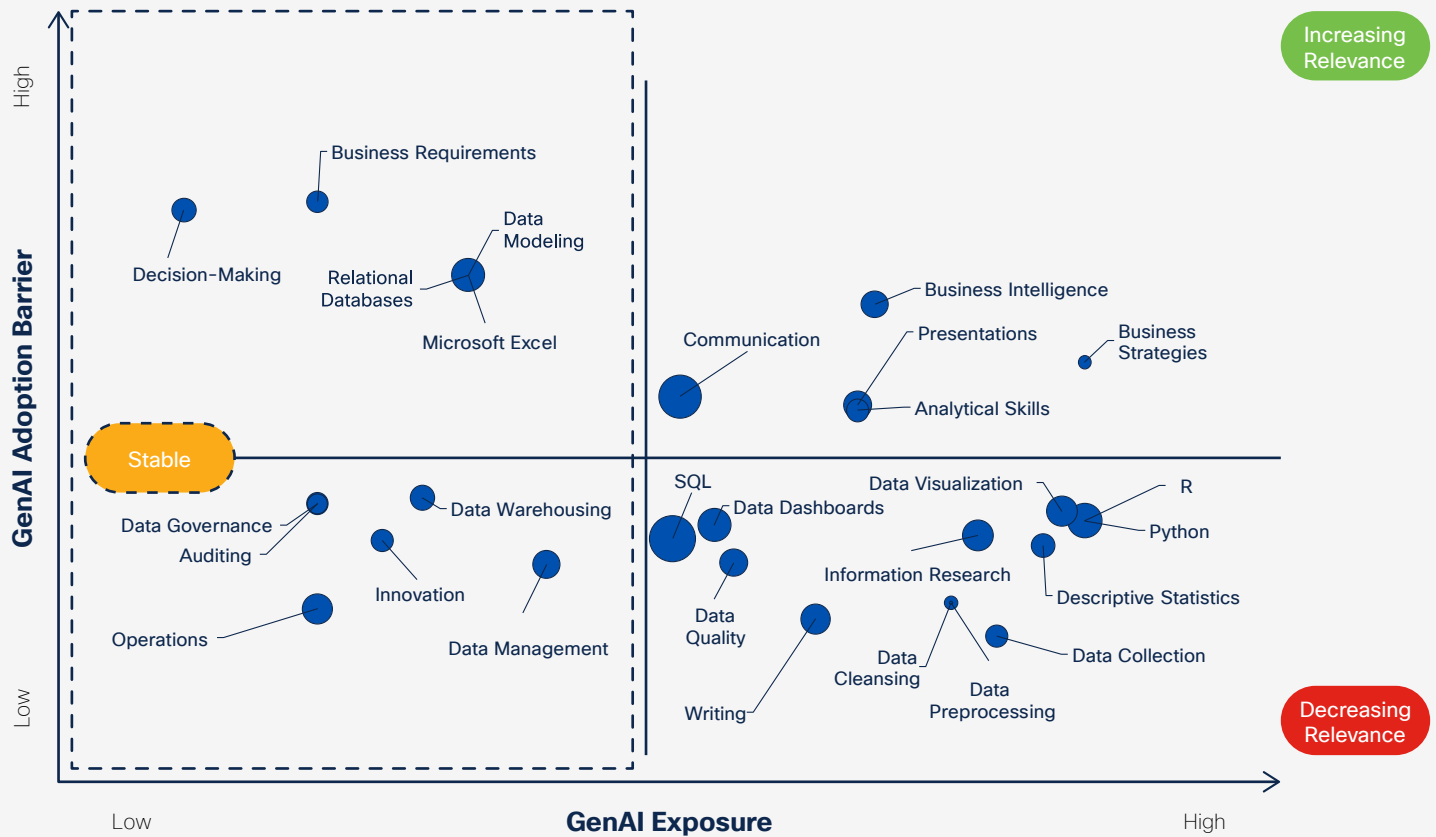
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Data Analyst job role, please see NetAcad.com/AItraining.

Python Developer

Job role description

Python Developers analyze requirements and design system installations or modifications using Python, ensuring feasibility within time and cost constraints. They collaborate with stakeholders to gather information and coordinate project activities. Additionally, they develop, modify, and test software systems and stay updated on advancements in Python and related technologies.

