BUILDING AN AI-READY PUBLIC-SECTOR WORKFORCE

Carnegie Mellon University
Open Forum for AI: Talent and Workforce

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THE AI WORKFORCE

INTRODUCTION

Organizations in the public and private sectors and across diverse domains are implementing artificial intelligence (AI) tools to solve their most pressing problems, including improving public services and policy outcomes. In order to benefit from the opportunities created by AI, it is of critical importance to ensure the existing infrastructure and workforce are prepared to integrate AI. The widespread influence of AI and rapidly-changing capabilities have exacerbated the need for frequent upskilling. The public sector also needs to be prepared to utilize open-source infrastructure and technologies to power AI tools. Equipping the public sector to leverage AI will ensure the technology benefits society equitably and can be used to tackle the United States' (U.S.) greatest challenges.

Though AI solutions can be groundbreaking, absent a technically proficient and adaptable workforce, the public sector will not be equipped to deploy AI effectively. Leaders across the government recognize the importance of strong talent; as stated by Lieutenant General Francis L. Donovan, vice commander of the United States Special Operations Command, the key to using AI for government advantage is to "match incredible tech with incredible people." According to Justin Fanelli, Chief Technology Officer of the U.S. Department of the Navy, even if an organization has innovative ideas and sufficient capital, hiring the wrong people is costly and minimizes returns (including social returns). In a discussion of data and compute governance, Jennifer Bachus, Acting Head of the Bureau of Cyberspace and Digital Policy, stressed that skilled workers are foundational to hardware and software development: "that's the first level, that's what everyone wants, is the skills." Talent is clearly a necessary input for AI implementation.

Moreover, open-source AI is important to ensure the public sector has access to cutting-edge technologies and the ability to adapt AI tools to public-sector-specific challenges. Because the private sector tends to dominate foundational model development, open-source AI allows the public sector to utilize technology despite lacking the resources to build models from scratch. However, public-sector professionals often lack sufficient awareness of technology, especially as it pertains to open-source systems. Developing and contributing to open-source technology requires specific skills, such as understanding licensing needs, releasing reproducible architectures, and collaborating through standard open-source workflows. Therefore, public-sector professionals must be uniquely prepared to contribute to and promote open-source AI to ensure the government keeps pace with technological advancements.

However, despite nascent efforts to prepare the public-sector workforce to utilize AI, there are still critical gaps between the existing skills present in the workforce and those that leaders have identified as most essential for addressing both the technical nuance and the social and political implications of AI adoption. As such, deliberate workforce development efforts must be made to close skills gaps and to prepare workers to implement and evaluate AI use. curricula must prepare students to understand and address unique AI-related challenges at the intersection of technology and society. These efforts are especially important presently to ensure the gap between people with knowledge of AI and those without closes rather than widens. Delaying upskilling efforts could result in further-entrenched discrepancies between people with and without access to quality AI education.

Currently, the private sector has a significant comparative advantage in developing training programs and attracting talent, so cross-sector collaboration is necessary to ensure the public sector can also leverage talent successfully. Universities must learn from the successes of the private sector and develop curricula that prepare students to utilize cutting-edge technologies and address related challenges with agility. By building the skills and knowledge necessary for safe and responsible AI development, the public sector can reap the benefits of AI while mitigating risks, ensuring opportunities created by AI are not concentrated to a small portion of society.

Although leaders across the public and private sectors broadly agree that talent development is essential to effective AI implementation, what this entails in practice has not yet been concretely outlined. This report will clarify the competencies workers should possess to work with AI in the public sector as well as examples of how academic institutions can create curricula that prepare early career professionals with this knowledge.

In order to prepare professionals to work with open-source AI in the public sector, Carnegie Mellon University's Heinz College of Information Systems and Public Policy has released an open-source curriculum of four courses: Introduction to AI; Fundamentals of Operationalizing AI: Mastering AI System Lifecycle from Theory to Practice; Responsible AI: Principles, Policies, and Practices; and Generative AI: Applications, Implications, and Governance. Collectively, these courses introduce students to the knowledge and skills requisite to understand the foundations of AI design and implementation, including opportunities, risks, limitations, and frontier developments.

