Guide to Essential Competencies for AI

A project of the AI Alliance

AI Alliance

Executive Summary

An Essential Competencies Guide for AI

The AI Alliance is a collaborative effort of top tech companies, academic institutions, research organizations, and non-profits working to create a future of open, safe, and responsible AI. This collaboration is a unique opportunity to create alignment and coordination across sectors, especially to align education with employers needs. The Alliance developed the Essential Competencies Guide in partnership with the Aspen Institute.

The objectives of this Guide are:

- **Promoting understanding of AI:** Defining essential competencies to help individuals and organizations grasp necessary knowledge and skills.

- **Supporting curriculum development:** Providing a framework for aligning education and training programs around core AI competencies.

- **Facilitating workforce development:** Assisting organizations in upskilling employees and developing AI-focused training programs.

- **Bridging the AI divide:** Promoting equitable access to AI education and learning opportunities.

The Guide addresses the increasing need for AI competencies and acknowledges the challenges individuals, academic institutions, and companies face in aligning talent supply with demand for new skills. By providing a clear framework focused on ethical AI, the Alliance hopes to contribute to a more inclusive future where AI is used and developed responsibly.

Essential competency areas include:

Responsible Use

Competencies that reflect the primary knowledge, skills, and abilities that enable ethical use of AI that protects one's personal and professional security, mitigates negative impacts on personal, professional, and social outcomes, and prioritizes mindful, informed, and productive interaction.

Identifying Data Limitations

Competencies focused on the knowledge, skills, and abilities required to effectively recognize AI limitations and opportunities, including recognition of data limitations and effective evaluation of AI outputs.

Data Analysis

Competencies that support effective selection, use, and management of data, as well as adopting appropriate methods to meet project goals and solve problems.

Machine Learning

Competencies focused on concepts and applications core to programming in AI, and in researching and developing GenAI tools and methodologies for desired outcomes.

AI Logic

Competencies that reflect the knowledge, skills, and abilities core to working in symbolic/logic-based AI and making strategic decisions about the use of symbolic AI approaches.

The goal of this Guide is to support alignment and advancement among the many stakeholders and organizations working to provide education and skill development at all levels. We anticipate the Guide creating value for:

- **Public Engagement**—Local leaders and community-based organizations, often in partnership with education and training providers, will need to play a role in building awareness among the public of the importance of AI competencies, and in creating programs and opportunities for many more people to access high-quality AI training at scale.

- **Public Awareness**—Ethical AI development and use is a shared responsibility, and awareness of AI's benefits and risks is unbalanced, with many people unaware and even afraid of AI technology and its implications. Supporting awareness and skill-building for novices through this Guide, and continuing to advance digital literacy more broadly, will be helpful in mitigating anxiety and creating more informed and confident users of AI tools and products.

- **Curriculum Development**—While training providers and educators know best what their students need, aligning curriculum and learning activities to these core competencies across diverse environments can assure people across all roles move toward a higher baseline of AI knowledge and skills.

- **Workforce Development and Upskilling**—Tech and information firms will likely have a strong sense of the skill development required for their workforces, but for organizations that will be impacted by advancements in AI and whose workforces need education and training, this Guide may be helpful in organizing workforce developing programs. For organizations looking to hire vendors to support training and development, the Guide may be helpful in both creating training scopes and assessing vendor capacities.

- **Competency Assessment**—Managers and facilitators can use this Guide to both ensure that people undergoing training and skill development are building the right competencies, and to help people understand their own learning and knowledge growth.

- **Alignment of Education Initiatives**—As learning and skills are increasingly able to be documented and shared through Learning and Employment Records, competencies developed in AI areas by individuals in the workplace and through employer-supported upskilling programs may be recognizable by higher education institutions for credit toward credentials. This may be especially true of well-regarded programs like IBM's SkillsBuild, Cisco's Networking Academy, and through platforms like Coursera and LinkedIn Learning.

In addition to articulating competency areas and levels of proficiency, the Guide includes Role Profiles as illustrations of how the competencies align to important roles across societies. We include roles such as Novice Users and Decision Makers, along with AI's Future and Expert Workforce. Along with descriptions of how AI competencies impact these roles, we include recommendations for low- and no-cost education and training resources tailored to each profile.

Given the rapid pace of change in AI technology and tools, the Alliance anticipates that the Guide will require periodic updates. The AI Alliance also welcomes stakeholders to share feedback, ideas, and their experiences using the Guide.

Visit this link to share your thoughts.

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Introduction

The AI Alliance is an unprecedented collaboration between businesses, universities, research organizations, government, and non-profit organizations working collectively to create a future of open, safe, and responsible AI. The Alliance works across natural boundaries of organizational type and geography to accelerate responsible innovation in AI, while creating opportunities everywhere and for everyone.

The AI Alliance is committed to open innovation across the AI technology landscape, with the philosophy that this approach:

- Harnesses the innovative talent of the global community;

- Ensures accountability among individuals and companies;

- Instills trust from improved transparency, demystifying technical innovation for both the public and policymakers; and

- Better enables robust testing and validation through broad-based community approaches.

Artificial Intelligence (AI) is a broad term, which has historically referred to a collection of technologies designed to emulate human intelligence. For the purposes of this Guide, we speak to AI competencies in athe context of the breadth of AI knowledge, application, development, and impacts, inclusive of:

- Computational systems that can perform tasks that, in the past, have required human intelligence.

- Automated systems and approaches that mimic or simulate human thinking and may operate autonomously, including Generative AI, which utilize Machine Learning, Natural Language Processing, and Computer Vision.

Skills and education—what people need to understand about AI, defined by Alliance member IBM as technology that enables computers and machines to simulate human intelligence and problem-solving capabilities, to effectively work, live, and advance

in a world that is changing at an increasing pace—is a core priority of the Alliance. The Alliance's efforts focus both on the research and advanced skills needed by AI professionals as well as the pragmatic skills and understanding required by policymakers, educators, and the public about AI's advantages and limitations. To advance this approach, the AI Alliance believes it is important to define a set of essential competencies that are relevant across society.

The Essential AI Competencies Guide is intended to be a useful tool in supporting organizations and individuals in their understanding the AI knowledge and skills that are most critical to their roles and areas of work.

The Alliance provides this guidance to spur reflection, especially among individuals in leadership positions and those who are influencing others' education and opportunities. It is also intended to catalyze action, resulting in shifts to curriculum, an enhanced focus on digital literacy, new programming, and improved alignment and agreement between sectors. Additional use cases will emerge over time.

The goal of this Guide is to support action on the part of the many stakeholders and organizations working to advance education and skill development. Specific use cases will emerge over time.

We anticipate this Guide creating value across multiple activities, including:

Curriculum Development—While training providers and educators know best what their students need, aligning curriculum and learning activities to these core competencies across diverse environments can assure people across all roles move toward a higher baseline of AI knowledge and skills.

Workforce Development and Upskilling—Tech and information firms will likely have a strong sense of the skill development required for their workforces, but for organizations that will be impacted by advancements in AI and whose workforces need education and training, this Guide may be helpful in organizing workforce developing programs. For organizations looking to hire vendors to support training and development, the Guide may be helpful in both creating training scopes and assessing vendor

capacities.

Competency Assessment—Managers and facilitators can use this Guide to ensure that people undergoing training and skill development are building the right competencies, and to help people understand their own learning and knowledge growth.

Alignment of Education Initiatives—As learning and skills are increasingly able to be documented and shared through Learning and Employment Records, competencies developed in AI areas by individuals in the workplace and through employer-supported upskilling programs may be recognizable by higher education institutions for credit toward credentials. This may be especially true of well-regarded programs like IBM's SkillsBuild, Cisco's Networking Academy, and through platforms like Coursera and LinkedIn Learning.

Public Engagement—As AI awareness and literacy grow in importance to the health of societies and economies, policymakers at all levels, as well as community-based organizations that support local populations, will need to play a role in assuring that foundational competencies and AI literacy initiatives reach everyone. Public and community leaders will also need to effectively navigate and negotiate around publicly perceived needs and concerns about AI's impact on societies and economies and align AI skill development at scale with business demands and pain points.

About
the Guide

The development of the Essential AI Competencies Guide emerged as a priority from AI Alliance members, who represent corporate, academic and non-profit organizations. Leaders elevated the essential competencies required by different people across societies and economies, recognizing that AI will affect everyone, with special attention paid to those who will be most impacted by automation.

