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AI career paths and skills for Information Systems graduates

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Abstract

The objective of this study is to identify artificial intelligence (AI) skills in the industry that are easily accessible for the information systems (IS) graduates to upskill. Data were collected from three sources: (a) AI learning paths, courses, and certifications available on major public cloud platforms including Microsoft Azure, Amazon AWS, and Google GCP; (b) AI job listings at leading job websites including LinkedIn, Indeed, and others; and (c) career recommendations obtained using two generative AI tools from Google including Google Career Explorer and Gemini. The data from these sources were reviewed by the author to extract AI skills that are adjacent to a typical IS curriculum. Term-frequency and bigram-frequency analyses of the terms in job titles and job descriptions were performed to better delineate potential AI skill paths and skills. The results indicate that undergraduate IS majors do have adequate foundational skills and education to pursue AI upskilling such as an AI certification, or an AI major or minor. This study is expected to be of practical use to IS graduates in their career upskilling, and to IS curriculum committees for designing and offering AI courses and concentrations .

Keywords: AI, machine learning, upskilling, IS education

Introduction

Since the release of ChatGPT (a generative AI chatbot) in 2022, interest in practical applications of artificial intelligence (AI) has intensified and continues to increase at an increasing rate. Businesses, governments, and general public around the world are deploying and using AI-based tools for tasks ranging from routine to complex decision support and automation. Many startup companies are AI-focused and most forward-thinking and innovative companies are incorporating AI into their workflows and operations (Wells, 2025). Generative AI is transforming industries, including sales and marketing, healthcare, finance, and many more. Agentic AI is helping companies develop autonomous systems to make decisions and perform tasks without human intervention. In response to the ongoing inroads of AI in the workplace, businesses and governments must equip workers with critical AI skills (Maggioncalda, 2025).

Commensurate with these developments, industry demand for AI skills has been growing rapidly in recent years and growth in AI jobs has outpaced all job openings in the past three years (PwC, 2024). At the same time, interest in AI jobs from potential workers has also been growing fast as indicated by job search data. For example, Google searches in the US for the term “AI jobs” have surged 37% over the past 12 months, according to Google Trends data (Google, 2025).

A distinction can be made between *AI specialist skills* and *AI applied skills*. Some examples of specialist skills include deep learning, natural language processing, and AI systems development, deployment and operations (AI DevOps). But AI is affecting almost all jobs requiring current and future workforce to

acquire applied AI skills to enable them integrate AI in their work. As highlighted in a recent AI jobs report (PwC, 2025), such upskilling also offers a wage premium – see Table 1 below.

Table 1. Average Wage Premiums in the US for Applied AI Skills

Job Role	Average AI Wage Premium
Database designers and administrators	53%
Lawyers	49%
Sales and marketing managers	43%
Financial analysts	33%
Application programmers	32%
Systems analysts	30%
Accountants	18%

Source: PwC (2025)

The objective of this study is to identify and examine the demand for applied AI skills in the industry that are reasonably accessible for the IS graduates to upskill. Findings of this study are expected to help information systems graduates looking to upskill, and inform IS curriculum development.

Information systems, or management information systems (MIS) is a field of study in most Colleges of Business in the United States. Besides other required and elective courses, students in the MIS major take at least one course each in a programming language, database management, computer networking, and systems analysis and design. Additionally, their course requirements typically include courses in various functional areas of business such management, marketing, accounting, finance, and human resource management. These and required general education courses equip them with necessary foundational knowledge and skills necessary to upskill with applied AI skills.

A practical approach that facilitates upskilling is based on the concept of *skill adjacency*. "Adjacent skills include both soft skills and industry-specific knowledge that are not an employee's primary area of expertise but are closely related to them." (Robert Half, 2025). Skill adjacency shortens the learning curve and helps workers to learn new skills relatively easily. It has been recognized as a practical strategy to fill the increasing skill gap due to rapidly changing technology in the workplace. Using this strategy, companies can retain employees and recruit new ones that are job-ready (Baker & Zuech, 2021; Shirani, 2022). A recent study prepared for the World Economic Forum (LinkedIn, 2020) illustrates the success of the *skill adjacency* strategy: according to this study, approximately half of the employees hired in AI and data science jobs came from other unrelated industries after retraining.

