

Chapter 2: Artificial Intelligence

In this chapter, you will discover how artificial intelligence is transforming the way people learn, work, and communicate. You will explore how AI systems are trained, how they generate content, and how they are used in everyday applications. You will also examine the opportunities and challenges of AI, including ethical considerations, bias, and responsible use.

Learning Objectives

- Define artificial intelligence.
- Explain how AI differs from traditional computer programming.
- Describe common types of AI.
- Identify how AI is used in everyday life.
- Discuss the benefits and limitations of AI.
- Recognize ethical concerns surrounding AI.
- Use AI tools responsibly to improve productivity and learning.

Think About It

- What AI technologies have you already used today?
- Which of them did you choose to use, and which worked automatically in the background?
- Do you think AI will make your future career easier, more challenging, or both?

A Day with AI

When your alarm goes off in the morning, your smartphone has already used artificial intelligence to determine the best time to wake you based on your sleep schedule. As you drive to campus, your GPS suggests a faster route because it has analyzed current traffic conditions. During breakfast, a music app recommends songs you might enjoy, while your email automatically filters spam from important messages.

Later in class, you ask an AI chatbot to explain a difficult concept from your textbook. After school, Netflix recommends a new movie based on what you've watched before, and your bank sends an alert after AI detects an unusual purchase on your credit card.

By bedtime, you've interacted with artificial intelligence dozens of times, often without even realizing it.

A Day without AI

Imagine waking up tomorrow and discovering that every AI system in the world has suddenly stopped working.

- Your phone no longer recognizes your face.
- GPS cannot calculate traffic or directions.
- Netflix and Spotify no longer recommend anything.
- Your email fills with spam.
- Voice assistants remain silent.
- Translation apps stop translating.
- Online shopping websites cannot recommend products.
- Customer service chatbots disappear.

How different would your day look?

Artificial intelligence has become woven into every part of our lives. Oftentimes, it is so seamlessly integrated into everyday tasks that we wouldn't notice the presence of AI unless it were suddenly absent.

This chapter explores how AI works, where it is used, and why understanding it has become an essential skill for everyone; not just computer scientists.

What is Artificial Intelligence?

Artificial intelligence (AI) is the ability of a computer system to perform tasks that normally require human intelligence.

These tasks include:

- Understanding language
- Recognizing images
- Learning from experience
- Making predictions
- Solving problems
- Creating new content
- Making recommendations

Unlike traditional computer programs that simply follow fixed instructions, many AI systems learn from large amounts of data and improve over time.

Traditional Programming:

A programmer writes specific instructions:

```
If temperature > 80°,  
  Turn on air conditioner.
```

The computer only does exactly what the programmer tells it.

Artificial Intelligence:

Instead of writing every rule, the programmer allows the computer to learn patterns from data.

An email program using AI learns which messages are spam by analyzing millions of previous emails.

A Brief History of AI

1950:	Alan Turing proposes the Turing Test
1956:	The term "Artificial Intelligence" is coined
1980s:	Expert systems become popular
1997:	IBM Deep Blue defeats world chess champion Garry Kasparov
2011:	IBM Watson wins Jeopardy!
2022:	ChatGPT brings AI into everyday life
Today:	AI is used in nearly every industry

Types of AI

Narrow AI

Narrow AI is Designed for one specific task.

Examples:

- Siri
- Alexa
- Face recognition
- Netflix recommendations

This is the type of AI we use today.

General AI

A theoretical AI capable of performing any intellectual task a human can perform. General AI does not yet exist.

Generative AI

Generative AI creates new content rather than simply analyzing information:

- Writing stories
- Creating artwork
- Generating music
- Writing computer code
- Designing logos
- Creating videos

Examples include: ChatGPT, Gemini, Claude, Microsoft Copilot, Midjourney, and Adobe Firefly.

AI Agents

An **AI agent** is an artificial intelligence system that can perform tasks on behalf of a user by making decisions, taking actions, and adapting to changing information. Unlike a traditional AI chatbot that simply answers questions, an AI agent can carry out a sequence of steps to accomplish a goal. For example, an AI agent might search for information, compare products, schedule appointments, organize files, send reminders, or monitor data for important changes. Many AI agents can interact with other software and online services, allowing them to automate repetitive tasks and improve productivity.

As AI technology continues to advance, AI agents are becoming valuable assistants in education, business, healthcare, customer service, and many other fields. While they can save time and increase efficiency, human oversight remains important to ensure their actions are accurate, ethical, and aligned with the user's goals.