"We're standing at a moment of opportunity. The vision of an AI-powered future has become an exciting reality, with an ever-growing list of real-world examples of AI delivering competitive advantages across industries and driving inclusion. There is the potential to do so much more, and skills are the key to unlocking that value. Our work through the AI Alliance highlights the skills our workforce needs, and lays-out how to best combine durable and technical competencies to be prepared for roles as they continue to evolve. One thing is abundantly clear: lifelong learners will thrive."

LYDIA LOGAN, IBM, VP GLOBAL EDUCATION AND WORKFORCE DEVELOPMENT

We leveraged AI Alliance members' insights and guidance and spoke with multiple leaders in the field. The Guide also incorporates ideas and feedback generated through a September workshop hosted by Meta, which included workforce development leaders, academic researchers and faculty, and corporate leaders. The Guide includes insights gained through a literature review, research and analysis into existing AI skills frameworks, thought pieces, occupation/position descriptions, and academic and workforce curriculum to determine a universe of competencies that are relevant, broadly applicable, and describe a baseline set of competencies which are needed across economies and societies.

We do not attempt here to create a skills framework, identifying the comprehensive list of skills within the industry and mapping to those roles. Recently, the AI-Enabled ICT Workforce Consortium released "The Transformational Opportunity of AI on ICT Jobs," which provides an exhaustive accounting of the specific skills and capacities that will be required within information and computer technology roles, and how those skills will be affected by the emergence of AI. This excellent resource provides details at occupational and skill levels and provides helpful context for the impact of AI on each ICT occupation.

The Case for Essential AI Competencies

The AI skills challenge is systemic—no one sector is responsible for it, and no single sector can solve it. To reach scaled solutions, work across business, education, workforce training providers, government, and non-profit organizations is required.

There is also a need to get specific, focusing on the core competencies required not only by professionals who will develop and build the latest AI products, but those required for everyone living and working in AI-impacted societies and economies.

"I think that there is a conversation we need to have as an industry and within our society about what AI is and how it will affect the future of our work, economics and the labor landscape in the US. There is a lot the future of AI can bring and deliver, if we're inclusive and thoughtful about how we develop it. There is an opportunity to have a meaningful impact on education, and to retrain and reskill people to use the latest tech in ways that enhance their work and personal lives."

REBEKKAH HOGAN, META, AI PROGRAM MANAGEMENT LEAD, CO-CHAIR, AI ALLIANCE SKILLS AND EDUCATION WORKING GROUP

Working across sectors, aligning on the fundamental building blocks, we have a unique opportunity to begin to solve a global problem, and craft solutions that will reach all the people who will be impacted by AI.

Each month, new research emerges about the disruptions and new opportunities in work and life resulting from advancements in AI. The "AI Divide" is real and growing, with a new to increase opportunities for those who are least likely to access the education and skill development they need to navigate changes. Workers have a growing awareness that they will need new skills, but often lack confidence and knowledge about how and where to acquire them; employers face ever-mounting needs to upskill and reskill people due to AI implementation and automation; surveys indicate that education providers, especially highly accessible colleges and universities, may struggle to keep up with skills demands and create the cultures and capacities necessary in faculty to effectively teach in an AI-impacted environment; and workforce organizations responsible for connecting people with learning opportunities still grapple with significant digital literacy gaps. Across the globe, two-thirds of people believe that their lives will be "dramatically impacted" by AI in the near future.

Digital Literacy is Key

Effective AI use is grounded in digital literacy. The attainment of basic digital skills is highly differentiated across geographies. The International Telecommunications Union estimates that 56% of the world's population has basic digital literacy. However, this varies widely across countries, with less developed nations likely to have lower levels of digital skills, and access to hardware and connectivity. Recent research from the US conducted by National Skill Coalition and the Atlanta Federal Reserve Bank shares that about a third of the US working population lacks foundational digital skills.

"Generative AI is so pervasive—it will touch every aspect of our daily lives. So, we have to think about how we demystify and build trust in order to fully capture its unique value. It's in the early days, and many aspects of its design and function remain a black box. I think it's going to take some time for people to get comfortable, and that will happen by being more transparent and upfront about core issues and proposed solutions. It will take a major effort in training not only the current set of workers, but our education system and curriculums must quickly adapt as well. From students to doctors or engineers, they can all be positively affected by this technology., and that's where the AI Alliance plays a huge role."

JEREMY EDER, RED HAT, DISTINGUISHED ENGINEER AND CHIEF AI/ML STRATEGIST

Significant efforts are underway to support digital literacy, but more work is needed. Before AI competencies can be gained, people must have a solid grasp of basic digital skills, including:

- Using devices (not only smartphones), understanding how to operate devices, and navigating through device settings.

- Internet navigation and safety, including searching for information online and awareness of basic internet safety measures.

- File and content management, including creating, saving, and organizing documents.

- Basic communications, including email and messaging applications.

Framework

This Guide recognizes that ethical AI is a shared responsibility between users, developers, and the policy environments in which users and developers operate. We attempt to reflect this shared responsibility across the competency areas, and within the role profiles included below.

We identified durable competencies and foundational concepts, followed by five areas of AI competency that are applicable across multiple roles in economies and societies, as well as across levels of proficiency.

Durable Competencies: Cross-cutting competencies that may be needed to facilitate learning and application of AI competencies.

Foundations: Terms and concepts that are prerequisites to the acquisition of specific AI competencies.

AI Competency Areas:

- **Responsible Use:** Competencies that reflect the primary knowledge, skills, and abilities that enable ethical use of AI that protects one's personal and professional security, mitigates negative impacts on personal, professional, and social outcomes, and prioritizes mindful, informed, and productive interaction.

- **Identifying Data Limitations:** Competencies focused on the knowledge, skills, and abilities required to effectively recognize AI limitations and opportunities, including recognition of data limitations and effective evaluation of AI outputs.

- **Data Analysis:** Competencies that support effective selection, use, and management of data, as well as adopting appropriate methods to meet project goals and solve problems.

- **AI Logic:** Competencies that reflect the knowledge, skills, and abilities core to working in symbolic/logic-based AI and making strategic decisions about use of symbolic AI approaches.

- **Machine Learning:** Competencies focused on concepts and applications core to programming in AI, and in researching and developing GenAI tools and methodologies for desired outcomes.

Each AI competency area is reflected graphically as a stepping-stone, representing that people will gain AI competencies and knowledge in many ways—both informally and through structured programs—and will dip in and out of use as their roles and lives dictate. The model also acknowledges that people will need to learn and re-learn AI competencies, starting at lower levels as technology advances and new tools and products emerge.

Each specific competency within the framework is defined and detailed according to proficiency level and includes skills indicators to provide clarity.
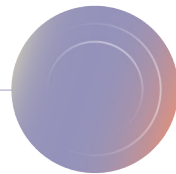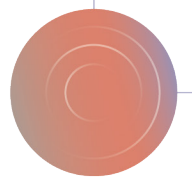
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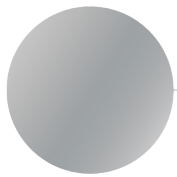
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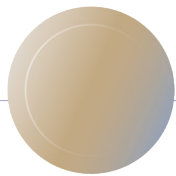
EXPERTISE

MASTERY

Competency Levels

Each AI competency area includes four levels of performance, describing growth from fluency to mastery. In all cases, these levels build. People with Mastery competencies, for example, will have specific competencies over and above those of Expertise, Proficiency, and Fluency.

Foundations, the terms and concepts that are pre-requisite to learning any AI competencies, may be considered "Level 0." These terms and concepts are not specific to any competency area, however, and are shared on their own.

Level 1: Fluency

Competencies in this area focus on the knowledge, skills, and abilities that will enable people to use AI tools and products, with an understanding of the basic principles of how AI works, how it can be used responsibly, and how one can use AI productively in their own work and lives. People with this competency level can follow conversations about AI and should be able to identify applications of AI and complete basic tasks using AI products and tools.

Level 2: Proficiency

Proficiency-level competencies focus on the knowledge, skills, and abilities that will enable people use AI tools and products critically to solve problems and create desired outcomes. People with Proficiency competencies have solid knowledge of AI topics and can demonstrate skills and knowledge without significant support. People may be able to share their knowledge and experiences with others.