Methodology

The methodology for this study involved three steps: First, in the data collection step, data were collected from relevant AI education and training sources, recommendations by two generative AI tools, and from AI job announcements posted on popular job websites. In the second step, job roles and skills identified as appropriate for IS graduates were extracted from the data. In the third step, job roles and skills in the industry were mapped to a typical IS curriculum by the author to confirm that they included IS-adjacent roles and skills. Figure 1 summarizes this process.

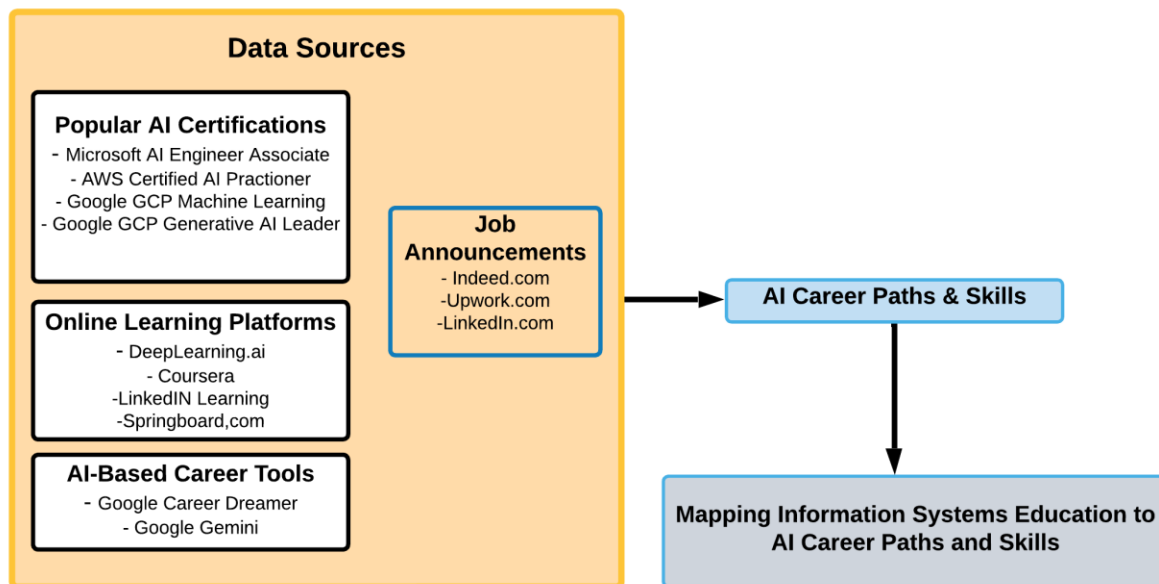


Figure 1. The Study Methodology

Data Sources and Data

Data were collected from the following three categories of sources:

1. Popular platforms for AI education, training, and certification

- Since major AI workloads are performed on various public and private cloud platforms and data centers, including Microsoft Azure, Amazon AWS, and Google GCP, it makes sense to review training and certifications offered by these platforms.
- AI skills training data were also collected from other popular online learning platforms including DeepLearning.Ai, Coursera, LinkedIn Learning, and Springboard.

2. Generative AI tools:

Google Career Dreamer (<https://grow.google/career-dreamer/>) is an AI-based tool for career exploration. I used this online tool along with *Google Gemini* (<https://gemini.google.com/>) to discover relevant AI skills suitable for IS graduates.

3. Online AI job listings:

Data on the industry demand for AI skills were collected from a number of employment websites that aggregate job listings from multiple sources. The following search terms were used to find relevant job listings: *AI*; *machine learning*; *data science*; *deep learning*; *data analytics*.

Data collected from the above three categories of sources are discussed below in more detail.

AI Training and Certifications by Public Cloud Platforms

AI certifications offered by the three leading public cloud platforms including *Amazon AWS*, *Microsoft Azure*, and *Google GCP* offer a set of AI career paths and skills. Since they provide data, machine learning, and AI services which satisfy the demand of their enterprise customers, their certifications serve as a good proxy for most recent in-demand AI skills. AI careers and skills retrieved from these sources were reviewed

by the author of this study to ensure that they represented IS-adjacent skills with respect to a typical IS/MIS bachelor's degree curriculum in the US.