Key Point: An AI chatbot answers questions. An AI agent goes a step further by planning and carrying out actions to help achieve a specific goal.

Real-World Examples:

Education:

An AI agent helps a student create a study schedule, reminds them of assignment deadlines, and suggests practice questions.

Business:

An AI agent analyzes sales data, prepares a weekly report, and alerts managers to unusual trends.

Healthcare:

An AI agent monitors patient data and notifies medical staff when it detects signs that require attention.

Personal Productivity:

An AI agent organizes your calendar, summarizes emails, and reminds you about upcoming meetings.

Modern AI Tools

AI Application	Used in:	Capabilities:
ChatGPT	Education, Business, Marketing, Customer Service	Drafts documents, answers questions, summarizes information, brainstorms ideas, and assists with coding.
Microsoft Copilot	Business, Office Administration, Education	Assists with Word, Excel, PowerPoint, Outlook, and Teams by generating content, analyzing data, and summarizing meetings.
Google Gemini	Education, Research, Business	Generates text, answers questions, summarizes information, and assists with research and productivity tasks.

AI Application	Used in:	Capabilities:
GitHub Copilot	Software Development	Suggests code, completes functions, explains programming concepts, and helps debug software.
Adobe Firefly	Graphic Design, Marketing, Advertising	Generates images, edits photos, creates graphics, and assists with creative projects.
Midjourney	Digital Art, Illustration, Game Design	Creates high-quality AI-generated artwork and concept illustrations from text prompts.
DALL·E	Education, Marketing, Publishing, Design	Produces original images and illustrations from written descriptions.
Grammarly	Writing, Education, Business	Checks grammar, spelling, clarity, tone, and writing style.
Canva Magic Studio	Marketing, Education, Small Business	Creates presentations, social media graphics, videos, and marketing materials with AI assistance.
Duolingo Max	Education, Language Learning	Uses AI to provide personalized language instruction and conversational practice.
IBM Watson Health	Healthcare	Assists with medical research, data analysis, and clinical decision support.
Viz.ai	Medicine	Helps physicians identify signs of stroke and other urgent medical conditions from medical images.
John Deere See & Spray™	Agriculture	Uses computer vision to identify weeds and apply herbicide only where needed.
Tesla Autopilot	Transportation	Assists drivers with steering, braking, lane keeping, and other driving tasks.

AI Application	Used in:	Capabilities:
Salesforce Einstein	Sales, Marketing, Customer Relationship Management	Predicts customer needs, automates workflows, and analyzes sales data.
QuickBooks Intuit Assist	Accounting, Finance, Small Business	Helps categorize expenses, generate financial insights, and automate bookkeeping tasks.
Tableau Pulse	Business Intelligence	Uses AI to identify trends, explain data changes, and create business insights.
Notion AI	Business, Project Management, Education	Summarizes notes, drafts documents, organizes projects, and answers questions about stored information.
Otter.ai	Education, Business, Journalism	Records meetings and lectures, generates transcripts, and summarizes conversations.
Runway	Film, Media Production, Content Creation	Uses AI to edit videos, remove backgrounds, generate visual effects, and create animations.

Table 2.1 – Modern AI Tools

AI in Everyday Life

Many people use AI dozens of times every day without realizing it:

- Google Search
- GPS navigation
- Netflix
- Spotify
- Amazon recommendations
- Face ID
- Credit card fraud detection
- Spam filtering
- Voice assistants

AI in Different Industries

AI in Education

AI is changing how students learn and how teachers teach.

- **Personalized Learning:** Educational software can adjust lessons based on each student's progress.
- **Tutoring:** AI tutors are available 24 hours a day. It can explain math problems, summarize readings, help practice foreign languages, and review for exams.
- **Teaching:** Teachers use AI to create quizzes, generate worksheets, write lesson plans, produce study guides, and translate materials.
- **Accessibility:** AI helps students with disabilities by providing speech-to-text, text-to-speech, real-time captions, and language translation.

AI in Business

Businesses use AI to save time, reduce costs, and improve customer service. Examples include:

- **Customer Service:** Chatbots answer common questions around the clock.
- **Marketing:** AI helps companies analyze customer behavior; recommend products; and personalize advertisements.

