

# Master Of Real Estate Management

Prepared by  
Dr. Al Montaser Abuhussein

REA655  
Artificial Intelligence in Business

## Lecture 1



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Chapter  
01

## The Foundations of AI



## Chapter 01 Learning Objectives

1. Defining AI: meanings, goals, rationality, and the problem of defining intelligence.
2. AI History: the “secret period” and the optimism phase after Dartmouth.
3. From Power to Knowledge and Learning: why brute-force computation failed.
4. Industrialization of AI: expert systems and the rehabilitation of neural networks.
5. Elements of an AI Theory.
6. Fundamental AI Framework.

### Real estate learning focus

Throughout the lecture, each AI concept is linked to property valuation, investment decisions, smart buildings, and market forecasting.



**Chapter  
01****1. Defining AI**

The first challenge in AI is not technical; it is conceptual: what do we mean by intelligence?

## Chapter 01 Why Defining AI is Difficult

Intelligence is an elusive term because it has many meanings in everyday and scientific usage.

Intelligence may refer to learning, reasoning, problem-solving, creativity, adaptation, or quick response to new situations.

A task often seems intelligent only until we know how to automate it; once programmed, people may no longer consider it “real intelligence”.

This creates a moving boundary: AI is often perceived as “what has not yet been done by machines”.

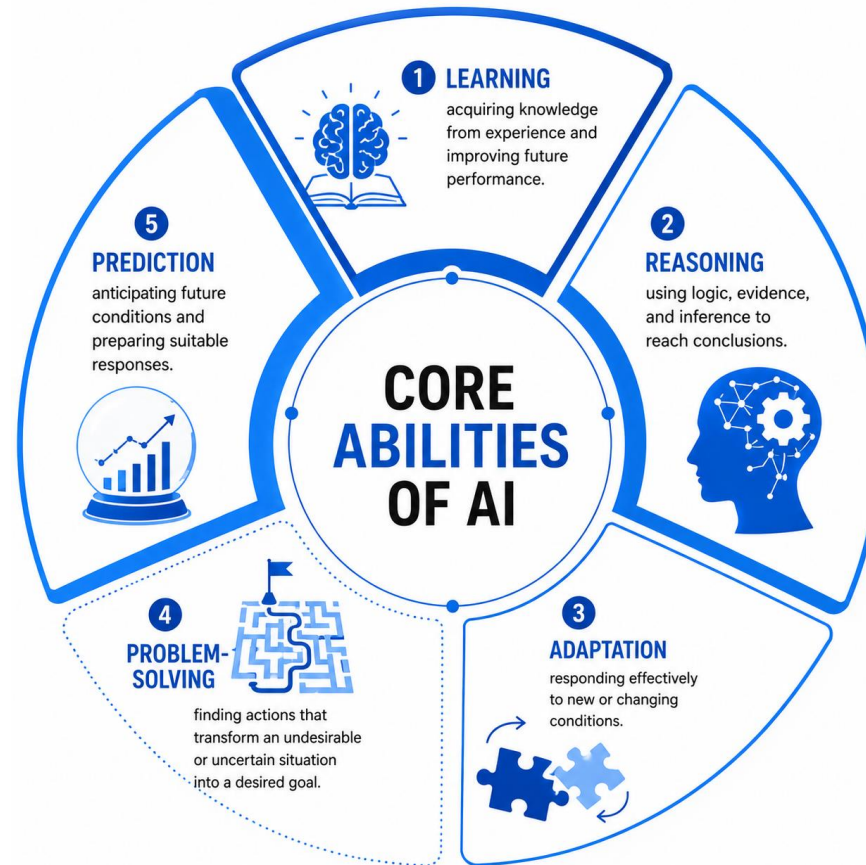
For business students, the practical question is not whether AI thinks like humans, but whether it improves decisions and outcomes.

### Real estate example

A valuation model may not “understand” property like a human appraiser, but if it improves pricing accuracy and speed, it performs an intelligent business function.

Chapter  
01

# Core Meanings of Intelligence



## Study note

When explaining AI to managers, translate “intelligence” into managerial capabilities: learning from data, predicting outcomes, and choosing better actions.

# Chapter 01

## Major Definitions of AI

- 01



AI can be viewed as the task of making computers think: “machines with minds” in a broad sense.