Heinz College is uniquely well-positioned to identify the skills and knowledge necessary for public-sector AI professionals because the college has been operating at the intersection of mission-driven, public-sector work and technical innovation for decades. As the only college in the world to co-locate a School of Public Policy and a School of Information Systems, Heinz College is steeped in a rich history of interdisciplinary collaboration. At Heinz, public policy students and information systems students take classes together, collaborate on projects, and have the unique opportunity to learn from each other's backgrounds. Moreover, Carnegie Mellon University has been a leader in the field of public interest technology for over 50 years, and is ranked #1 in Computer Science, Computer Engineering, Artificial Intelligence, and Information and Technology Management. The university's legacy of contributing to AI research, innovation, and policy development provides the background necessary to identify ways academic institutions can best implement curricula that prepare students to leverage AI responsibly for public good.

ESSENTIAL SKILLS

EXECUTIVE SUMMARY

As AI becomes indispensable across domains and sectors, many workforce development efforts emphasize the importance of technical expertise, such as programming and machine learning (ML) skills. While this focus is important for a portion of the workforce, it can obscure a more nuanced reality: the level of technical fluency necessary varies across the workforce (Figure 1). At a minimum, nearly all workers need to broadly understand how AI systems work. Workers should possess the ability to use AI effectively, recognize its limitations, and make informed implementation decisions. Technical fluency, not deep technical specialization, is essential across the workforce. Beyond that, public-sector AI practitioners—such as data analysts, technical program managers, and IT specialists—should possess a foundational technical skillset, including basic knowledge of databases, such as SQL; programming, such as Python; introductory ML concepts, such as those covered in Introduction to AI (described below) and Machine Learning for Problem Solving; and statistical and mathematical concepts, such as data analysis. At the most complex level, a small fraction of workers will require the technical abilities necessary to design AI systems and develop algorithms.

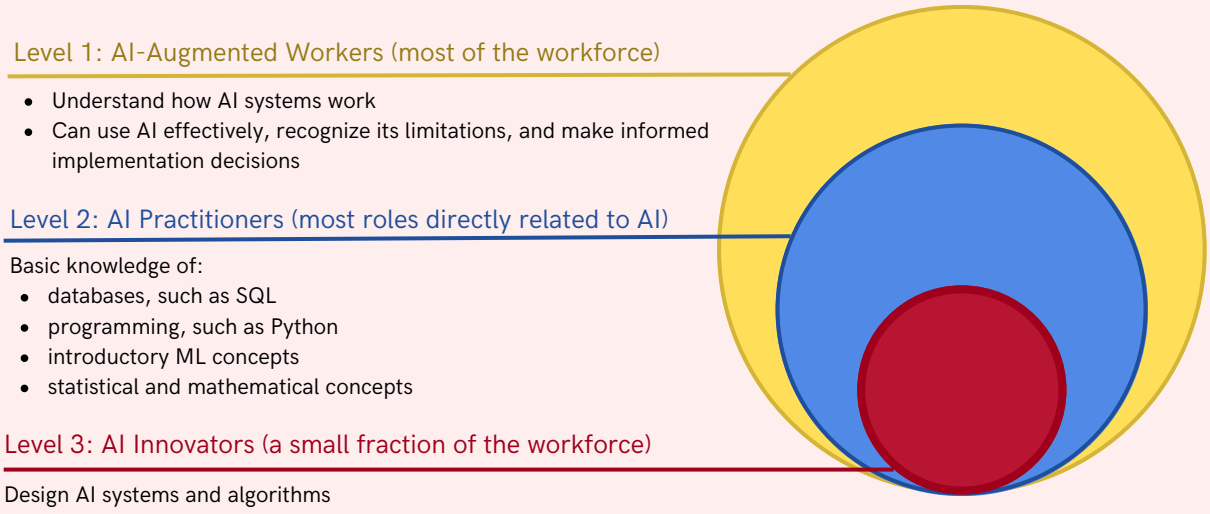

Figure 1. Levels of Technical Fluency for AI and AI-Augmented Work.