Microsoft Azure

The following ordered sequence of learning paths is recommended for getting started with Azure AI workloads:

- Azure Fundamentals (AZ-900): Although not required, it is necessary and most appropriate that the learners first get introduced to cloud computing concepts and terminally in general, and get hands-on introduction to Azure virtual machines and core services such as compute, storage, and networking. Microsoft Azure course AZ-900, Azure Fundamentals is a free online course for this purpose (<https://learn.microsoft.com/en-us/training/courses/az-900t00>).
- Azure AI Fundamentals (AI-900): Next, Azure AI Fundamentals course, AI-900 is recommended for getting started with Azure-based AI-specific services.: (<https://learn.microsoft.com/en-us/training/courses/ai-900t00>).
- Plan and prepare to develop AI solutions on Azure (<https://learn.microsoft.com/en-us/training/modules/prepare-azure-ai-development/>). This module would be next step in the upskilling journey in Microsoft AI. This module introduces AI developer tools and SDKs for AI projects, Azure AI Foundry, and responsible AI considerations.
- Azure AI Engineer Associate, AI-102: (<https://learn.microsoft.com/en-us/plans/8x6ybzt1m6x6n>). Although this path and certification are not immediately skill-adjacent for IS graduates, this would be the next logical step in the Azure AI journey.

Amazon AWS

- AWS Certified Cloud Practitioner (<https://aws.amazon.com/certification/certified-cloud-practitioner/>). To get started with Amazon AWS AI services, it is recommended that the IS graduates first take an online course and the associated certification exam, which provide a high-level foundational knowledge of AWS Cloud, services, and terminology.
- AWS Certified AI Practitioner (AIF-C01): (<https://aws.amazon.com/certification/certified-ai-practitioner/>.) The learning objectives of this certification exam and associated online course are to understand AI, ML, and generative AI concepts, methods, and strategies in general and on AWS; understand the appropriate use of AI/ML and generative AI technologies to relevant questions within the candidate's organization; determine the correct types of AI/ML technologies to apply to specific use cases; and use AI, ML, and generative AI technologies.

Google GCP

Depending on the learners' prior knowledge and skills, IS graduates have multiple options for getting started with machine learning and AI courses and services on the Google cloud platform (GCP) listed here: <https://cloud.google.com/learn/training/machinelearning-ai>. More specifically, the following certification and an associated course are recommended for the IS graduates to achieve AI and machine learning proficiency:

- Professional Machine Learning Engineer: This certification exam assesses the ability to architect low-code AI solutions; collaborate within and across teams to manage data and models; scale prototypes into ML models; serve and scale models; automate and orchestrate ML pipelines; and monitor AI solutions.

AI Career Paths and Skills Recommended by AI Tools:

Google Career Dreamer is an AI-based online career exploration tool that works together with Google Gemini chatbot to get input from the user and recommends career paths and skills based on the user's prior education and other preferences. Since the data used to train a generative AI model are frequently refreshed

using web crawlers, the recommendations provided by these tools are expected to be somewhat more current than other sources. I used both of these AI tools to generate career paths and skills associated with each path and ensuring they were suitable for IS graduates. The step-by-step process and results of this process are described below.

Step 1:

I used Google Career Dreamer (<https://grow.google/career-dreamer/home/>) to input skills and profile of a typical IS/MIS graduate – Figures 2 and 3 below:

The screenshot shows the 'Student' profile section of the Google Career Dreamer tool. It indicates a 'Bachelor's degree' in 'MIS'. Below this, a prompt asks the user to 'Select at least 3 skills that apply to you.' There are two buttons: 'Re-generate' and 'Select all'. A grid of skill tags is displayed, with some highlighted in green and others in grey. The green tags are: Database Management, Data Analysis, Project Management, Systems Analysis, Problem-Solving, and Business Intelligence. The grey tags are: Software Development, Network Security, and Communication.