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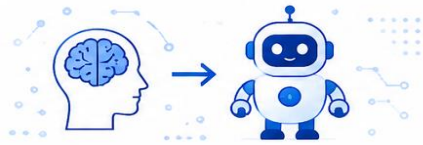


AI can be viewed as automating activities linked to human thought processes, such as decision-making, problem-solving, and learning.


- 03



AI can be viewed as creating machines that perform functions requiring intelligence when performed by humans.


- 04



AI can be viewed as studying mental faculties through computational models.


- 05



AI can also be viewed as the branch of computer science concerned with automating intelligent conduct.



**Chapter  
01****Two Dimensions of AI Definitions**

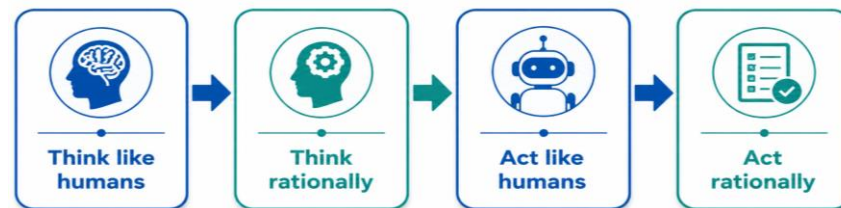
Some definitions focus on mental processes: how a system thinks, reasons, perceives, or learns.

Other definitions focus on conduct: what a system does and whether its behavior appears intelligent.

Some definitions compare AI with human performance; others compare it with rational or ideal performance.

The chapter therefore groups AI into four goals: thinking like humans, thinking rationally, acting like humans, and acting rationally.

This distinction matters because business applications often prioritize rational action over human-like thinking.



**Chapter  
01****The Four Main Goals of AI**

Systems that think like humans attempt to model human cognition and mental processes.

Systems that think rationally rely on logic and correct reasoning.

Systems that act like humans imitate human behavior, language, and interaction.

Systems that act rationally choose actions that are expected to achieve the best outcome.

In business, rational action is often the most useful goal because managers need decisions that improve performance.



**Chapter  
01****Rationality in AI**

A rational AI system is one that does the correct thing based on the information available to it.

Rationality does not require emotions, consciousness, or human-like internal experience.

Rational systems are valuable in business because they help reduce uncertainty and support consistent decisions.

However, rationality depends on data quality, assumptions, objectives, and the environment in which the system operates.

A system may be mathematically rational but still produce problematic outcomes if the goals or data are flawed.

**Real estate example**

An AI may recommend a property because expected ROI is high, but managers must also consider ethics, community impact, regulation, and long-term risk.

**Chapter  
01****Properties of Intelligence**

intelligence lists as a combination of learning, abductive, deductive, and inductive reasoning.

It includes analysis: identifying important elements in a situation and distinguishing them from irrelevant details.

It includes synthesis: connecting different situations and building new concepts from existing ones.

It includes innovation: producing new ideas, anticipating future developments, and detecting unexpected opportunities.

It also includes prioritization and coherent behavior that is appropriate to the situation.

**Real estate application**

A real estate manager uses intelligence when comparing projects across location, legal risks, demand, financing cost, expected return, and social impact.

**Case Application****Study Focus**

**Chapter  
01****The Meaning of “Artificial”**

There are two meanings of artificial: something that merely imitates reality and something fabricated that performs a real function.

Artificial flowers only look like flowers; they do not perform the biological function of flowers.

Artificial light is not sunlight, but it is real light because it illuminates.

We apply the second meaning to AI: artificial intelligence may not be human intelligence, but it performs intelligent functions.

Therefore, AI should be evaluated by what it enables, not only by whether it duplicates human consciousness.

**Teaching analogy**

Artificial property valuation is not a human appraiser, but it can still illuminate the market and support better decisions.

**Case Application****Study Focus**

**Chapter  
01****Managerial Implication of Defining AI**

Managers should avoid vague claims such as “AI will think for us”.

A useful managerial definition should identify the task, the data, the decision, and the expected business value.

AI is best understood as a set of technologies that support intelligent action under uncertainty.

For real estate management, AI is valuable when it improves valuation, forecasting, maintenance, customer targeting, and investment decisions.

A clear definition helps organizations choose appropriate AI tools instead of adopting technology for its own sake.

**Mini case**

A real estate firm should not “buy AI”. It should define the problem: reduce vacancy, predict demand, automate tenant support, or improve investment selection.