Principal tasks

- Analyze requirements to recommend and plan the installation or modification of systems, leveraging Python for efficient and effective solutions.
- Analyze user needs and software requirements to determine feasibility of design within time and cost constraints.
- Confer with data processing or project managers to obtain information on limitations or capabilities for data processing projects.
- Confer with systems analysts, engineers, programmers, and others to design systems and to obtain information on project limitations and capabilities; performance requirements; and interfaces.
- Consult with customers and departments on project status, proposals, and technical issues, focusing on Python-based software system design and maintenance.
- Coordinate the installation of Python-based software systems.
- Design, develop, and modify software systems using Python, leveraging scientific analysis and mathematical models to predict and measure outcomes and consequences of design.
- Determine system performance standards.
- Develop or direct Python-based software testing or validation procedures, programming, or documentation.
- Modify existing software to correct errors, adapt it to new hardware, or upgrade interfaces and improve performance.
- Obtain and evaluate information on factors such as reporting formats required, costs, or security needs to determine hardware configuration.
- Prepare reports or correspondence related to Python project specifications, activities, or status.

- Store, retrieve, and manipulate data for analysis of system capabilities and requirements.
- Supervise and assign work to programmers, designers, technologists, technicians, or other engineering or scientific personnel.
- Stay updated on the latest developments in Python and related technologies, incorporating new features and improvements into projects.

Principal skills

- Python
- SQL
- Communication
- Software Engineering
- Problem-Solving
- Machine Learning
- Debugging
- Unit Testing
- Data Engineering
- Big Data
- Task Management
- Test Automation
- Writing
- Information Research
- Planning
- Collaboration
- Business Requirements
- Configuration Management

Note: Ordered by the frequency on job posts.
See https://lightcast.io/open-skills for the description of these skills.

GenAI impact: Medium

GenAI is set to significantly transform the skill sets required for Python Developers. In the near term, 61% of their skills will be impacted, with 22% of these skills seeing increased relevance in boosting efficiency and 39% of skills that heavily relate to coding becoming less relevant. As such, developers will transition from a primary focus on writing code to understanding and addressing business problems, use cases, and success measures. They will play a critical role in integrating AI and GenAI solutions into business processes, requiring them to have a comprehensive understanding of both technical and business aspects.

Figure 14 shows the analysis of GenAI's short-term impact on Python Developer skills, categorized as *Increasing Relevance*, *Decreasing Relevance*, or *Stable*.

Key insights

- 61% of the skills will likely be impacted by GenAI in the near term, of which 22% could see increased relevance in boosting efficiency.
- In the long run, another 17% of skills could see decreasing relevance, with 22% of skills still requiring direct human involvement with advanced GenAI.
- Python Developers will need effective Prompt Engineering skills as well as a deep, technical understanding of LLM Architecture, because these workers will be responsible for designing, developing, and maintaining GenAI applications; building core software automating tasks that will leverage GenAI; and creating intelligent AI agents.
- Rather than simply focusing on writing code, Python Developers will now need to understand core business problems, use cases, and success measures as they develop software to address these items.

Skill impact

- **New Skills:** Agentic Frameworks, AI Literacy, LLM Architecture, MLOps, Prompt Engineering, Responsible AI, Retrieval Augmented Generation (RAG)
- **Increasing Relevance:** Debugging, Machine Learning, Test Automation, Unit Testing
- **Decreasing Relevance:** Big Data, Data Engineering, Information Research, Python, Software Engineering, SQL, Writing
- **Stable:** Business Requirements, Collaboration, Communication, Configuration Management, Planning, Problem-Solving, Task Management