Level 3: Expertise

Expertise competencies focus on the knowledge, skills, and abilities that enable people to work within AI domains, using, analyzing, adapting, and even modifying aspects of AI technology to achieve desired outcomes. People with Expertise competencies may work in technology environments or frequently apply technology to their fields of work and study or to their lives. People at this competency level have strong knowledge of AI topics and implications and can demonstrate and apply knowledge and skills without support.

Level 4: Mastery

Mastery-level competencies focus on the knowledge, skills, and abilities that enable people to work at the highest levels of the field, innovating, developing, and leading others. People with Mastery competencies have extremely strong knowledge of AI topics and their implications, and may be leading teams or organizations, teaching others at an advanced level, serving as a leader in their domain, or building new AI models and approaches, and will often contribute to the public through thought leadership, advocacy, and research.

"I am interested in allowing students to do more experiential learning, helping them learn how AI can improve our quality of life, and in their own daily lives, embrace AI in positive ways. Students are in a dilemma. On one side, there is a lot of talk about unpleasant situations in the job market, and so some students are afraid to touch the concept. On the other side, for computer science students, they are engaging in a process seeing it could be a career pathway for them. We need to bring the bigger picture to them. Let them experience the possible outcomes. AI can facilitate production, efficiency, and help us reduce risk in human labor. There are positive ways it can contribute."

RUI LI, PH.D., NEW YORK UNIVERSITY TANDON SCHOOL OF ENGINEERING, INDUSTRY ASSISTANT PROFESSOR

Durable
Competencies

Durable Competencies

The AI Competencies outlined in this report do not exist in a vacuum, and many readers of this Guide will need to consider 'durable competencies' in their workforce skilling curricula and capacity building to successfully level up and align workers with one or more AI competency areas. More basic Digital Literacy considerations (access, skills, use patterns) will also be relevant to many readers of this Guide.

With an estimated 40% of global jobs exposed to AI-related changes and a structural labor market churn of 152 million jobs over the next five years, AI will ultimately impact just about everyone.

> "We can make an impact with training aimed at decision makers and consumers of things using AI, replacing fear and uncertainty about AI with the ability to be savvy consumers of it. You don't have to be technical to use AI tools, but you should understand what's going on."
>
> **DEAN WAMPLER**, PH.D., IBM, HEAD OF TECHNOLOGY, AI ALLIANCE

Yet, an increase in technology and automation will not likely result in fewer durable or "soft" skills required by people, and indeed, may increase the demand for uniquely human skills and capacities, which will require continued support for development. The following durable skills and capabilities are noted as high priorities, bolstering AI competencies in all categories, and important for people across all roles in our societies and economies.

Durable competencies are presented here in list form, as their levels and demonstrations will be highly contextualized across organizations and societies. These durable competencies are teachable, demonstrable, and able to be assessed.

Flexibility

• The ability to embrace change and adapt to new experiences, environments, and situations will be a high priority in work-places and societies impacted by AI.

Growth Mindset

• As the pace of change increases, there is wide recognition that people will need to learn more, and more often. This learning may not always require formal credentials or aca-demic programs, but will almost certainly include on-the-job training and upskilling, reskilling for new roles inside an orga-nization, and continuous acquisition of new skills to keep up with new tools and processes.

• The introduction of AI to societies and workplaces has inspired excitement for some, but fear in others. A large pro-portion of the world's population is anxious about using basic computing technology tools. To effectively engage with and use AI to its best potential, building confidence both in one's ability to use technology correctly and in one's ability to solve ambiguous problems using technology will be key. The best way to build technical confidence is through practice in no- or low-consequence situations.

Personal Agency

• The capacity and willingness to take purposeful action and to believe that those actions can have a positive impact on the future will become more important as the impacts of AI are more broadly and deeply experienced. Without this compe-tency, the potential of AI technologies will likely remain unrealized, and people may become apathetic or overly pes-simistic about the changing world. A strong sense of personal agency underlies the psychological resilience one needs to set goals, take responsibility and face challenges in a fast-changing and uncertain world.

Creative Problem Solving

• Creativity enables people to think about problems and tasks in new ways, using imagination, different perspectives, and knowledge to put together solutions and ideas uniquely. As AI tools automate routine tasks and even develop solutions using existing data, connections, and examples, humans' ability to connect seemingly disparate ideas and contexts will likely become even more valuable. Strategic and critical

thinking—capacities for seeing the whole, considering all dimensions, and evaluating information to make critical decisions—and the ability to employ different methods of problem solving will be core competencies.

Communication and Collaboration

- Effective communication will be an important skill not only between humans, but between humans and machines. AI functions optimally with clear prompts and directives from users. Further, as noted above, outcomes produced by AI will often lack context, nuance, and empathy—all aspects of effective communication.

- Effective collaboration will also be important. Teams can often go farther, faster, and that will not change in an AI-impacted world. The added innovation, creativity, and accelerated learning supported by teamwork will continue to be valuable in all contexts.

- Machines cannot yet interpret reactions, emotions, or body language, nor can AI understand cultural contexts and nuances that emerge within and across different societies and groups. Cultural competency will emerge as a particularly important area of knowledge and skill.

Project Management

- Effective project management skills are essential in many organizations and roles, from goal development to timeline and budget management to understanding the unique perspectives and priorities of different audiences.

"When GenAI first came out a lot of discussion was around how students would use it to cheat and circumvent learning. This is a real concern. However, there is such a huge opportunity in using GenAI to improve and change what and how we teach. Recognizing that our students are going to live in an AI-enabled world, at Cornell we realized that we must change our curriculum to include GenAI in it. Our students are going to use these tools, so our focus is on building their skills in critical thinking, making well-reasoned arguments, being able to use GenAI effectively, and thinking of GenAI as a partner."

KAVITA BALA, PH.D., CORNELL UNIVERSITY, DEAN BOWERS COLLEGE OF COMPUTING AND INFORMATION SCIENCE AND LEAD DEAN, CORNELL AI INITIATIVE

Foundations

Foundations competencies may be considered as pre-requisites to gaining further AI-specific competencies. Understanding of these words and ideas does not require in-depth technical expertise, experience with AI products and tools, or significant training in AI. Rather, they provide one with the vocabulary and basic frameworks to understand what AI is and is not, as well as what it does and what it does not do.

TERMS	DEFINITIONS
Artificial Intelligence	A collection of technologies designed to emulate human intelligence; computational systems that can perform tasks that, in the past, have required human intelligence.
Algorithms	Procedures and formulas used by AI to process data and make decisions.
Symbolic/ Logic-Based AI	A form of AI that relies upon pre-defined rules and logic to make decisions, also known as classical AI.
Generative AI (GenAI)	A form of AI that creates new content based on patterns from training data, including GPT for text or GANs for images.
Training Data	Data that is used to "teach" a machine learning model to recognize or reproduce patterns.
Machine Learning	A technique for building AI that uses algorithms to identify patterns in data and uses those patterns in data and allows machines to use those patterns to make predictions and decisions.
Deep Learning	An area of machine learning that uses neural networks, computational models consisting of interconnected layers and nodes, to model complex patterns in large datasets.
Supervised Learning	A type of machine learning where models are trained on labeled data with known outcomes to predict outcomes for new, unseen data.
Unsupervised Learning	A type of machine learning where models analyze and learn patterns from unlabeled data, or data without specific outcomes, used for clustering or finding hidden patterns.
Natural Language Processing	A branch of AI focused on enabling machines to understand and process human language, which powers applications like chatbots, sentiment analysis, and translation.
Bias	In AI, bias refers to errors in models that can cause incorrect, inaccurate, or discriminatory outcomes based on limitations in the training data or model design.

AI is a tool, not a human replacement. AI can improve productivity and assist humans in their work and lives but should not be viewed as interchangeable with human intelligence or capacity.

AI outputs are based on **patterns in data**. AI systems depend on data to "learn" and make decisions, and those decisions are only as good as the data on which AI models are trained.

AI can **never be completely de-biased**. Instead, ethical users examine choices and data sources for bias that might be harmful to users or society. AI model training data is often biased and less accurate for populations underrepresented in data sources or at decision-making tables.

AI does **not understand—it processes** data. While responses from new GPT tools are remarkably polished, AI does not possess consciousness or understanding.