For the purpose of this report, we focus primarily on professionals who will operationalize AI in the public sector. For most public-sector AI practitioners who work in positions directly related to AI (not just augmented by AI), the second level of technical fluency is essential, while achieving the third level may be useful but not imperative. However, across positions, technical fluency is necessary, but not sufficient, for an AI-ready workforce. Technical knowledge must be paired with strategic, ethical, and collaborative skills for responsible AI implementation.

Regardless of the technical requirements of specific positions, critical and analytical skills, including the ability to evaluate implications of emergent technology and manage risks, are crucial and often under-developed. Currently, early career professionals often lack systems thinking skills, which would enable them to integrate AI solutions into existing systems in alignment with organizations' specific missions and needs while considering tradeoffs, resource constraints, and broad implications. Communication skills also remain of critical importance, including for jobs with a heavily technical or mathematical focus, such as computer scientists and data scientists. Because summarizing complex technical information for diverse audiences can be difficult, AI policy conversations often involve misinformation or misunderstandings. Therefore, AI policy professionals must have the ability to clearly communicate and effectively defend their positions. Moreover, teamwork continues to be one of the most frequently sought skills, according to federal job listings, leaders in the AI industry, and professors. Collaborative work drives AI progress, so skills such as conflict resolution and leadership remain essential. In fact, because a great majority of public-sector AI development will be done by contractors, it is increasingly crucial for AI practitioners to develop the leadership skills necessary to manage and collaborate with teams of contractors.

Above all, lifelong learning is critical for AI preparedness; given the rapid rate of technological change, knowledge becomes outdated quickly, so the ability to quickly adapt to new paradigms is possibly the most valuable skill workers can possess. To remain AI-ready, workers must be prepared to stay up-to-date with AI advances and to apply foundational knowledge in order to understand the frequently changing AI landscape. For a comprehensive list of skills essential to public-sector AI work, refer to Figure 2, below.

Figure 2. Essential Skills for the Public-Sector AI Workforce.

Given these workforce needs, CMU Heinz College's AI curriculum prioritizes both foundations of AI, ML, and data science as well as a wide range of skills necessary to assess, respond to, and communicate the ethical, social, legal, and economic considerations of AI implementation. Through interactive activities and experiential learning, Heinz College ensures that students are prepared to solve concrete problems. An AI-ready workforce requires not only knowledge of AI and its implications but also the experience and skills necessary to apply this knowledge to emerging challenges. This report outlines key learning outcomes and skills crucial for an AI-ready public-sector workforce, as well as examples of how these are implemented in Heinz College courses. This framework of core competencies for public-sector AI professionals can inform curriculum development for other academic institutions and public agencies.

COURSE OVERVIEWS

CORE CURRICULUM

Introduction to AI is a programming-intensive course that provides an overview of foundational AI concepts and techniques, such as ML, model evaluations, neural networks, computer vision, large language models, and natural language processing as well as real-world applications, including their limitations and social implications. The curriculum also covers strengths and weaknesses of human decision-making and learning, especially in the context of AI. A portion of the course also introduces students to new technologies that are likely to become increasingly prominent in the near future, such as brain-computer interfaces and quantum computing.

This course culminates in a final project in which students pick a specific problem and design a real AI solution, from the problem scoping and data collection stage to developing a usable tool. The course enables students to become confident in their ability to identify and scope important problems and experiment with many methods to determine how to efficiently apply AI to those problems, giving them the tools and knowledge necessary to implement AI solutions in real-world contexts.

This course requires the greatest amount of prerequisite technical knowledge relative to the other courses. Students should be prepared to implement technical solutions for course activities, so this course is tailored to students with greater interest and experience in designing and programming AI solutions. The remaining courses are tailored for diverse audiences and often include students both with and without programming and other technical experience. In these classes, students often have the ability to choose more technically rigorous project options to best suit their level of technical familiarity and interest.