AI in Finance

Banks use AI for:

- **Fraud detection**
- **Credit scoring**
- **Investment analysis**

AI in Manufacturing

Factories use AI to:

- **Predict equipment failures**
- **Inspect products**
- **Improve quality control**

AI in Medicine

Healthcare has become one of AI's fastest-growing fields:

- **Medical Imaging:** AI helps doctors identify broken bones, tumors, lung disease, and eye diseases.
- **Drug Discovery:** AI speeds the search for new medicines.
- **Patient Monitoring:** Hospitals monitor patients continuously for early warning signs.
- **Virtual Health Assistants:** Patients can receive reminders about taking medication, appointments, and healthy habits.

AI in Creative Arts and Entertainment

AI is changing creative work.

- **Digital Art:** Artists use AI to create paintings, illustrations, and character designs.
- **Music:** AI can compose songs, generate background music, and suggest melodies.
- **Writing:** Authors use AI to brainstorm ideas, edit drafts, and generate outlines.
- **Movies:** Studios use AI for visual effects, animation, voice enhancement, and video editing.

AI in Sports

Professional and amateur sports increasingly rely on AI.

- **Performance Analysis:** AI studies athletes to improve technique, and detect and prevent injuries, and devise game strategies. Wearable devices monitor athletes to assist in training.
- **Team Analysis:** Teams use AI to analyze opponent tendencies, player statistics, and to help devise winning strategies.
- **Fan Experience:** AI powers instant replays, generates personalized content, and makes fantasy sports recommendations.

AI in Agriculture

Farmers use AI to increase crop production:

- **Monitoring soil moisture**
- **Predicting weather**
- **Detecting plant diseases**
- **Operating autonomous tractors**
- **Controlling precision irrigation**

AI in Transportation

The transportation industry uses AI for:

- Navigation apps
- Traffic prediction
- Self-driving vehicles
- Route optimization
- Fleet management

AI in Retail

AI assists with:

- Self-checkout systems
- Inventory management
- Personalized shopping recommendations
- Dynamic pricing
- Customer support chatbots

AI in Science

Researchers use AI to:

- Analyze huge datasets
- Predict weather
- Model climate change
- Discover new materials
- Explore space

AI in Government

Governments use AI for:

- Emergency response
- Traffic management
- Fraud detection
- Public health monitoring
- Disaster prediction

Think About It

- Many of these AI tools are designed to **assist professionals rather than replace them**. As AI becomes more capable, employers increasingly value workers who know how to use AI effectively while applying human skills such as critical thinking, creativity, communication, and ethical decision-making.
- **Note for students:** New AI applications are introduced every year. The specific tools listed here may change over time, but the ways AI is used across professions (improving productivity, analyzing data, creating content, and supporting decision-making) will continue to expand.

AI Learning

How do we learn things? We may find it easy to tell the difference between a dog and a cat, but we might be hard-pressed to identify the specific features a cat has that a dog doesn't. We learn about things through repeated exposure throughout our lives.

AI learns through a similar process:

- Collect data
- Find patterns
- Learn from examples
- Make predictions
- Improve through feedback

Thousands of pictures of cats and dogs are shown to an AI. Eventually it learns the difference without someone writing every rule.

AI Prompting Tips

Better prompts produce better results. Instead of the prompt:

“Explain AI”

Be more specific:

“Explain artificial intelligence to a first-year college student using simple language and three real-world examples.”

Try to include

- Your audience
- Desired length
- Level of detail
- Format (table, list, paragraph, etc.)
- Purpose

Benefits and Limitations of AI

Benefits of AI

- Saves time
- Increases productivity
- Improves accuracy
- Reduces repetitive work
- Analyzes massive amounts of data
- Personalizes experiences
- Assists with decision-making
- Improves accessibility

Limitations of AI

AI is powerful, but it is not perfect. It can:

- Make mistakes
- Produce incorrect information ("hallucinations")
- Reflect biases in training data
- Lack common sense
- Misunderstand context
- Require human oversight

Ethical Issues

Important concerns:

Privacy

How should personal data be collected and used?

Bias

Can AI treat some groups unfairly?

Copyright

Who owns AI-generated work?

Deepfakes

AI can create realistic fake images, audio, and videos.

Employment

Some jobs may change or disappear, while new AI-related jobs emerge.

Responsible AI Use

Students should remember to:

- Verify important information.
- Cite AI appropriately when required.
- Protect personal information.
- Avoid plagiarism.
- Think critically about AI responses.
- Use AI as a learning assistant, not a replacement for learning.

Discussion Question

What AI application would be most useful in your future career? Explain how it could improve productivity or help solve problems in that profession.