Figure 14. GenAI short-term impact on Python Developer skills
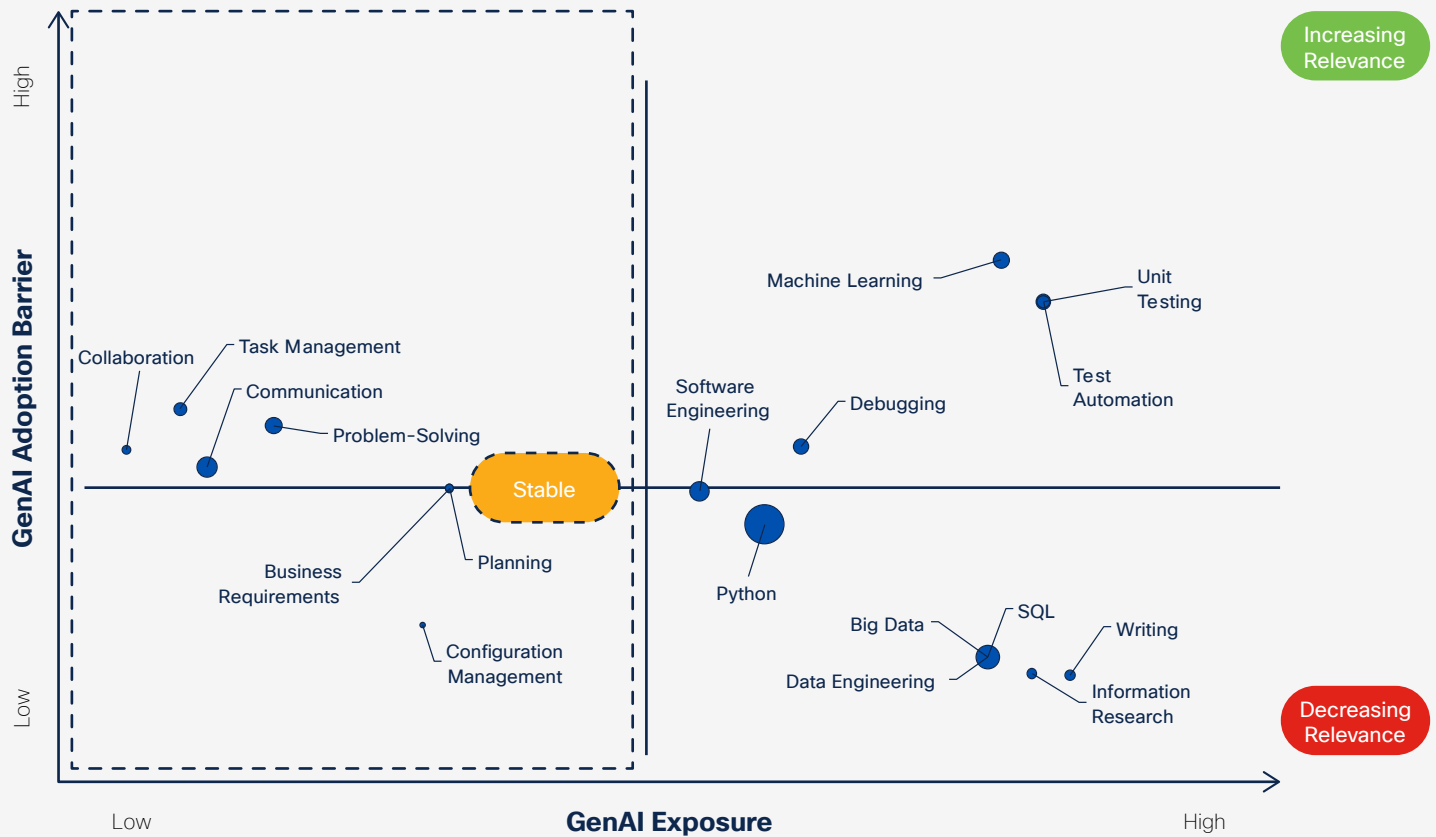
NOTE: GenAI exposure and adoption barrier quadrant boundaries occur at their mean values across all roles. Bubble size reflects the demand for the skill within the role over the 12-month period between April 2023 and March 2024.

Source: Lightcast GenAI Impact Analyses, 2024

Training recommendations

For the latest training recommendations for the Python Developer job role, please see NetAcad.com/AItraining.

About Cisco Networking Academy

Cisco Networking Academy is a global leader in IT skills development, dedicated to transforming the lives of students, educators, and communities. As one of the longest-running IT skills-to-jobs programs in the world, Cisco Networking Academy is dedicated to creating an inclusive future through the power of technology, education, and career opportunities.

Our model

At Cisco Networking Academy, we design comprehensive skills-to-jobs curricula tailored to support learners on their journeys from curiosity to career development. Our curricula are offered in partnership with high schools, vocational colleges, universities, and non-profits worldwide, enriching their offerings and enhancing educational outcomes. Additionally, we offer online self-paced course options to empower students to take control of their educational journey at their own pace.

Bridging the digital divide and closing the talent gap

As technology evolves, so does the demand for digital skills. The *Future of Jobs Report 2025* states that by 2030, 170 million jobs will be created, and 92 million jobs will be displaced worldwide due to technological and economic shifts (World Economic Forum, 2025). This results in a net increase of 78 million jobs, representing about 7% of current employment. The need for skilled workers has never been greater.