AI **requires human oversight and interaction**. To ensure ethical use and application, protect people, avoid bias, and produce reliable results, AI requires human supervision, direction, and interpretation.

AI is **pervasive**. In some cases, AI use and AI-powered products are very clear to end-users. In other cases, it is nearly impossible to know with certainty whether a tool or product uses AI and whether an image, text, or video has been created with AI. Using critical thinking in evaluating results and strong judgment in sharing and using content is vital.

AI technology and applications are rapidly changing. As a result, **adaptation and continuous learning** will be important to stay updated on changes in AI, and to continue to benefit from the technology.

Technical
Competencies

Responsible Use

Competencies that reflect the primary knowledge, skills, and abilities that enable ethical use of AI that protects one's personal and professional security, mitigates negative impacts on personal, professional, and social outcomes, and prioritizes mindful, informed, and productive interaction.

	KNOWLEDGE	SKILLS AND DEMONSTRATIONS
Level 1 Fluency	Awareness that applications, products, and tools use AI, and the ways and reasons AI may be used within those products.	Accurately identify an instance of an AI-powered product or tool and provide a basic description of how AI is used within that product or tool.
	Understanding the opportunities of AI use, including increasing productivity, reducing menial tasks, and improving human safety.	Identify at least two specific examples of where AI has or could increase productivity, reduce menial tasks, or improve human safety.
	Understanding of basic prompt engineering practices that maximize accuracy and efficiency of outputs.	In prompts, provide intent and context, define a desired output, use simple language, and deploy multiple techniques to reach desired outcomes, including sequencing queries and "tree of thought" prompting.
	Understanding of the role of personal data in AI systems, and awareness of basic methods of personal data privacy protection.	Demonstrate judgment and caution when sharing personal data, recognizing and exercising opt-in and opt-out consent decisions when sharing personal data.
	Awareness of methods of data and privacy protection required in one's work environment.	Demonstrate compliance with data security practices and AI use policies.
Level 2 Proficiency	Understanding how, where, and for what purpose AI tools and products can be deployed to complement and/or benefit one's purposes, and to meet one's needs.	Effectively use AI to solve a concrete problem or address a specific issue.
	Awareness of area-of-study and field-specific requirements and restrictions on use of AI in research and practice (from blanket bans to restrictions on certain outputs).	Identify the specific acceptable AI-use policies and practices for one's field of study and/or area of work.
	Awareness of the implications and consequences of AI use, including legal, reputational, personal, and professional risks.	Provide a basic description of personal and professional risks of inappropriate or unethical use of AI tools and products.
Level 3 Expertise	Awareness of the legal and regulatory requirements of data protection, consequences of breaches, and actions required in response to data breaches.	Apply appropriate and/or required data controls to ensure protection as appropriate to one's role, including encryption and anonymization.
	Awareness of how the use of AI may complement or disagree with standards, norms, and requirements for ethics applicable to one's country, field, and/or organization.	Identify where AI use may be out of alignment with the standards for ethics within a field of study, area of work, organization, or country and take action accordingly.
	Awareness of best practices for documentation and reporting transparency.	Adopt and follow documentation and transparency policies that align to domain-specific requirements.
Level 4 Mastery	Awareness of the management strategies of teams, projects, and organizations to maximize data privacy and protection.	Create organizational policies, practices, and safeguards for ensuring individual and organizational data privacy and protection.
	Awareness of how project and program structures, including personnel, incentives, and internal corporate cultures, may contribute to or mitigate unethical use of AI tools and products.	As appropriate to one's role, take action to ensure that policies, programs, and tools include safeguards against improper and unethical use by others.
	Understanding the potential future opportunities and limitations of AI methods and tools.	Apply knowledge of the benefits and limitations of current AI models and methods to future use cases in context.
	Understanding of opportunities and venues to advocate for tools, policies, and campaigns that support end-users to have deeper awareness and understanding of use of AI.	Contribute to policy, regulatory, and field-building conversations and initiatives designed to ensure AI-generated content is identified.

Identifying Data Limitations

Competencies focused on the knowledge, skills, and abilities required to effectively recognize AI limitations and opportunities, including recognition of data limitations and effective evaluation of AI outputs.

	KNOWLEDGE	SKILLS AND DEMONSTRATIONS
Level 1 Fluency	Awareness of the potential for misleading results and "hallucinations" in AI systems.	Distinguish between accurate and inaccurate outcomes of AI tools and products.
	Awareness that GenAI outputs are bound by limitations in training data.	Accurately describe an instance in which training data limitations may manifest in AI outcomes.
	Awareness of how human biases impact AI training data, leading to potentially inaccurate or incomplete results from those models.	Accurately describe an instance in which human bias may manifest in AI outcomes.
	Awareness of how data used in some AI models is updated, limiting the availability of certain information.	Describe how outputs from a static AI model may differ from outputs generated by a dynamic model.
	Understand the implications of misinterpreted or inaccurate results from AI systems on one's role and organization.	Accurately describe the potential consequences of the use of misinterpreted or inaccurate results of AI systems.
Level 2 Proficiency	Knowledge of what data is being used and considered in an AI-powered product or tool.	Provide a basic description of the types and sources of data used in popular AI tools and products.
	Understanding of how to check or evaluate AI responses for accuracy, including where one can go to find alternative sources of information.	Use logic, reasoning, and skepticism to assess the results produced by AI systems, reflecting on whether different datasets may produce different results.
Level 3 Expertise	Understanding of how data limitations manifest and/or have specific implications for one's field of study and/or profession.	Accurately describe or identify specific instances of how data limitations may have implications for one's field (e.g. healthcare diagnostic tools using AI may use training data that does not accurately represent diverse populations).
	Understanding of how to address and mitigate data limitations in model design, data selection, and evaluation.	As appropriate to one's role, correct and/or account for the limitations, including dates, data sources, and transparency factors, of models used.
Level 4 Mastery	Understanding of how data limitations in AI tools and products may create negative implications for individuals, enterprises, and societies.	As appropriate to one's role, take action to mitigate bias and limitations from AI tools and results, as well as from project and program structures.
	Understanding of opportunities and venues to advocate for tools, policies, and campaigns that enable end-users to recognize AI data limitations.	As appropriate to one's role, effectively communicate to internal stakeholders, influencers, policymakers, and/or the public about competencies for recognizing and evaluating AI data limitations.

Data Analysis

Competencies that support effective selection, use, and management of data, as well as adopting appropriate methods to meet project goals and solve problems.

	KNOWLEDGE	SKILLS AND DEMONSTRATIONS
Level 1 Fluency	Understanding of basic data visualization tools and approaches, including simple charts and graphs.	Accurately translate data into a simple visual format.
	Understanding data sources and aims of an AI system or process.	Read and document data sources and relationships within an AI system or process.
Level 2 Proficiency	Understanding of basic statistical and mathematical concepts, including means, correlations, and others, that are relevant to data analysis.	Accurately describe and/or define basic concepts, providing a simple explanation for why these concepts are important in AI.
	Understanding of data characteristics and differences between unstructured and structured data.	Accurately compare and contrast unstructured and streaming data, providing pros and cons for use in context.
Level 3 Expertise	Understanding of the strengths and weaknesses of machine learning libraries appropriate for a given task, mitigating data limitations	Identify and select relevant machine learning libraries appropriate for a given task.
	Understanding of approaches and techniques to evaluate outcomes and assess models, including computational performance and accuracy.	Select machine learning model evaluation metrics and parameters for testing.
	Knowledge of best practices in managing and maintaining networks.	Use network telemetry methods to collect, measure, and analyze the behavior and performance of a network.
	Knowledge of best practices in protecting systems, networks, and data.	Use cloud-native security practices to support security for applications built and deployed in the cloud.
	Knowledge of data augmentation techniques and handling imbalanced data sets.	Accurately describe common data issues, including overfitting, underfitting, and imbalanced, and effectively apply augmentation strategies.
	Knowledge of strategies for data collection, cleaning, and preprocessing to ensure high-quality inputs for training models.	Demonstrate effective data remediation techniques, accounting for inconsistencies and missing values.
	Understanding of data visualization and interpretation approaches, enabling effective insights gathering and model transparency.	Effectively deploy statistical methods to interpret data and visualize those interpretations using tools like Power BI or Tableau.
	Understanding of performance tracking using metrics, identifying instances of model drift, accuracy degradation, and system load.	Identify or develop key performance indicators that enable effective performance tracking.
Level 4 Mastery	Understanding of tools and frameworks for continuous integration, deployment, and monitoring of models in production environments.	Effectively select tools and frameworks that support model development and implementation.
	Deep understanding of data protection laws (GDPR, CCPA) to ensure AI systems comply with regulatory requirements.	Demonstrate deep understanding and adherence to data protection laws.