Fundamentals of Operationalizing AI grounds knowledge of fundamental AI concepts, techniques, and applications in real organizational landscapes by uniting all the components of the business innovation process. It focuses on the skills and learning outcomes necessary to implement solutions for organizations across the AI lifecycle to ensure that AI tools are specifically tailored to address context-specific needs and to maximize returns (which includes social impact in the public sector). As one student who took the course stated, "Being able to implement AI requires a careful consideration of not only the technology itself but how it aligns with the company."

Responsible AI concentrates primarily on one stage of the AI lifecycle: risk management. It focuses on governance (both corporate and regulatory) of AI tools and strategies for addressing risks posed by AI. Building on Fundamentals of Operationalizing AI, it equips students with the knowledge and skills to not only implement AI effectively but also safely and ethically.

Generative AI cuts across stages of the AI lifecycle, taking a vertical approach to introducing students to the unique opportunities and challenges related to generative AI relative to other forms of AI. The goal of the course is to equip students with a fundamental understanding of how generative AI is built and operated, how it can benefit individuals and society, how it presents societal challenges, and how to use institutional, corporate, and societal frameworks to address those challenges. It also includes significant attention to cutting-edge, frontier advances in generative AI, including policy developments, preparing students to understand future changes after taking the course.

Students who take this course are well-prepared to use AI effectively for personal productivity as well as broader challenges, including by acknowledging its limitations. After being introduced to many new topics in generative AI through the course, students frequently report that they subsequently became more interested in focusing on specific aspects of generative AI design, implementation, and governance.

Collectively, these courses prepare students to evaluate and design AI implementations for practical contexts. Through group projects and other collaborative activities, all of the courses focus on equipping students with baseline skills necessary to collaborate on team projects, such as leadership and conflict resolution. Beyond that, the courses focus on diverse, nuanced skills and content that provide students with the expertise necessary to respond to various aspects of AI-related opportunities and challenges. By addressing both the technical and societal implications of AI, as well as how to actively respond to risks, these courses prepare students to contribute to tangible impact through effective and safe use of AI.

However, one current gap in the core AI curriculum at Heinz College is a focus on the unique skills necessary for open-source AI implementation (Learning Objective 3), as mentioned above. Given the unique challenges and opportunities presented by open-source infrastructures and the importance of openness in AI to maximize public benefit, future curriculum should incorporate special attention to skills and knowledge related to open-source workflows. In addition, while each course addresses important aspects of AI, the curriculum as a whole should prioritize an integrated design that equips students to synthesize insights from across courses. Systems thinking at the program level would prepare students to apply interdisciplinary skills to address rapidly evolving challenges.

Each of these courses contributes to building an AI-ready workforce by helping students gain the knowledge and skills necessary to use and evaluate AI meaningfully. One student who took all four courses has since developed his own projects using AI, including implementing AI tools in his nongovernmental organization; he said, "Would I be able to do this without these courses? Probably yes, but without the due considerations they require." Together, this curriculum prepares students to not only maximize the impact of AI but to do so safely and responsibly.

Learning Objective 1

Apply systems thinking to understand organization-specific needs and frame problems in order to integrate AI implementations with existing processes.

Why It Matters

Implementation of AI tools requires attention to an organization's specific *existing structures and processes*. Organizations tend to *struggle with the entire AI implementation process*, focusing only on the technical process of building and operating new tools but fail to include the organizational perspective.

Understanding an agency or organization's unique needs is critical for both *developers and designers* as well as *end-users of AI tools* in the public sector: those creating systems need to *tailor applications to the specific ecosystems* of the deployment environment, and end-users need to gain the ability to *evaluate AI applications* and determine which models and tools should be applied in which scenarios.

Systems-level thinking is necessary to evaluate interactions between models, institutional incentives, societal impacts, and existing power structures. This competency is also useful for adequately addressing concrete *practical considerations*, such as resource constraints, fairness and explainability tradeoffs, and implementation challenges.