**Case Application****Study Focus**

**Chapter  
01****2. Artificial Intelligence: History**

AI did not appear suddenly; it developed through myths, mathematics, cryptography, computation, and scientific ambition.

**Chapter  
01****Why the History of AI Matters**

The history of AI shows that intelligent machines were imagined long before modern computers existed.

Historical development helps explain why AI includes logic, computation, learning, and knowledge representation.

AI history also shows repeated cycles of optimism, disappointment, and renewal.

Managers can learn from these cycles: promising technologies need realistic expectations, suitable data, and operational readiness.

For real estate, the lesson is to adopt AI strategically rather than assume that every AI tool will automatically create value.

**Chapter  
01****Early Dreams of Intelligent Artifacts**

The book begins by noting humanity's long-standing desire to build artifacts that emulate intelligent beings.

Ancient myths, automatons, and artificial helpers expressed a desire to surpass human limitations.

These early ideas were not scientific AI, but they reveal a persistent human aspiration to externalize intelligence.

Modern AI transforms this aspiration into computational systems capable of reasoning, learning, and prediction.

In business terms, AI is part of the broader human effort to extend organizational capabilities through tools.

**Chapter  
01****The Secret Period (1932-1955)**

This period laid AI foundations before the term “Artificial Intelligence” was officially introduced.

**Chapter  
01****The Secret Period: Overview**

The period from 1932 to 1955 is often referred to as the “secret period” because many important developments related to Artificial Intelligence occurred before AI became an officially recognized academic field.

This period involved cryptography, mathematical logic, computation, heuristic search, and early ideas about machine intelligence.

World War II accelerated computational thinking because codebreaking required advanced mathematical and heuristic methods.

The work of Polish cryptanalysts and Alan Turing demonstrated how complex problems could be solved using structured search and intelligent simplification.

These ideas later became central to AI problem-solving.

**Study focus**

Do not present this period as “old history”; present it as the origin of AI techniques for handling complexity.

**Case Application****Study Focus**

**Chapter  
01****Enigma and Heuristic Problem-Solving**

The Enigma codebreaking problem involved an enormous number of possible configurations.

Polish cryptanalysts reduced complexity by identifying patterns and ignoring elements that were not essential for the first stage of the search.

This was an early example of heuristic reasoning: using a practical shortcut to reduce the search space.

The “bomba” machine helped automate parts of this process.

The lesson for AI is that intelligent systems often succeed by reducing complexity, not by testing every possible solution.

**Chapter  
01****Combinatorial Explosion**

Combinatorial explosion occurs when the number of possible solutions grows so rapidly that exhaustive search becomes impossible.

Early AI researchers learned that brute-force computation works only in small or simplified environments.

Complex real-world problems require heuristics, knowledge, probability, and learning.

This concept explains why AI is not merely about faster computers.

It also explains why domain knowledge remains crucial in business AI applications.

**Chapter  
01****Alan Turing: Foundational Contributions**

Alan Turing developed the concept of the Turing Machine, a theoretical model of computation.

He showed how algorithmic processes could be represented and executed by machines.

Turing also recognized that computation could go beyond numerical calculation to symbolic and intelligent behavior.

He explored machine learning, chess-playing machines, and the possibility of intelligent behavior in computers.

The chapter presents Turing as a central figure whose machines, programs, and test shaped AI foundations.

**Managerial lesson**

Modern AI systems are built on the idea that decision procedures can be formalized and implemented in machines.

**Case Application****Study Focus**

**Chapter  
01****Turing's Machine Intelligence**

Turing was interested not only in machines that calculate, but in machines that could learn and adapt.

He considered search through possible solutions guided by heuristic rules.

He also discussed machine learning and chess, long before modern AI systems mastered board games.

This shows that AI foundations included both computation and learning from the beginning.

Turing's work helped shift the question from "Can machines calculate?" to "Can machines behave intelligently?"

**Chapter  
01****The Turing Test**

Turing reframed the question “Can machines think?” into a behavioral test: can a machine imitate human conversation convincingly?

If a human interrogator cannot distinguish the machine from a human participant, the machine is said to pass the test.

The test focuses on observable behavior rather than internal consciousness.

The chapter emphasizes that failing the test does not prove a machine lacks intelligence; it simply does not establish human-like conversational behavior.