Machine Learning

Competencies focused on concepts and applications core to working with AI models that use Machine Learning, and in researching and developing GenAI tools and methodologies for desired outcomes. People wishing to gain Expertise and Mastery competencies in Machine Learning Model Development and Programming will require a strong foundation in mathematics, particularly in linear algebra, calculus, probability, and statistics.

	KNOWLEDGE	SKILLS AND DEMONSTRATIONS
Level 1 Fluency	Understanding of basic coding concepts.	Demonstrate, through description or application, basic coding concepts, including variables, loops, conditionals, and functions, which are needed for writing and testing simple machine learning scripts.
	Understanding of basics of low-code and no-code development solutions, approaches that reduce the need for manual programming.	As appropriate to one's role, select no- or low-code AI products and tools to solve specific problems.
	Understanding of the types of machine learning.	Describe supervised learning, unsupervised learning, and reinforcement learning and how they differ.
Level 2 Proficiency	Basic understanding of programming languages for AI development.	Demonstrate basic use of one AI programming language, such as Python.
	Understanding of simple algorithms.	Demonstrate, through description or application, knowledge of basic machine learning approaches like linear regression or decision trees.
Level 3 Expertise	Understanding of existing open-source AI libraries for machine learning programming.	Select appropriate machine learning libraries for a given task.
	Understanding of natural language processing, which uses machine learning to enable computers to understand and communicate with human language.	Demonstrate, through description and/or application, expertise in NLP techniques (tokenization, parsing, stemming) and deep learning-based models, including transformers, BERT, and GPT.
	Recognize the importance of and use cases for transformers.	Accurately describe the multiple applications of transformers in natural language processing, speech recognition, and Generative AI.
	Understanding of classification and clustering, methods by which data is organized and labeled.	Accurately describe and apply machine learning algorithms.
	Understanding of differences between supervised, unsupervised, and reinforcement machine learning.	Accurately describe differences between terms and approaches.
	Understanding of computer vision, enabling models to create meaningful information from images, videos, and other visual inputs.	Accurately describe and apply the applications of computer vision and the deep learning models that enable it.
	Understanding of Retrieval-Augmented Generation.	Accurately describe RAG and its potential benefits to AI models.
	Capacity in programming languages for AI development.	Demonstration of expertise in programming languages, with the ability to select the appropriate language to create the desired outcome.
Level 4 Mastery	Understanding of the strengths and weaknesses of solutions and approaches, including statistical and machine learning solutions, appropriate to the project.	Effectively evaluate, select, and deploy solutions and approaches to reach project objectives.
	Capacity to adapt or create new or customized learning algorithms for unique applications.	Design, develop, and execute new or adapted models to meet specific needs or solve specific problems.
	Understanding of current and emerging AI research and tools.	Apply the latest research and innovations to one's work as appropriate to one's role.

AI Logic

Competencies that reflect the knowledge, skills, and abilities core to working in ymbolic/logic-based AI and making strategic decisions about the use of symbolic AI approaches. People wishing to gain Expertise and Mastery competencies in AI Logic will require a strong foundation in mathematics, particularly in logic and set theory, discrete mathematics, algebra, probability, and statistics.

	KNOWLEDGE	SKILLS AND DEMONSTRATIONS
Level 1 Fluency	Awareness of methods for structuring and organizing information in ways that can be used by machines.	Demonstrate basic capacity organizing information using ontologies and semantic networks, including hierarchical structures of ideas and visual representations of how ideas are related.
	Familiarity with logic and formal reasoning.	Describe, using basic terms and concepts, types of logic, including propositional logic, first-order logic, temporal, and modal logic.
Level 2 Proficiency	Awareness of the tradeoffs between symbolic and machine learning approaches in ability to trace the reasoning behind results and in handling of ambiguity.	Describe, using basic language and concepts, the differences between approaches and how differences impact the transparency of results and outcomes from ambiguous inputs.
	Understanding of proof systems and techniques essential for automated reasoning.	Apply proof techniques such as natural deduction, resolution, and tableau methods to validate logical statements and solve logical problems.
Level 3 Expertise	Capacity with programming languages commonly used in symbolic/logic-based AI.	Demonstrate ability to use programming languages, such as LISP, Scheme, Prolog, Haskell to encode knowledge and solve problems.
	Understanding of methods for introducing constraints into logic programs and solving problems where constraints must be satisfied.	Demonstrate ability to integrate constraints to solve complex problems requiring finding an optimal solution from a large set of possibilities.
	Understanding of reasoning algorithms to infer new information from existing knowledge bases.	Select and implement methods (forward chaining, backward chaining, and inference engines) based on requirements of a challenge or problem.
	Understanding of methods and algorithms to support planning, scheduling, and searching.	Effectively use algorithms, including STRIPS and PDDL for planning, A*, IDA*, and greedy search for exploring large search spaces, and genetic algorithms, simulated annealing, and local search to find optimal solutions.
	Knowledge of strategies and methods for organizing and structuring information represent concepts and relationships.	Demonstrate understanding of ontology design and semantic networks and frames to organize knowledge and describe relationships between concepts and terms.
	Ability to represent data and knowledge using graph structures.	Describe and apply graph concepts and algorithms (traversals, shortest paths, and network flows) to model relationships and dependencies.
	Understanding of Natural Language Processing (NLP) techniques involving analyzing language structures, extracting meaning from text, and translation.	Demonstrate, through description and/or application, knowledge of NLP algorithms and statistical and linguistic methods.
	Translate knowledge from diverse subjects into logical rules.	Design and develop processes for knowledge acquisition, creating logical rules that align with domain expertise and are validated by domain experts.
	Understanding of model checking strategies to ensure that systems behave according to specifications.	Demonstrate accurate application of verification strategies, using model checking tools and interpretation of model checking results.
	Knowledge of algorithms and tools for automatically proving mathematical theorems.	Demonstrate effective use of resolution methods, SAT solvers, and Satisfiability Modulo Theories solvers to solve complex problems.
Level 4 Mastery	Understanding of neuro-symbolic AI, which combines symbolic/logic-based AI with machine learning.	Demonstrate, through description and/or application, integration of symbolic/logic reasoning with machine learning models.
	Understanding of scalable rule-based architectures.	Design rule-based architectures that can process significant numbers of rules and facts while maintaining consistency and handling conflicts.

Role Profiles

Role
Profiles

In addition to identifying the essential competencies needed across societies and economies, this Guide considers how those competencies might serve specific roles identified as important by technology and academic leaders within the AI Alliance. These roles include:

- **Novice User**—The Novice User, representing the majority of the "general public," should understand the basic concepts, opportunities, and limitations of AI, and be able to follow public conversations, publications, and work discussions about AI. Novice Users may gain competencies informally, through self-directed learning, or through community- and work-based programs. The Novice User should have understanding at the Fluency level across Responsible Use and Identifying Data Limitations competency areas.

- **AI-Informed Decision Makers**—AI-Informed Decision Makers, the organizational, business, policy, and community leaders who make decisions on the behalf of employees and the public, play an important role in regulating technology, supporting access to training, protecting data and preserving privacy, and creating effective environments for responsible innovation, maximizing the public good while minimizing downsides. Decision Makers should have Expert competency levels in Responsible Use and Data Limitations, and reach Proficiency in Data Analysis, Machine Learning, and AI Logic.

- **AI Navigators**—AI Navigators are responsible for helping others gain skills in AI, and must also use AI effectively and responsibly themselves. Navigators are often in positions of great influence and trust, coaching vulnerable members of society through their learning journeys and creating opportunities for learning, growth, and job placement. Navigators will likely lack technical expertise and experience, though they may be very familiar with occupational-specific tools and encounter AI tools and products daily through their work

directly and with students. Navigators should possess Proficiency-level competencies in Responsible Use and Identifying Data Limitations, and Fluency in Data Analysis, Machine Learning, and AI Logic.