Generational impact and stronger communities

Education is the ultimate equalizer, offering everyone—regardless of background—the opportunity to gain expertise and shape their future in the digital age. Cisco Networking Academy plays a vital role in Cisco's broader mission to positively impact communities around the world. By democratizing access to cutting-edge digital skills education and training, we aim to empower individuals and foster generational change that strengthens societal structures and creates sustainable futures.

Cisco Networking Academy stands as a beacon of hope and opportunity in the digital era, equipping individuals with the skills and knowledge needed to thrive in the workforce of tomorrow.

About Lightcast

The world is full of talent data. But more data can lead to more questions, uncertainty, and stagnation as organizations sift through it to figure out what's fact and what's fiction.

Lightcast's talent intelligence platform brings clarity to the most difficult workforce questions in a rapidly changing world. Built on a 20-plus-year data foundation as Emsi Burning Glass, Lightcast brings together tens of billions of vetted, constantly updated data points and incredible insights to drive strategic talent decisions. Organizations can tap into the deepest repository of skills supply-and-demand data to transform hunches into a skills-based future. Used by more than 400 organizations and 67 of the Fortune 100, our flexible solution can integrate your own data, use our in-house talent experts, or give you the tools and confidence to explore it for yourself.

Have even more questions? Lightcast has answers. Learn more about the global standard for talent intelligence at lightcast.io.

About this report

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Acknowledgments

Appendix

Methodology details

We utilize GPT-4 to generate GenAI exposure and adoption barrier metrics for skills within each job profile and validate the findings with SME evaluation. Both metrics are generated at the task level using the O*NET task profile for each role and then aggregated to the skill level with a custom role-specific skill-to-task mapping.

Exposure

The GenAI exposure metric for a skill quantifies the extent to which workers in a role can leverage GenAI when applying this skill to perform tasks. GenAI exposure is first measured at the task level by asking GPT-4 to determine whether access to a powerful LLM can help workers reduce the time to complete the task by 0% (*unaffected*), *at most 50%,* or *at least 50*%. Access to the LLM includes a web interface like ChatGPT or OpenAI Playground, an API, or an LLM-based software application. The previously mentioned qualitative labels are converted to quantitative ratings, assuming on average 0% time saved for *unaffected,* 25% time saved for *reducing time by at most 50%,* and 75% time saved for *reducing time by at least 50%.* After that, we average the quantitative ratings across all tasks to the skill level to constitute the skill's exposure to GenAI, weighting core tasks twice as important as supplemental tasks.

Adoption barrier

The GenAI adoption barrier metric for a skill measures the limitation of relying heavily on GenAI due to the human-centric nature of the tasks requiring that skill. This metric is first assessed by GPT-4 on a scale from 1 to 10 at the task level, based on six O*NET work contexts that necessitate significant human involvement: face-to-face interaction, public speaking, responsibility for outcomes of other workers, consequence of errors, frequency of decisions, and lack of routine and structure. A higher requirement for human oversight indicates a higher barrier to GenAI adaptability in the task. Finally, the task-level adoption barriers are averaged across tasks to the skill level, again with core tasks weighted twice as heavily as supplemental tasks.

GenAI skill impact framework

The impact of GenAI at the skill level is categorized based on the extent of skill exposure to GenAI and the barriers to adopting GenAI. Using the midpoint of each metric for all skills across nine roles, we define the boundaries for areas to categorize the nature of GenAI's impact on skills both in the short term and the long term.[9]

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9 Using midpoints ensures that the boundaries are insensitive to the specific roles included in the analysis. For both metrics, the midpoint closely aligns with the mean and median values across nine roles. Specifically, for the exposure metric, the midpoint is 0.375, the mean is 0.38, and the median is 0.34. For the adoption barrier metric, the midpoint is 5, the mean is 5.15, and the median is 5.26.

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Short-term impacts

The top right quadrant of Figure A1 are skills with *Increasing Relevance,* which are highly exposed to GenAI but face large barriers to full GenAI adoption. Workers still need to be hands-on when using these skills to complete tasks, but they can benefit from GenAI's support to increase efficiency. On the other hand, skills in the bottom right quadrant are also highly exposed to the technology but do not require much human attention. Consequently, their low barrier to adoption indicates having *Decreasing Relevance* with the risk of being automated away. The left half represents skills that are currently insulated from GenAI; thus their relevance is *Stable* in the short run.