The test remains important for understanding chatbots, virtual assistants, and generative AI.

**Chapter  
01****Cybernetics: Feedback and Control**

Cybernetics introduced the study of communication, control, and feedback in machines and living systems.

Feedback is central to intelligent behavior because systems must compare outcomes with goals and adjust actions.

Cybernetics also introduced teleological or goal-oriented computation.

Information was treated as an abstract form that could be separated from the physical signal carrying it.

These ideas influenced AI, robotics, automation, and systems theory.

**Chapter  
01****McCulloch and Pitts: Neural Foundations**

McCulloch and Pitts modeled neurons using symbolic logic and mathematical structures.

Their formal neurons were simplified representations of biological neural networks.

They showed that processes describable by logical expressions could be represented in networks.

This work became a foundation for artificial neural networks and later deep learning.

Although simplified, the model helped connect brain-inspired thinking with computation.

**Modern link**

Image recognition for property photos, defect detection, and aerial urban analysis are descendants of neural-network thinking.

**Case Application****Study Focus**

**Chapter  
01****Craick's Internal Model Theory**

Craick argued that intelligent organisms contain internal models of external reality.

These models allow them to test alternatives mentally before acting in the real world.

The model supports prediction, assessment of future situations, and learning from past experience.

This idea is close to modern predictive modeling in AI.

For managers, it explains why data-driven models are valuable: they allow organizations to simulate decisions before committing resources.

**Real estate example**

Before buying land, an AI model simulates future demand, price growth, construction cost, financing conditions, and possible risk scenarios.

**Case Application****Study Focus**

**Chapter  
01****Dartmouth Proposal: Birth of AI**

The term “Artificial Intelligence” appeared in the 1955 Dartmouth Summer Research Project proposal.

The proposal assumed that every aspect of learning and intelligence could be described precisely enough for a machine to simulate it.

The proposed topics included language use, abstraction, problem-solving, self-improvement, neural nets, and creativity.

This moment marks the formal beginning of AI as an independent field.

The proposal also reflected strong optimism about rapid progress in AI.

**Teaching point**

Dartmouth matters because it transformed scattered work in computation, logic, and learning into a named scientific field: Artificial Intelligence.

**Case Application****Study Focus**

**Chapter  
01****Torrents of Optimism and Hope (1956-1968)**

Early AI success created high expectations, but real-world intelligence proved more difficult than expected.

**Chapter  
01****The Optimism Phase: Overview**

From 1956 to 1968, AI researchers achieved impressive but limited successes.

Computers were beginning to perform tasks previously thought to require human intelligence.

This created strong optimism that machines would soon solve many complex human problems.

Important developments included AI programming languages, theorem proving, game playing, and early neural networks.

However, most successes occurred in simplified environments rather than messy real-world contexts.

**Chapter  
01****Logic Theorist and Theorem Proving**

Newell, Shaw, and Simon developed the Logic Theorist, an early AI program for proving mathematical theorems.

The program used heuristic search techniques rather than simple brute force.

Its success showed that computers could manipulate symbols and perform non-numerical reasoning.

This challenged the belief that computers were only arithmetic machines.

It also strengthened the symbolic approach to AI.

**Chapter  
01****General Problem Solver (GPS)**

Newell and Simon's General Problem Solver attempted to imitate human problem-solving protocols.

GPS used means-end analysis: compare the current state with the goal, identify differences, and select actions to reduce those differences.

This approach was flexible but still limited when problems became complex or poorly structured.

GPS demonstrated the ambition to create general reasoning systems.

It also showed that generality is difficult without rich knowledge about the world.

**Real estate example**

Goal: improve occupancy. Current state: high vacancy. Means-end actions: adjust rent, improve amenities, target new segments, or redesign marketing.

**Case Application****Study Focus**

**Chapter  
01****Early Neural Networks: ADALINE and Perceptron**

Widrow and Hoff developed ADALINE, an early adaptive linear neural network.

Rosenblatt presented the Perceptron and proved that it could learn certain feasible correspondences.

These systems created optimism about machine learning and brain-inspired computing.

However, simple perceptrons had limited representational power.

The later discovery of these limitations contributed to reduced funding and interest in neural networks.

**Modern link**

Today's deep learning systems are far more powerful, but the roots of learning from data go back to these early models.

**Case Application****Study Focus**

**Chapter  
01****Why Early Optimism Was Limited**

Researchers underestimated how difficult real-world intelligence is.