- **AI Users on the Job**—This wide category includes people who work in roles that may benefit from solid AI competencies. Their technical skills may be highly job-specific, such as working with a particular software program or device, but they may experience significant productivity and quality gains through using AI strategically. Users on the Job can likely gain competencies in weeks or months and will gain new skills and capabilities in particular products and applications as they are introduced. AI Users on the Job should have Proficiency-level competencies across Responsible Use and Identifying Data Limitations, and Fluency in Data Analysis.

- **AI Empowered Specialists**—Empowered Specialists are people in career fields outside of AI and technology whose work will benefit from and be impacted by AI. Empowered Specialists include professionals in careers that rely on information and data for decision-making, as well as those in research fields that could benefit from the significant computing and analytic power AI provides. While they may not require deep technical expertise, Empowered Specialists require Expertise-level competencies in Responsible Use and Identifying Data Limitations, Proficiency in Data Analysis, and Fluency in Machine Learning and AI Logic.

- **AI Future Workforce**—The Future Workforce, those students studying toward tech careers and those entering into and preparing for their first tech roles, will require different skill sets appropriate to their specific roles and areas of focus. As highlighted in the recent report, "The Transformational Opportunity of AI on ICT Jobs," a product of the AI-Enabled Information and Communications Technology Workforce Consortium, the vast majority, 91.5%, of ICT roles will "experience either high or moderate transformation due to advancements in AI." Further, AI skills, from ethics through analytics and data management are expected to increase in relevance for tech roles. The Future Workforce requires

Expertise-level across all competencies. We encourage readers to visit the ICT report for a comprehensive assessment of the skills required by specific job families and occupations in the ICT workforce.

- **AI Expert Workforce**—The AI Expert Workforce includes the senior leaders, developers, and data scientists who take on lead roles in the design, creation, and execution of AI tools, products, services, and applications. They are responsible not only for the development and execution of complex projects and products, but also for the effective management of people and environments that are vital to the success of these initiatives. The Expert Workforce, because of their deep and unique knowledge and insights into the potential opportunities and risks of AI, is also called upon to advocate for responsible use, access and opportunities for others, and even policy recommendations. The Senior Workforce requires Mastery level of all competencies.

Each profile includes examples of occupations and positions that are representative of the role for illustrative purposes only. These examples may shift significantly depending on individual needs, employer needs, organizational structures, and other unique factors in each context.

Each profile includes links to low- and no-cost resources for skill development and training.

The Novice User
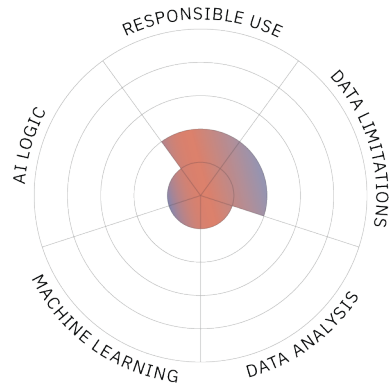
The Novice User, representing the majority of the "general public," should understand the basic concepts, opportunities, and limitations of AI, and be able to follow public conversations, publications, and work discussions about AI. Novice Users may gain competencies informally, through self-directed learning, or through community- and work-based programs.

EXAMPLE ROLES

A **student** in high school or college, especially a student in a non-technical field, will need a working knowledge of AI practices, policies, and applications relevant to their environment, both to ensure compliance and avoid negative consequences and to take advantage of AI-powered tools that can support solid academic performance, including writing and editing tools.

An **hourly service or production worker** will need a solid understanding of the compliance environment in which they work, and knowledge of the potential personal and professional consequences of misuse. Frontline workers across all industries (including retail associates, hotel clerks, call center workers, and others) may encounter AI on the job in a variety of forms, including worker support chatbots and virtual assistants, inventory management systems, scheduling and workflow systems, and safety monitoring systems. A basic understanding of responsible use, limitations in training data, and effective application can enable frontline workers to optimize their own performance, use AI tools effectively, and protect themselves and their data.

CONSIDERATIONS AND RECOMMENDATIONS

Novice Users may use products and tools without being aware that they are AI-powered and may have incomplete and inconsistent understanding of all competencies. Competencies for Novice Users can be built in hours or days but may require consistent refreshing as policies and practices change and as tools are updated.

FREE AND LOW-COST RESOURCES INCLUDE:

- IBM SkillsBuild—IBM SkillsBuild supports a free online course providing the basics for understanding AI terms, concepts, and use cases.

- AI Foundations for Everyone—In partnership with Coursera, IBM supports AI Foundations for Everyone, designed to introduce core concepts, describe issues and limitations of AI, and recognize the opportunities AI presents.

- AI Courses and Certifications—Intel supports a variety of self-paced courses and resources, including an Introduction to AI that provides foundational concepts, early skill development in tools and data management, and social and industrial applications and implications.

AI-Informed Decision Maker
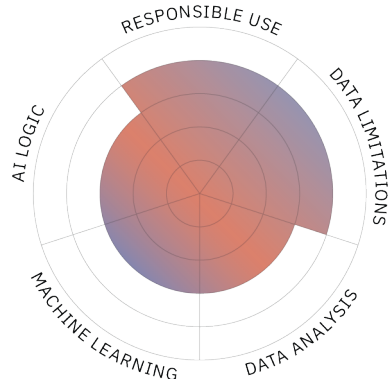
AI-Informed Decision Makers, the organizational, business, policy, and community leaders who make decisions on the behalf of employees and the public, play an important role in regulating technology, supporting access to training, protecting data and preserving privacy, and creating effective environments for responsible innovation, maximizing the public good while minimizing downsides. Decision Makers should have Expert competency levels in Responsible Use and Data Limitations, and reach Proficiency in Data Analysis, Machine Learning, and AI Logic.

EXAMPLE ROLES

Policymakers must balance the very real social and economic implications of AI, the environmental impacts of increased AI utilization, and the need for governance that enables responsible innovation. Accountable to individuals, communities, businesses, and nations' interests, policymakers need solid understanding of current systems and their implications for the future. To make informed decisions, policymakers will benefit from strong understanding of foundational AI terms and concepts, and their applications, as well as of the technical limitations and challenges of AI.

Business leaders, including CEOs, COOs, and managers, may be interested in using AI to explore new business opportunities, complement and support personnel, and enhance business productivity. While the tactical decision about which AI products and processes to implement will likely fall to a technical expert, business leaders will require an understanding of responsible use, limitations in data that may impact usability and outcomes, and a working knowledge of how AI works in their organizations' contexts.

CONSIDERATIONS AND RECOMMENDATIONS

AI-Informed Decision Makers will likely not enter into their roles with technology backgrounds. Yet, because this role involves making decisions about policy, governance, and access for others, it is vital that Decision Makers gain AI competencies. It is likely that competencies for Decision Makers can be gained in weeks or months, with constant learning to refresh and advance those competencies as new tools, products, and technologies emerge.

RESOURCES FOR DECISION-MAKERS INCLUDE:

- Digital Readiness for Leaders—Intel supports specific programming for government leaders responsible for developing solutions for emerging technologies.

- GenAI for Business Leaders—EdX provides a condensed course providing foundational information about GenAI, its impacts on industries, and guidance in developing policies and tools for AI use within organizations.

AI Navigators

(radar chart with axes labeled: RESPONSIBLE USE, DATA LIMITATIONS, DATA ANALYSIS, MACHINE LEARNING, AI LOGIC)
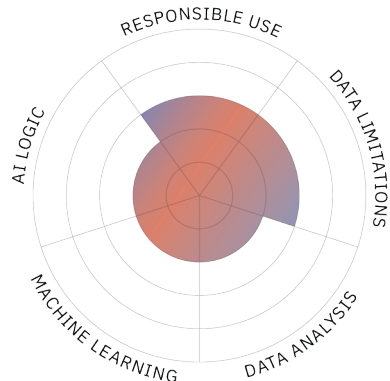
AI Navigators are responsible for helping others gain foundational skills in AI and who must also use AI effectively and responsibly themselves. Navigators are often in positions of great influence and trust, coaching vulnerable members of society through their learning journeys and creating opportunities for learning, growth, and job placement. Navigators will likely lack technical expertise and experience, though they may be very familiar with occupational-specific tools and encounter AI tools and products daily through their work directly and with students. Navigators should possess Proficiency Level competencies in Identifying Data Limitations and Ethical Use, and Fluent User Level competencies for Project Management and Leadership.