Long-term impacts

In the distant future, advancements in AI and robotics may enable the automation of tasks currently performed by humans in physical environments. For example, sophisticated robotics could potentially undertake responsibilities such as hardware configuration and maintenance. However, even with technological advancements, the degree to which AI can replace human

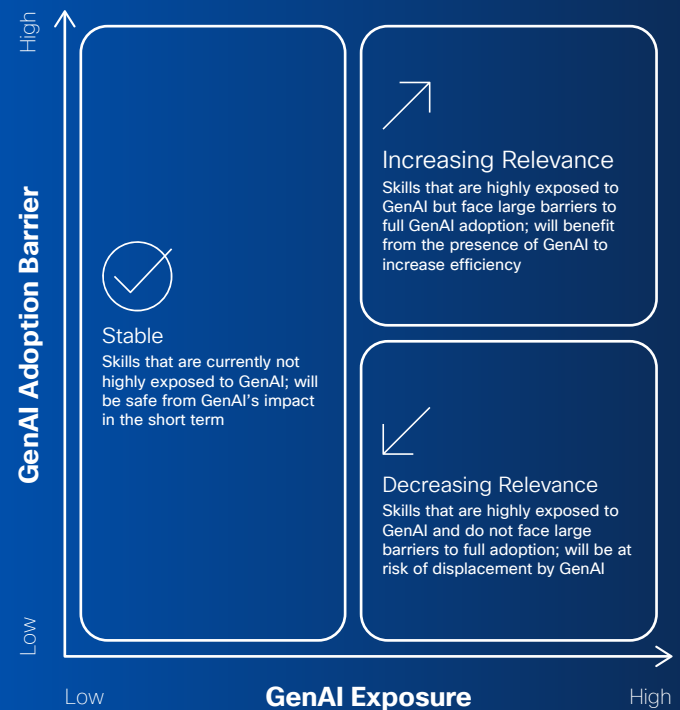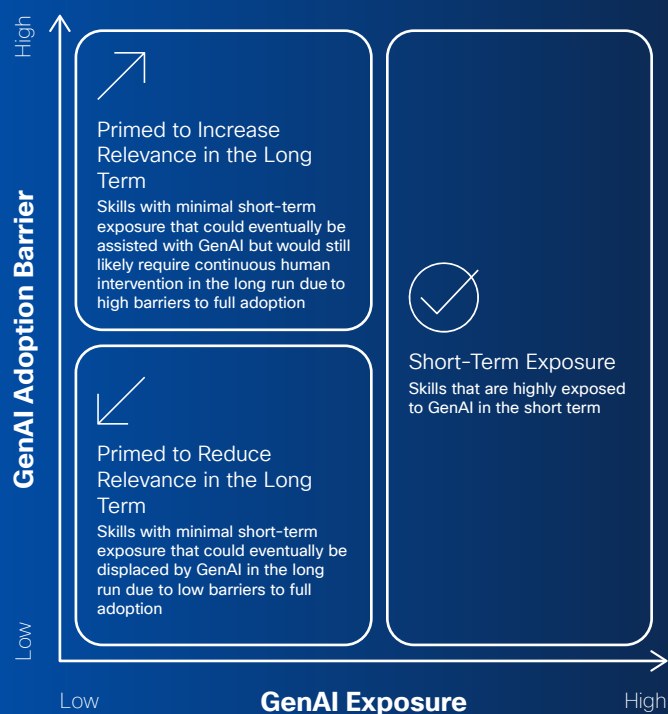## Figure A1. GenAI short-term skill impact framework

Increasing Relevance
Skills that are highly exposed to GenAI but face large barriers to full GenAI adoption; will benefit from the presence of GenAI to increase efficiency

Stable
Skills that are currently not highly exposed to GenAI; will be safe from GenAI's impact in the short term

Decreasing Relevance
Skills that are highly exposed to GenAI and do not face large barriers to full adoption; will be at risk of displacement by GenAI

GenAI Adoption Barrier — High / Low

GenAI Exposure — Low / High

Figure A2. GenAI long-term skill impact framework

Primed to Increase Relevance in the Long Term
Skills with minimal short-term exposure that could eventually be assisted with GenAI but would still likely require continuous human intervention in the long run due to high barriers to full adoption

Short-Term Exposure
Skills that are highly exposed to GenAI in the short term

Primed to Reduce Relevance in the Long Term
Skills with minimal short-term exposure that could eventually be displaced by GenAI in the long run due to low barriers to full adoption

GenAI Adoption Barrier — High / Low

GenAI Exposure — Low / High

roles will hinge on the necessity of human oversight in machine-executed tasks.