Examples of Implementation

Responsible AI: Students complete a final team project in which they are given the description of a realistic problem related to responsible AI development and must create a detailed plan to apply the National Institute for Standards and Technology (NIST) Risk Management Framework and address risks and limitations. They must also communicate the nature of the risks and mitigation strategies through a final presentation.

Introduction to AI: Students complete a final project in which they design an AI tool to address a real-world problem. This project involves scoping the problem, designing a plan for data collection, and using knowledge of foundational AI concepts to implement the tool.

Fundamentals of AI: Students complete a project in which they develop and evaluate tools to assess air quality. The individual element of this project is focused on foundational ML concepts; students use training techniques, such as batch processing and data streaming, to develop AI tools. In the group element, students simulate deploying the model in a real organization using Docker and compare various models' performance in terms of accuracy.

Learning Objective 2

Apply foundational data science and artificial intelligence concepts to real-world problems across the AI lifecycle– from data collection and engineering through modeling, deployment, monitoring, and explainability.[1]

Why It Matters

Public-sector AI professionals must possess r*obust technical skills*, such as the ability to *identify data needs and considerations* and *understand the AI lifecycle*, which will enable them to make informed, strategic decisions about AI use.

Though the majority of workers do not need to possess the expertise to design novel AI algorithms, they should have the *technical understanding necessary to operationalize* AI implementations. Workers who understand how models are trained, evaluated, and monitored can contribute to safe, effective development by creating AI tools, procurement processes, oversight mechanisms, and governance frameworks.

Understanding foundational AI and data science concepts is also essential for *identifying problems* suitable for AI and *framing those problems* such that AI can solve them. This foundational knowledge also equips professionals to mitigate risks, communicate challenges and opportunities to diverse stakeholders, and maximize returns from AI implementation.

Examples of Implementation

Generative AI: Students complete a creative exercise (with limited technical aspects) in which they attempt to jailbreak various AI tools and identify vulnerabilities. Students write a research paper, including methodology, criteria, results, and recommendations to developers to address the models' vulnerabilities going forward.

Introduction to AI: Students complete a final project in which they design an AI tool to address a real-world problem. This project involves scoping the problem, designing a plan for data collection, and using knowledge of foundational AI concepts to implement the tool.

Introduction to AI: Students have technical homework assignments in which they complete coding challenges, such as implementing a Monte Carlo tree search, data analysis of health informatics, a transfer learning model for computer vision, and a natural language processing model.

[1] Requisite technical skills change frequently, but currently include basic statistics, reading and understanding code, data visualization, containerization and orchestration, monitoring and drift detection, and LLMOps and retrieval-augmented generation using tools such as Kafka, Docker, PyTorch, Pandas, Kubeflow, and Evidently.

Learning Objective 3

Understand the unique requirements and opportunities of open-source AI infrastructures and leverage them effectively.[1]

Why It Matters

Open-source infrastructure is critical to *ensure the benefits of AI are leveraged in the public sector*. Because of its *transparency and availability*, open-source infrastructure *builds trust and promotes adoption*. Open-source software will help the *U.S. government compete* in terms of innovation by giving the public-sector access to cutting-edge technologies.

However, open-source systems require *specific skills and knowledge*, such as knowledge of how open-source systems operate and of regulatory frameworks specific to open-source systems. Open-source systems present *unique challenges* because the technology must be scalable to large, diverse audiences, which can create capacity constraints. Professionals must be uniquely prepared to recognize and respond to those challenges. Open-source workflows also require individuals to *navigate collaboration with huge, disconnected teams* due to the decentralized nature of the systems, emphasizing the importance of building skills specific to open-source collaborative work. An AI-ready public-sector workforce must be *specifically prepared to work within open-source environments*. Existing AI training programs are not sufficient to cover the unique challenges of open-source AI.

Examples of Implementation

None of Heinz College's core AI curriculum currently focuses on skills specific to open-source AI infrastructures.

However, other foundational skills, such as knowledge of statistics, data science, and ML and an ability to collaborate and manage conflict on diverse teams, are also relevant to open source.