Figure 2. Google Career Dreamer – Skill Input of a Typical IS Graduate

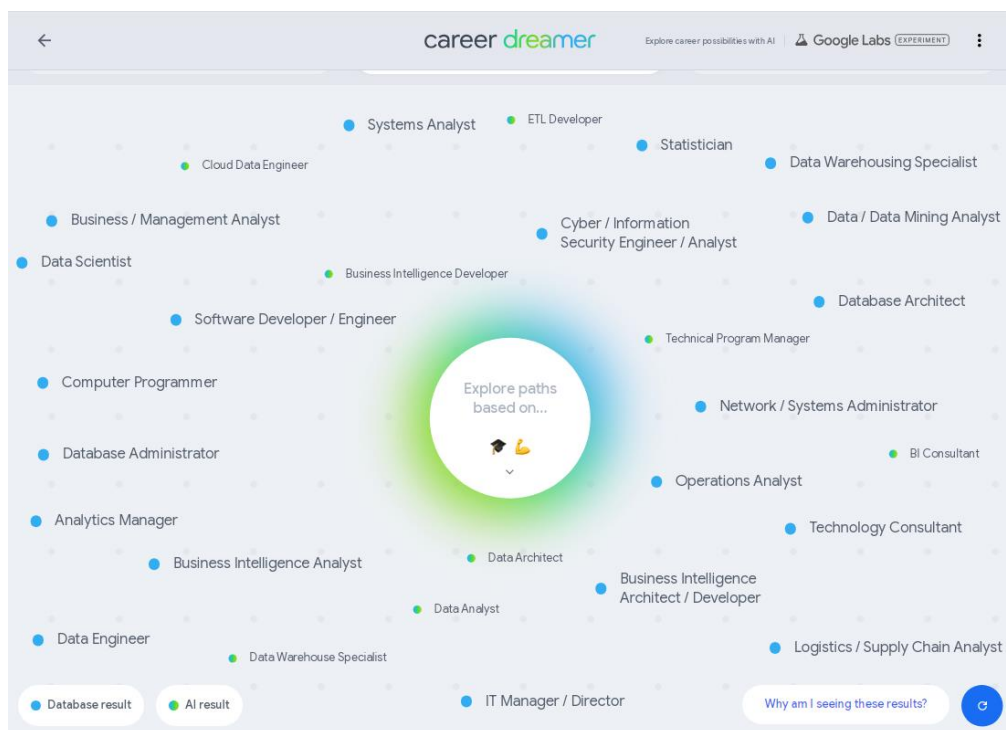


Figure 3. Google Career Dreamer – Detailed Profile Input of an IS Graduate

Step 2:

The Career Dreamer generated the following "Identity Statement" based on the input in Step 1.

I am a data-driven problem-solver with a strong foundation in management information systems and a passion for leveraging data to improve business outcomes. My skills in database management, data analysis, and systems analysis allow me to effectively identify and address complex business challenges. I am eager to contribute my analytical abilities and technical expertise to optimize processes and drive strategic decision-making.

Step3: the Career Dreamer generated the following prompt, which I then used in Google Gemini to generate a list of recommended paths and associated skills.

Based on this information and additional information I provide, help me explore potential career paths that could be a good fit for me based on my profile. I am especially interested in AI roles. For each role, provide an overview of what the role entails along with a thorough and thoughtful analysis of why I might be a good fit. Each role should be reasonably attainable; if the role requires more education or specialized experience than I currently have, provide specific and concrete guidance into how I can bridge the gap. Finally, give at least one example of a company that hires for that specific role.

Step 4: Google Gemini recommended career paths, skills, and necessary preparation. A snippet of the recommendations appears below:

It's great that you're thinking proactively about your career path and exploring the exciting field of AI! Your MIS background provides a solid foundation with skills in data analysis, systems analysis, and problem-solving, which are highly relevant to various AI roles. Let's explore some potential career paths in AI that could be a good fit for you:

Data Analyst with AI Focus

Overview: In this role, you would leverage your data analysis skills to work with large datasets, often to train or evaluate AI models. You would be responsible for collecting, cleaning, and preparing data, performing exploratory data analysis, and potentially visualizing insights to communicate findings to data scientists and other stakeholders. As you grow in the role, you might also contribute to feature engineering for AI models and analyze the performance of these models.

Why You Might Be a Good Fit

- **Strong Foundation in Data Analysis:** Your MIS degree has equipped you with core data analysis techniques, which are fundamental to any role involving AI.
- **Database Management Skills:** Your understanding of database management will be crucial for accessing and manipulating the large datasets used in AI.
- **Problem-Solving Abilities:** Identifying patterns and extracting meaningful insights from data, a key part of this role, relies heavily on problem-solving skills.
- **Business Intelligence Interest:** Your manually added interest in Business Intelligence aligns well with the need to translate data insights into actionable business strategies, often informed by AI.

Bridging the Gap

- **Focus on AI-Related Data Analysis:** Seek out online courses or certifications specifically focused on data analysis for machine learning and AI. Platforms like Coursera, edX, and Udacity offer excellent programs.
- **Learn Relevant Programming Languages:** Proficiency in Python and its data analysis libraries (like Pandas and NumPy) is often required. Start learning these languages through online resources and practice with real-world datasets.
- **Gain Experience with Data Visualization Tools:** Familiarize yourself with tools like Tableau or Power BI to effectively communicate data-driven insights.
- **Build a Portfolio:** Work on personal projects involving publicly available datasets to showcase your data analysis skills and your ability to apply them to AI-related problems.