Consequently, the long-term impact on skills is likely to be influenced by human-driven barriers to AI adoption. Skills with minimal short-term exposure to GenAI may eventually face displacement if they involve tasks requiring limited human involvement. In this context, skills in the upper-left quadrant categorized as *Stable* in the short term may shift to the right, becoming more susceptible to reduced relevance over time. Conversely, other skills that are currently shielded from GenAI capabilities, so long as they still require human intervention, may one day be augmented by the evolving technology. Put differently, *Stable* skills in the lower-left quadrant may also shift to the right, gaining increasing relevance in the long term.

Figure A2 illustrates the reclassification of skills based on their long-term dynamics. For clarity, skills experiencing short-term increases or decreases in relevance are grouped under the category of *Short-Term Exposure*.

Consistency of results

One limitation of using GPT-generated metrics for analysis is the inherent variability in its outputs. ChatGPT may produce different ratings for the same task even when provided with identical prompts. This variability in GPT-generated assessments can reduce the accuracy of the results. To achieve self-consistency in GPT's ratings, we run each prompt 100 times and use the average adoption barrier and exposure metrics across these 100 runs.

Methodology validation

As noted in this report, LLMs can hallucinate or produce inaccurate results. This concern also applies to our findings generated by GPT-4. To ensure the reliability of our results, we validate GPT-generated ratings with human ratings of GenAI exposure on the same tasks. Specifically, we ask SMEs to rate GenAI exposure on tasks using the same prompts presented to ChatGPT. Table A1 reports the correlation between ChatGPT-based and SME-based exposure ratings at the task level for each role.

Table A1. Comparison of task-level exposure ratings by GPT-4 and by SMEs

Role	Pearson Correlation	Number of SMEs
Cybersecurity Analyst	0.587	5
SOC Analyst – Level 1	0.928	5
Ethical Hacker	0.413	4
Network and IT Automation Engineer	0.862	6
Network Administrator	0.449	9
Network Support Technician	0.870	6
IT Support Specialist	0.502	9
Python Developer	0.747	5
Data Analyst	0.443	4

Notes:
- Each data point to calculate correlations is a task.
- Task-level exposure assessed by GPT-4 is averaged across 100 API calls.
- Task-level exposure assessed by SMEs is averaged across SMEs.

Overall, the correlation between SME and GPT-4 ratings is positive across all roles, ranging between 0.41 and 0.92. This indicates substantial agreement between the two independent sources. The correlation is particularly high for roles that involve many coding-heavy or routine tasks, including Network and IT Automation Engineer, Python Developer, SOC Analyst – Level 1, and Network Support Technician. In contrast, the positive correlation is moderate for roles involving interactive (training, discussion, presentation) or complex reasoning tasks (analysis, modeling, decision-making). OpenAI (2023) also documented that disagreement between humans and GPT-4 in their analysis tends to occur in the same types of tasks, although the paper did not specify which source is more confident with its ratings. In our analysis, we found GPT is often on par with SMEs in evaluating tasks, but tends to estimate higher exposure than SMEs when rating data science and engineering roles.

Comparison to other studies

Our methodology aligns well with established frameworks in the literature, while introducing key differentiations that allow for the contextualization of GenAI's impact on skills within each job.

Our research is among studies that use ChatGPT to assess the extent of GenAI exposure on jobs, including research by OpenAI (2023), ILO (2023), Indeed (2023), and LinkedIn (2023). In particular, our study follows the methodologies of OpenAI and ILO in assessing GenAI exposure at the task level within each job. To emphasize the impact of skills, we establish a custom mapping between skills and tasks to aggregate exposure to skill levels at the task level. This approach allows us to contextualize GenAI's impact on the skills required for task performance within each job. For example, Vulnerability Scanning is a crucial skill utilized by both Ethical Hackers and Cybersecurity Analysts. Ethical Hackers employ this skill to identify and understand potential security weaknesses, which then informs the development of tools designed to further test and exploit these areas. GenAI can enhance this process by automating data analysis and code reviews, thus improving tool development. Meanwhile, Cybersecurity Analysts use the Vulnerability Scanning skill to monitor systems and respond to incidents. GenAI-powered platforms can assist these analysts in quickly detecting vulnerabilities and implementing necessary mitigations, thereby enhancing overall security.

Finally, similar to IMF (2023), our study also employs O*NET work context concepts to measure the importance of humans in supervising technologies. Our definition of low barriers to full GenAI adoption, characterized by minimal need for human intervention, is analogous to IMF's definition of AI substitutability.