[1] In order to effectively leverage these infrastructures, professionals should possess certain open-source-specific competencies, including understanding licensing needs, releasing reproducible architectures, collaborating through standard open-source workflows, and publishing datasheets, model cards, and other transparency artifacts.

Learning Objective 4

Leverage AI tools effectively for specific problems, critically evaluate outputs, and understand the capabilities and limitations of AI solutions within public-sector workflows.

Why It Matters

Leveraging AI requires knowledge of its *strengths and limitations*, as well as the understanding that AI tools are not a monolith. All workers should have the ability to distinguish cases in which AI is and is not useful and identify which tools are appropriate in those contexts. They should be comfortable with *experimenting with and comparing AI models* to make granular decisions about suitable applications. In government contexts, these skills are essential for discerning where and how to implement AI as well as *navigating conversations with technology vendors*. Understanding how to probe for strengths and weaknesses of AI tools will contribute to strategic decision-making about governmental procurement and *maximally efficient application* of these tools.

Applying AI indiscriminately to existing workflows may lead to *ineffective use of AI tools* and may *increase hesitancy of adoption* if workers feel that AI applications are cumbersome rather than useful. Moreover, it can lead to *overreliance on the technology*, which can erode both technical skills, such as analyzing data and troubleshooting software, and professional skills, such as interpersonal communication, writing, and leadership.

Examples of Implementation

Introduction to AI: Students complete a final project in which they design an AI tool to address a real-world problem. This project involves scoping the problem, designing a plan for data collection, and using knowledge of foundational AI concepts to implement the tool.

Fundamentals of AI: Students complete a project in which they develop and evaluate tools to assess air quality. The individual element of this project is focused on foundational ML concepts; students use training techniques, such as batch processing and data streaming, to develop AI tools. In the group element, students simulate deploying the model in a real organization using Docker and compare various models' performance in terms of accuracy.

Generative AI: Class activities involve the use of various AI tools to learn about their uses and limitations. Students also engage in workshops related to writing and researching effectively with the assistance of AI.

Learning Objective 5

Measure and mitigate AI risks, apply regulatory frameworks, and ensure compliance with governance requirements.

Why It Matters

Workers must possess the specific knowledge necessary to *develop governance strategies at both the organizational and policy levels* in order to both mitigate risk and ensure that public-sector AI implementation is compliant with regulatory frameworks. Though no comprehensive federal AI legislation currently exists in the U.S., several existing legal frameworks, such as data and privacy legislation, apply to use of AI, so ensuring that implementation is compliant is necessary for legal (not to mention ethical) development.

Effectively recognizing and responding to risks also contributes to maximizing the impact of AI implementation because *unaddressed risks can be costly*, minimizing the overall return on investment, including social returns in the public sector. Responsible implementation requires management of not only *technical risks*, such as hallucinations and model drift, but also *societal risks*, such as workforce displacement and the spread of disinformation and misinformation, and *risks related to the interaction of societal and technical implications*, such as bias and fairness considerations and cybersecurity threats.

A *variety of potential governance strategies* are available to both government regulators and internal organizational governance teams. Understanding the *strengths and limitations of various forms of governance* as well as how to *apply risk management frameworks* is essential to responsible AI development.

Examples of Implementation

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Learning Objective 6

Evaluate social, economic, and ethical considerations of AI implementation.

Why It Matters

Relative to the private sector, the public sector requires a comprehensive understanding of *sociotechnical impacts of AI at scale*, including its effect on the labor market, democracy, the environment, and geopolitics. Private-sector professionals often work in narrower domains, focusing on isolated aspects of AI, such as technical development or governance considerations, rather than a combination of the two. However, public-sector workers must *integrate all these perspectives* and anticipate *how AI implementation might affect diverse stakeholders*.

Examples of Implementation

Responsible AI: Students read, analyze, and discuss realistic case studies which relate to implementing AI tools in a variety of real-world contexts. Students must consider broad sociotechnical implications of AI use and make evidence-based recommendations for balancing various values, such as bias, fairness, explainability, accuracy, privacy, and security.