Example Company: Accenture hires Data Analysts with a focus on AI and Machine Learning to help their clients leverage data for intelligent solutions.

Job Roles and Skills Listed on Employment Websites

A total of 35 job announcements were collected from three employment websites. Job title and job description were retrieved for each job announcement. Table 2 below shows the count of job listings by employment website, along with job titles and employers.

Table 2. Average Wage Premiums in the US for Applied AI Skills

Employment Website	Employers	Job Titles
Indeed.com (10 listings)	AllState; Amazon; Chan Zuckerberg Initiative; Imaging AI Lab; Zoom	AI researcher; Applied scientist; Data scientist; Machine learning engineer
LinkedIn.com (15 listings)	Adobe; Amazon; Ford Motor Company; Intuit; Meta; PayPal; Pinterest; TikTok; Toyota Research Institute; Twitch	AI scientist; Applied scientist; Machine learning engineer; Machine learning scientist; Machine learning research scientist
Upwork and others (10 listings)	Not available	This employment website lists part-time and contract work with no job titles.

Data Analysis, Results, and Discussion

Data collected was analyzed using term-frequency and bigrams frequency. Job descriptions retrieved from employment websites were analyzed using text mining techniques in a Python notebook. Various steps in this process included case-conversion, tokenization, removal of stopwords, and stemming. This analysis yielded a list of frequently used relevant terms. Two different analyses were performed on these terms including term frequency and bigrams frequency. For visual observation, word clouds of the most frequent terms were generated from the career recommendations given by Google AI tool, Career Dreamer (Figure 4) , and from the job titles posted on employment websites (Figure 5).

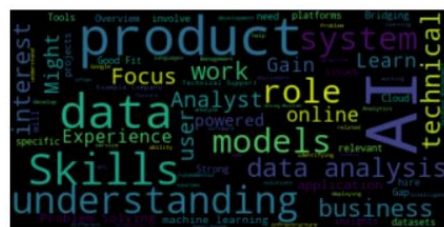


Figure 4. Google Career Dreamer – AI Job Descriptions Term Frequency

Based on the academic profile of a typical IS graduate, recommendations by Google Gemini and Career Dreamer appear to focus on data analysis and modeling, product management and business applications of AI, and machine learning (Figure 4). On the other hand, industry demand for AI skills emphasizes work experience, followed by machine learning, research, data-related skills, and some knowledge of business and computer science disciplines (Figure 5). These findings appear to indicate that foundational and applied AI skills would be the practical next step for IS graduates pursuing AI education.

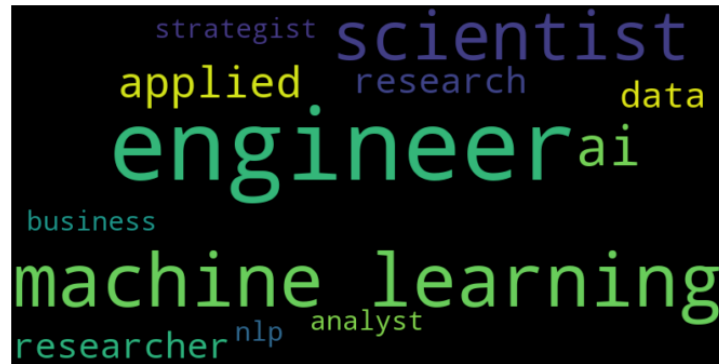


Figure 5. Employment Websites – AI Job Titles Term Frequency

Term Bigrams Analysis

In addition to identifying most frequently used terms in job titles and job descriptions, I also examined frequent two-word terms (or bigrams) for more insights into the nature of AI skill demand. Figure 6 below depicts the frequency of top 15 job-title bigrams. As the bigrams list indicates, machine learning is a skill that is necessary for practically all AI jobs, whether they are in applied fields (such as AI in business and business strategy) or more specialized ones such as AI engineering and research.