EXAMPLE ROLES

Teachers and faculty, especially those in non-technical areas of expertise, are Navigators, supporting students to gain understanding and awareness of foundational AI concepts and terms, and facilitating access to deeper learning opportunities based on students' interests and capacities. Not only do teachers need to understand and apply competencies, but they must also effectively teach others, adapting language and techniques toward different learning styles, student readiness levels, and contexts. Teachers may not make decisions directly about the broad curriculum they teach or the products they use—decisions that are often in the hands of administrators—but will be accountable for students' learning.

Workforce development professionals are often the first line of support for adults seeking career guidance and support. They may be charged with recommending education and training to adults. They must understand how to guide their clients and effectively support skill acquisition in AI topics, and may use AI tools to conduct assessments and match jobseekers with work opportunities.

CONSIDERATIONS AND RECOMMENDATIONS

Because they are responsible for teaching others, and are often for the development of learning programs and activities, Navigators' AI competency development cannot be left to chance. Navigators may be able to acquire AI competencies in weeks or months, and may benefit from both training and on-the-job experiences, as appropriate to individual roles.

RESOURCES FOR DECISION-MAKERS INCLUDE:

- AI Competency Framework for Students and Teachers—UNESCO prepared two competency frameworks designed for students and teachers. These resources include competency areas with associated curricular goals, pedagogical methods, and learning environments. These resources may be very helpful for schools that are implementing AI curriculum and who are seeking aligned assignments and lesson plans.

- AI for Education—Khan Academy provides a highly accessible, video-based series to support learning about how AI works, ethical considerations, and tools specifically for teachers and students.

AI Users on the Job
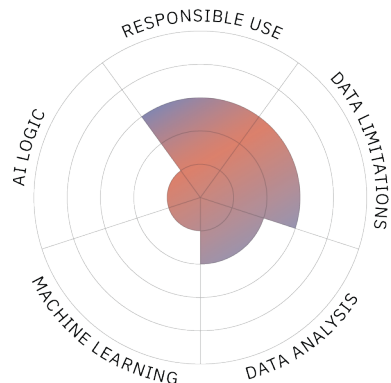
This wide category includes people who work in roles that may benefit from solid AI competencies. Their technical skills may be highly job-specific: working with a particular software program or device, but they may experience significant productivity and quality gains through using AI strategically. Users on the Job can likely gain competencies in weeks or months and will gain new skills and capabilities in particular products and applications as they are introduced.

EXAMPLE ROLES

Accounting, Finance, and Business Administration professionals may need to learn company-provided or personally assistive AI tools to complete their work responsibilities and automate workstreams. Receptionists, as well as other roles that require frequent emailing, transcription, and reporting may benefit from new tools that draft text and check language, as well as AI assistants that prepare draft meeting discussion notes. Human Resources professionals may benefit from AI in managing and filtering large queues of applications, and in analyzing large quantities of data to find patterns that impact business outcomes, like retention, productivity, and performance.

Transportation and Logistics professionals may benefit from AI in a variety of ways. Truck drivers, for example, may benefit through route optimization and predictive routing applications, and from AI-powered data collection and performance analysis. Logistics workers may benefit from improved safety, arising from AI-supported predictive maintenance in equipment, avoiding machine failures and preventing accidents.

CONSIDERATIONS AND RECOMMENDATIONS

Users in Context will likely benefit most from work-based learning and opportunities to gain AI knowledge and skills on the job. Organizations may use specific products, or require compliance with policies, making corporate leaders the right decision maker for training and upskilling programming for these professionals.

FREE AND LOW-COST RESOURCES INCLUDE:

- SHRM AI in the Workforce—SHRM supports high-quality training and resources for HR professionals. SHRM also partners with CalTech to offer the SHRM CalTech Advanced Technology Credential, designed to provide HR professionals with a quality foundation in multiple aspects of technology

- Coursera—In partnership with leading businesses and universities, Coursera offers a wide range of programs with specific end-users, occupations, and industries in mind, including healthcare and business.

AI Empowered Specialists
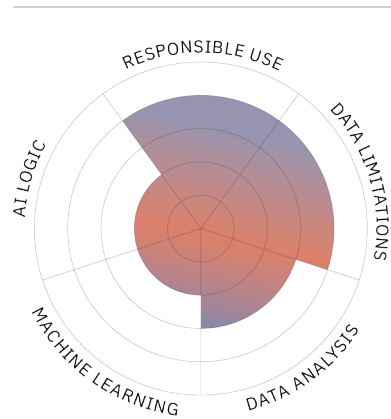
Empowered Specialists are people in career fields outside of AI and technology whose work will benefit from and be impacted by AI. Empowered Specialists include professionals in careers that rely on information and data for decision-making, as well as those in research fields that could benefit from the significant computing and analytic power AI provides. While they may not require deep technical expertise, Empowered Specialists require Expert level competencies in Responsible Use and Identifying Data Limitations, Proficiency in Data Analysts, and Fluency in Machine Learning and AI Logic.

EXAMPLE ROLES

Healthcare professionals may benefit immensely from using AI tools that support faster and more effective diagnosis, and from tools that enable automation of rote tasks. However, healthcare professionals at all levels must have a deep understanding of data limitations, recognizing particularly where the data used to build tools may not fully represent all populations. Ethical use and application are key to serving patients effectively and equitably, as well as protecting one's own interests.

Scientists and researchers in a variety of fields, including climate, agriculture, biology, sociology, and others, will likely stand to benefit immensely from advances in AI. Scientists and researchers will need not only deep knowledge of their own field and the particular norms and standards that

govern that field but also a deep understanding of the spaces where AI may be of particular value and how to leverage AI most effectively to meet research needs. This role will likely partner with an AI expert to support specific technical needs but may benefit from increasing fluency with programming tools and strong data analysis and visualization skills.

CONSIDERATIONS AND RECOMMENDATIONS

Empowered Specialists are experts in their field, likely possessing credentials and working positions of leadership. They likely have existing digital fluency and may have deep expertise in using the digital tools and products required in their professions. Empowered Specialists may be able to acquire AI competencies in weeks or months, and may benefit from both training and on-the-job experiences, as appropriate to individual roles.

RESOURCES FOR EMPOWERED SPECIALISTS INCLUDE:

• AI Courses and Certifications—Intel supports a variety of self-paced courses and resources, including an Introduction to AI that provides foundational concepts, early skill development in tools and data management, and social and industrial applications and implications.

• IBM SkillsBuild—IBM SkillsBuild includes many courses at all levels focused on the intersection of AI with fields of study and practice, including climate change and economic sustainability.

AI Future Workforce
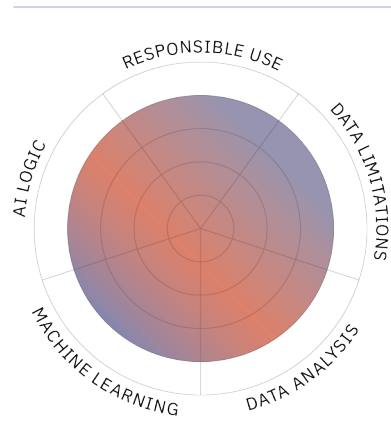
AI's Future Workforce, those students studying toward tech careers and those entering into and preparing for their first tech roles, will require different skill sets appropriate to their specific roles and areas of focus. As highlighted in the recent report, "The Transformational Opportunity of AI on ICT Jobs," a product of the AI-Enabled Information and Communications Technology Workforce Consortium, the vast majority, 91.5%, of ICT roles will "experience either high or moderate transformation due to advancements in AI." Further, AI skills, from ethics through analytics and data management are expected to increase in relevance for tech roles. The Future Workforce requires deep grounding in all aspects of AI competencies. We encourage readers to visit the ICT report for a comprehensive assessment of the skills required by specific job families and occupations in the ICT workforce.

EXAMPLE ROLES

Data Analysts are responsible for analyzing and synthesizing information and data, creating valuable and usable insights and recommendations. They collect and maintain data and use visualization skills to enable stakeholders to understand performance and make decisions. Analysts will leverage AI tools and products to create efficiencies in their work, and to ensure that data is unbiased, and results are accurate.

Design Engineers are responsible for building and adapting product designs. In addition to managing the product lifecycle, they use technical skills and collaboration to ensure products meet standards and client needs. Design Engineers will likely use AI tools and products to support ideation, prototyping, and modeling.