Responsible AI: When discussing bias and fairness considerations of AI tools, students use an interactive courtroom algorithm tool to see a real-world example of the tradeoffs between fairness and accuracy, as well as various definitions of "fairness." This activity gives students hands-on experience making fairness decisions related to AI implementation in high-significance contexts and incorporates class discussions related to ethical and policy analysis, requiring students to make evidence-based judgments about ethical AI use.

Responsible AI: Students complete an individual project in which they compare demographics and criminal justice outcomes of various counties in which an AI algorithm was implemented in criminal courts. The project includes a writing element in which students describe fairness considerations of AI models and a presentation summarizing the potential risk of bias related to this use of AI.

Generative AI: Students engage in a class debate, representing different perspectives to consider multiple stakeholders involved in the AI landscape and address challenges related to incorporating diverse views into policies for responsible AI operationalization.

Introduction to AI: At the end of the course, students complete a writing assignment in which they reflect on the feasibility and desirability of artificial general intelligence, which gives them the opportunity to apply economic and policy analysis to open questions about AI advancements.

Learning Objective 7

Communicate opportunities, risks, and broad implications of AI to diverse audiences, including technical and non-technical stakeholders, and manage transitions for broad audiences.

Why It Matters

Communication skills are especially important in order to *build trust and promote adoption* among many stakeholders, including constituents. Because hesitancy toward new technology can be a barrier to adoption, *clearly and transparently communicating opportunities and challenges* related to AI implementation is crucial for a smooth transition to AI-augmented government work. Broad AI implementation relies on workers with the ability to *translate technological expertise into widely comprehensible guidance* that accurately reflects technical realities and necessary tradeoffs. This is especially important for policy conversations, which often involve misinformation or misunderstandings. AI policy professionals must have the ability to *write actionable recommendations* and *effectively defend their positions*.

Communicating both opportunities and risks presented by AI is crucial for responsible, effective implementation. Policymakers, domain experts, and the general public must be *well-informed about the multi-faceted impacts* of AI in a manner that is *comprehensible and uniquely relevant* to their needs.

Examples of Implementation

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Responsible AI: Students complete a final team project in which they are given the description of a realistic problem related to responsible AI development and must create a detailed plan to apply the NIST Risk Management Framework and address risks and limitations. They must also communicate the nature of the risks and mitigation strategies through a final presentation.

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Learning Objective 8

Lead cross-sector and interdisciplinary collaboration and resolve conflicts in diverse teams.

Why It Matters

AI implementation *cuts across various domains*, such as financial services, software engineering, healthcare, and policy, so *multidisciplinary education is necessary* for preparing an AI-ready workforce. Dynamic exchanges across domains ensure specific *knowledge bases are not siloed*, promoting the most innovative and mutli-faceted development.

Moreover, *public-private partnerships are critical* to allow the public sector to be at the cutting-edge and to innovate on the level of private-sector corporations. An ability to *connect industry, government, and academia* and to seamlessly work across sectors is crucial.

AI curriculum should also prioritize *skills related to leadership and teamwork*, such as conflict resolution, understanding team members' wants and needs, and determining how to divide labor and negotiate. Collaborative work is the single *most frequently addressed skill* across the four core AI courses.

Examples of Implementation

Generative AI: Students complete a creative exercise (with limited technical aspects) in which they attempt to jailbreak various AI tools and identify vulnerabilities. Students write a research paper, including methodology, criteria, results, and recommendations to developers to address the models' vulnerabilities going forward.

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Fundamentals of AI: Students complete a project in which they develop and evaluate tools to assess air quality. The individual element of this project is focused on foundational ML concepts; students use training techniques, such as batch processing and data streaming, to develop AI tools. In the group element, students simulate deploying the model in a real organization using Docker and compare various models' performance in terms of accuracy.