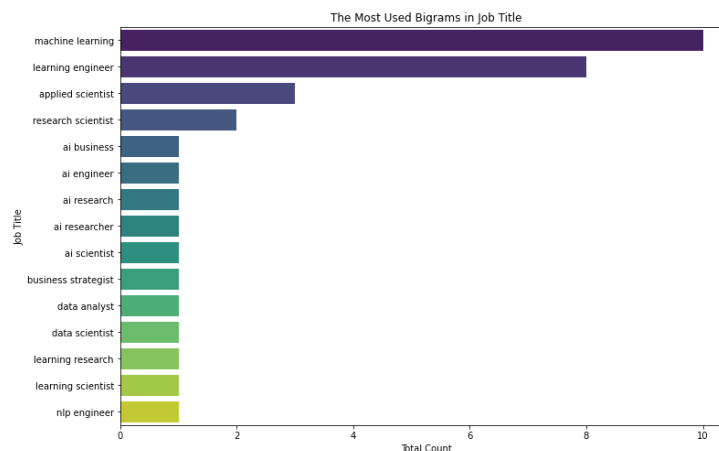


Figure 6. Frequent Bigrams in Job Titles

Analysis of the data from all three categories of data sources and a review of a typical IS curriculum indicate that applied AI skills would be most appropriate for IS graduates to pursue in their upskilling journey; advanced and specialized AI skills are not immediately accessible for them. They would, however, need to start with the foundational skills before proceeding to the applied or advanced AI skills. A learning path for foundational AI skills, generated by the author with help from ChatGPT (<https://chatgpt.com/>) appears in Figure 7.

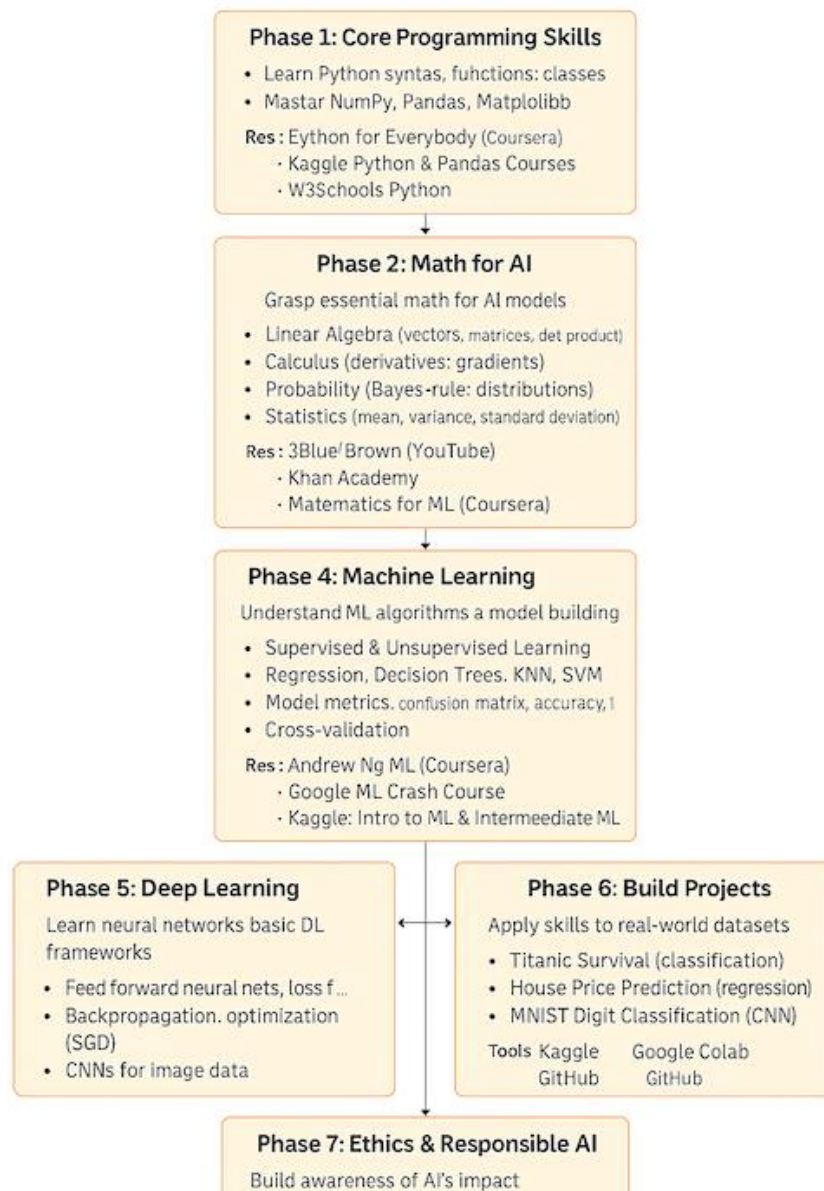


Figure 7. Foundational AI Skills

Source: ChatGPT (2025)

Mapping Foundational AI skills to a Typical IS Curriculum

A typical IS bachelor's degree curriculum in the US business schools that follow the ACM/AIS model provides graduates with necessary preparation and prerequisites for pursuing foundational and applied AI education. Figure 8 below shows the mapping of foundational AI skills to the IS curriculum.