CONSIDERATIONS AND RECOMMENDATIONS

AI's Future Workforce will require a variety of educational backgrounds, from short-term training and certification through bachelor's and master's degrees. Each company will determine their specific education requirements.

RESOURCES FOR FUTURE WORKFORCE INCLUDE:

- AI for Workforce—Intel supports AI programming in 42 states in the US through partnerships with community colleges, offering courses, certificates, and degrees in AI topics.

- Junior Cybersecurity Analyst—The Cisco Networking Academy supports entry-level certification and job training in Cybersecurity and a variety of other

- Google Advanced Data Analytics Professional Certificate—Offered through Coursera, individuals with existing tech experience can gain deeper skills over a 6-month course, which is also eligible for recognition toward credit at participating US colleges and universities.

- New York University Pathways to AI—For current undergraduate students majoring in computer science and AI fields, NYU offers a summer program designed to support the "next generation of AI researchers."

- AI Learning Academy—Meta partnered with Georgia Institute of Technology to build a deep learning course curriculum that is available for free through the Artificial Intelligence Learning Academy. Designed to complement enrollment in degree programs and with specific intent to encourage diversity and equity in the AI field, the AILA supports Deep Learning, and introductory and refresher courses in key subjects.

AI Expert Workforce
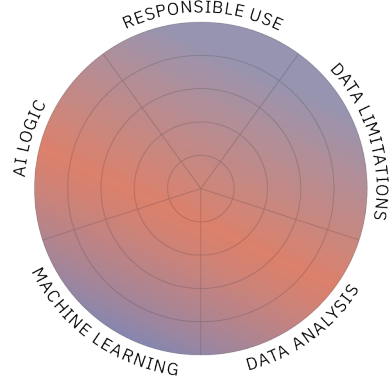
The AI Expert Workforce includes senior leaders, developers, and data scientists who take lead roles in the design, creation, and execution of AI tools, products, services, and applications. They are responsible not only for the development and execution of complex projects and products but also for the effective management of people and environments vital to the success of these initiatives. The Expert Workforce, because of their deep and unique knowledge and insights into the potential opportunities and risks of AI, is also called upon to advocate for responsible use, access and opportunities for others, and even policy recommendations.

EXAMPLE ROLES

AI Research Scientists are responsible for developing new algorithms, theories, use cases and applications for AI, advancing the field and innovating technical solutions. Research Scientists will conduct original research, both theoretical and applied, to develop new methodologies and algorithms. The role requires not only expert technical acumen, but a deep commitment to ethical use and responsible development.

Senior Software Engineers are responsible for designing, developing, and maintaining software systems. In addition to writing, reviewing, optimizing, and monitoring code, Senior Software Engineers are often responsible for providing mentorship and guidance to junior developers, as well as project management and continuous improvement.

AI Senior Product Managers often serve as the connection between the technical development team and end users and stakeholders, translating client needs and demands into AI requirements. This highly collaborative role requires both deep understanding of technical concepts and tools, and the ability to effectively communicate with non-technical audiences about products and processes.

Computer Science, Technology, and AI academic program Faculty play an important role, often balancing teaching with research, advocacy, and community-facing activities. This role requires deep knowledge and expertise in technical competencies, alongside the ability to teach and mentor students from a wide variety of backgrounds. Faculty must meet students where they are, while ensuring learning outcomes. Faculty also play a public role in advocating for responsible, ethical AI development and AI skill development in the broader society, as well as providing thought leadership to government, philanthropic, and academic stakeholders.

CONSIDERATIONS AND RECOMMENDATIONS

Roles within the Expert Workforce in AI predominately require a terminal credential, often at the graduate or doctoral level. Individuals looking to advance into these roles should take care to determine best academic program fit with their specific interests.

The Guide
in Use

The ultimate goal of this Guide is to support alignment and advancement among the many stakeholders and organizations working to provide education and skill development at all levels. We anticipate the Guide creating value for:

- **Public Engagement**—Local leaders and community-based organizations, often in partnership with education and training providers, will need to play a role in building awareness among the public of the importance of AI competencies and in creating programs and opportunities for many more people to access high-quality AI training at scale.

- **Public Awareness**—Ethical AI development and use is a shared responsibility, and awareness of AI's benefits and risks is unbalanced, with many people unaware and even afraid of AI technology and its implications. Supporting awareness and skill-building for novices through this Guide and continuing to advance digital literacy more broadly, will be helpful in mitigating anxiety and creating more informed and confident users of AI tools and products.

- **Curriculum Development**—While training providers and educators know best what their students need, aligning curriculum and learning activities to these core competencies across diverse environments can assure people across all learner groups move toward a higher baseline of AI knowledge and skills.

- **Workforce Development and Upskilling**—Tech and information firms will likely have a strong sense of the skill development required for their workforces, but for organizations that will be impacted by advancements in AI and whose workforces need education and training, this Guide may be helpful in organizing workforce developing programs. For organizations looking to hire vendors to support training and development, the Guide may be helpful in both creating training scopes and assessing vendor capacities.

- **Competency Assessment**—Managers and facilitators can use this Guide to both ensure that people undergoing training and skill development are building the right competencies, and to help people understand their own learning and knowledge growth.

- **Alignment of Education Initiatives**—As learning and skills are increasingly able to be documented and shared through Learning and Employment Records, competencies developed in AI areas by individuals in the workplace and through employer-supported upskilling programs may be recognizable by higher education institutions for credit toward credentials. This may be especially true of well-regarded programs like IBM's SkillsBuild, Cisco's Networking Academy, and through platforms like Coursera and LinkedIn Learning.

While the impact of this Guide will be realized over time, partners are already anticipating how they will use the tool:

- [Workforce Professionals Training Institute](#), a New York City-based organization dedicated to strengthening capacity in workforce development systems, envisions the Essential Competencies Guide being useful for a number of upcoming initiatives, including the development of an AI learning community designed to engage workforce leaders in building their AI skills and developing organizational strategies for how to effectively embed AI. WPTI may also use the Guide in their work to build guidance for workforce development professionals, supporting them to gain the right AI skills for effective use in their roles and in best supporting the people seeking workforce development services.

- [Meta](#) may use the Guide to inform the organization's trainings and educational offerings, ensuring the information is at the correct level and entry point for the competencies needed by each target audience.

- The [US Chamber of Commerce Foundation](#) supports a variety

of technology and training initiatives designed to help businesses and business-serving organizations solve problems and build new systems to fit the modern economy. The Chamber Foundation will explore embedding the Essential Competencies Guide within JobSIDE, a web-based resource designed to help employers more easily produce skill profiles for in-demand jobs, and to support easier alignment of education, training, and credential offerings against those jobs. The Foundation will also share the Guide as a resource through its T3 Innovation Network, and through its Talent Pipeline Management ® Academy, which provides employers and their education and workforce development partners with strategies and tools to co-design talent supply chains across communities.

- Faculty at NYU will explore how the Guide may inform a curricular renovation for undergraduate students, focusing on understanding of AI, ethics, data limitations, and sustainability.

- This framework has helped inform the development of IBM SkillsBuild's learner journeys that start at digital literacy and aim to build confidence in emerging technologies, positioning the participants for success in a rapidly evolving AI-impacted economy. The combination of durable and foundational competencies outlined in the report along with the levels of performance provide an actionable and practical design framework for curriculum.

Call to
Action

It is our hope that this Guide provides value to individuals, leaders, and organizations seeking clarity about AI competency development.

The pace of change in AI technology, and in the many products, tools, and applications that use AI, requires that a competency Guide be iterative. This Guide, while based on significant research and stakeholder feedback, can be considered one draft of many to come. It will change over time, and the tools, resources, and case studies that can best support users of this resource will grow over time, as well.

We welcome your feedback. Please share your insights and ideas here. We are interested in understanding not only what you think about opportunities to improve, refine, and expand this resource, but also opportunities to understand concrete applications. We encourage you to share your thoughts.

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About the Alliance

The AI Alliance is focused on fostering an open community and enabling developers and researchers to accelerate responsible innovation in AI while ensuring scientific rigor, trust, safety, security, diversity, and economic competitiveness. We bring together a critical mass of compute, data, tools, and talent to accelerate and advocate for open innovation in AI.