Learning Objective 9

Forecast future technological advances, maintain knowledge of cutting-edge technology, and be able to apply foundational concepts to new developments. Develop strategies and capabilities for continuous learning and adaptability.

Why It Matters

Ultimately, the *future impacts of AI are entirely uncertain* and the *pace of development is exceptionally fast*, with new tools and methods emerging in months, not years. A strong foundational knowledge of AI equips professionals to understand evolving policy debates and AI capabilities, but *static knowledge is not sufficient*. Workers who are best prepared for the future of AI will be those with the ability to *learn quickly and continuously*, evaluate emerging technologies, adapt frameworks to new capabilities, and design responsive policies rapidly. *Agility and adaptability* are two of the most frequently cited skills for an AI-ready workforce.

Public-sector AI workers should also be able to *forecast future developments* in order to respond to coming changes before they fully materialize. Skills such as *horizon scanning and situational awareness* will enable professionals to anticipate challenges before they arise, ensuring that the public sector is *proactive rather than reactive* in navigating risks and opportunities of AI.

Examples of Implementation

Generative AI: Each class session includes a discussion of recent developments in AI technology and governance, including broad implications of these changes and how they relate to course content.

Introduction to AI: The course includes a week-long module on the future of AI, which introduces students to potential future developments that might become increasingly relevant in discussions surrounding AI implementation, such as quantum computing.

Introduction to AI: Class discussions involve forecasting future developments, such as the potential of superintelligence, and their implications. Students use ethical analysis to draw their own conclusions about certain technological advances.

Introduction to AI: Students complete a writing assignment in which they reflect on the feasibility and desirability of artificial general intelligence, which gives them the opportunity to apply economic and policy analysis to open questions about AI advancements.

SKILLS FORWARD

CONCLUSION

In order to utilize AI to broadly benefit the U.S., the public-sector workforce must possess both:

1. Knowledge of the technical realities of AI in order to operationalize highly context-dependent applications of AI and
2. The skills necessary to address both opportunities and challenges related to AI, to communicate technical realities, and to work collaboratively to advance responsible AI

As the impact of AI expands, public-sector workers must be prepared to recognize when AI should and should not be applied to existing problems and how to operationalize AI tools. According to Dr. Paul Alivisatos, President of the University of Chicago: "a human being who can engage with the machines in the deepest ways is going to be the most productive." Navigating AI-augmented work will require foundational knowledge of AI and ML concepts, attention to the strengths and limitations of AI tools, and a commitment to lifelong learning in order to remain knowledgeable about the constantly-changing AI landscape.

Currently, the public sector lags behind the private sector in terms of workforce preparedness. Embracing the opportunities presented by AI while mitigating risks will require deliberate workforce development to address existing skills gaps. Universities, such as Carnegie Mellon University, can lead these efforts by offering exemplary curricula that demonstrate how technical education can be blended with attention to communication, teamwork, critical thinking, and analytical skills. However, public-private partnerships will also be critical to build an AI-ready workforce and ensure the public sector is prepared to implement AI and to respond quickly to AI advances.

Building an AI-ready workforce is a collaborative effort. Government agencies and other public-sector employers must attract and support skilled workers who are both eager to work in mission-driven, purposeful positions and able to apply sociotechnical perspectives to AI implementation. Universities must develop curricula that prepare professionals to contribute meaningfully to a changing workforce and to utilize essential skills, such as critical thinking, teamwork, and communications, while addressing new challenges from AI. Corporations, especially those developing frontier AI, must collaborate with the public sector to provide open-source AI and to support workforce training efforts, given the private sector's comparative advantage in preparing workers for emerging challenges related to advanced technology. Moreover, an AI-ready workforce must be prepared to implement open-source AI, which provides the public-sector the opportunity to implement AI despite lacking the ability to engage in frontier model development. However, open source also presents unique challenges and requires specific skills, so workforce training programs, including university curricula, must incorporate open-source-specific skills development.

Through intentional and informed efforts to prepare all workers to work with AI, the public sector can ensure that the benefits of AI are distributed across society rather than concentrated among a few private-sector developers.

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