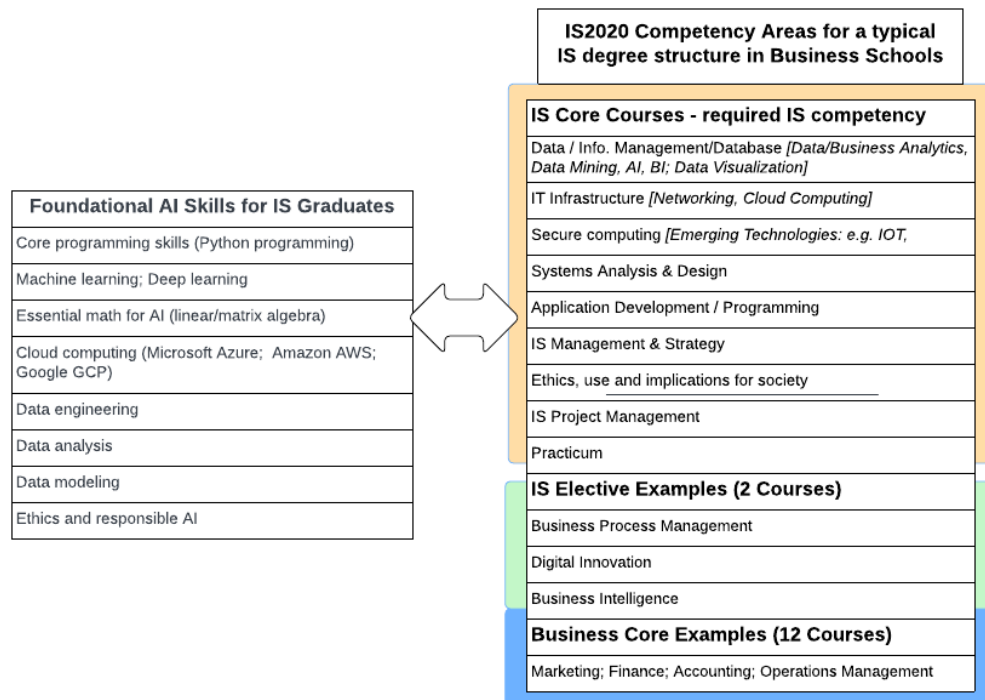


Figure 8. Mapping Foundational AI Skills to IS Curriculum

Besides other required and elective courses, IS majors frequently take at least one course each in a programming language, database management, computer networking, and systems analysis and design. These and other courses students take as part of their bachelor's degree requirements, provide them with necessary knowledge and skills to acquire foundational skills in AI.

Conclusion, Limitations, and Future Research

This study reports the results of a survey of AI skills from three categories of sources including three leading cloud platforms (Microsoft Azure, Amazon AWS, and Google GCP), job announcements posted on employment websites, and recommendations by two generative AI tools (Google Gemini, and Career Dreamer). The text of job titles and job descriptions obtained from all data sources was analyzed using text mining techniques – term frequency and bigram frequency. Results of these analyses were then reviewed by the author to categorize the AI skillsets either as foundational and applied, or advanced and specialized. According to the skill adjacency strategy which is considered a practical approach to upskilling, foundational and applied AI skills are considered a good entry point into AI careers for IS graduates. The typical IS curriculum provides graduates with adequate preparation for such transition.

One apparent limitation of this study is that it captures a snapshot of the state of AI at the current point in time. With the rapidly evolving technical and applied landscape of AI, the skills and skillsets will inevitably change and remain in flux. This requires a continuous and ongoing effort by IS curriculum committees at the national and university levels to accordingly update and upgrade the IS curriculum. Additionally, this

study does not delineate a structured set of paths in terms of courses and detailed course content. Future research may pursue more fine-grained pedagogical guidelines and recommendations.

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