Early systems often worked only in small “micro-worlds” with few objects and simplified rules.

They lacked common sense, context, and broad knowledge.

Hardware limitations also constrained memory and processing power.

This explains why AI progress moved from early optimism toward more cautious, knowledge-centered approaches.

**Chapter  
01****3. The Passage from Power to  
Knowledge and Learning (1969–1990)**

The field learned that raw computational power was not enough; intelligent systems needed knowledge and learning.

**Chapter  
01****From Power Strategy to Knowledge Strategy**

Early AI relied on the “power strategy”: using computation and search to explore possible solutions.

This worked for simple domains but failed in complex domains with too many possibilities.

Researchers realized that expert knowledge could guide search and reduce complexity.

The field moved toward knowledge-based systems that used rules, facts, and domain expertise.

This transition shaped practical AI applications in organizations.

**Business implication**

Managers should ask not only “Do we have computing power?” but “Do we have the right knowledge, data, and expertise encoded in the system?”

**Case Application****Study Focus**

**Chapter  
01****ELIZA and the Illusion of Understanding**

ELIZA was a program that simulated conversation using simple language patterns.

Some users felt that ELIZA understood them, but the system had no real general knowledge or common sense.

ELIZA exposed a key AI challenge: appearing intelligent is not the same as understanding.

The case remains relevant today because modern chatbots can produce convincing responses.

Students should distinguish between linguistic fluency, factual accuracy, reasoning, and true understanding.

**Real estate chatbot case**

A chatbot may answer “Which apartment is suitable for me?” fluently, but if it lacks accurate inventory, budget, legal, and preference data, its answer may be misleading.

**Case Application****Study Focus**

**Chapter  
01****The Lighthill Report and AI Disappointment**

AI faced criticism because many promised results did not materialize within expected timelines.

The Lighthill Report criticized AI's inability to handle combinatorial explosion and real-world complexity.

Government support for AI research was reduced in some contexts.

This period contributed to what later became known as an AI winter.

The lesson is that AI must be evaluated by realistic performance, not only by optimistic promises.

**Management lesson**

AI projects can lose executive support when they promise transformation but fail to deliver measurable operational value.

**Case Application****Study Focus**

**Chapter  
01****Industrialisation of AI**

Expert systems moved AI from research laboratories into practical business and industrial applications.

**Chapter  
01****Industrialisation of AI: Overview**

Between 1969 and 1990, AI became increasingly practical through expert systems and renewed neural-network research.

Expert systems represented the knowledge strategy: use expert knowledge to solve specialized problems.

These systems performed well when knowledge could be captured in rules and applied systematically.

They demonstrated that AI could create measurable organizational value.

This period connected AI directly to business, industry, and professional decision-making.

**Business lesson**

AI creates value when applied to high-value decisions where knowledge is structured, repeatable, and costly if performed poorly.

**Case Application****Study Focus**

**Chapter  
01****Expert Systems: Core Idea**

Expert systems imitate decision-making in specialized domains by using expert knowledge.

They typically rely on a knowledge base, rules, and an inference mechanism.

Unlike weak methods, they use domain-specific knowledge to guide reasoning.

Expert systems are especially useful when expert decisions are repetitive but require specialized knowledge.

They also make organizational knowledge more explicit and transferable.

**Real estate example**

A rule-based investment advisor can encode expert rules about ROI, vacancy risk, location quality, zoning, and financing constraints.

**Case Application****Study Focus**

**Chapter  
01****4. The Elements of an AI Theory**

AI can be understood scientifically by examining the fundamental elements that support intelligent systems, including knowledge, reasoning, learning, problem-solving, perception, and decision-making.

**Chapter  
01****AI as a Science**

Artificial Intelligence is viewed as a science focused on creating intelligent systems outside their natural environment “the human brain”.

This raises questions about the platform, possibility, and structure of artificial intelligence.

A theory of AI must explain how information, systems, and behavior relate to intelligent action.

The authors emphasize information as a foundational element, alongside matter and energy.

This theoretical discussion helps students see AI as more than software; it is a framework for organizing intelligent behavior.

**Managerial perspective**

A real estate AI platform is not only a software tool; it is a system for transforming data into information, information into knowledge, and knowledge into action.

**Case Application****Study Focus**

**Chapter  
01****Information as a Foundational Element**

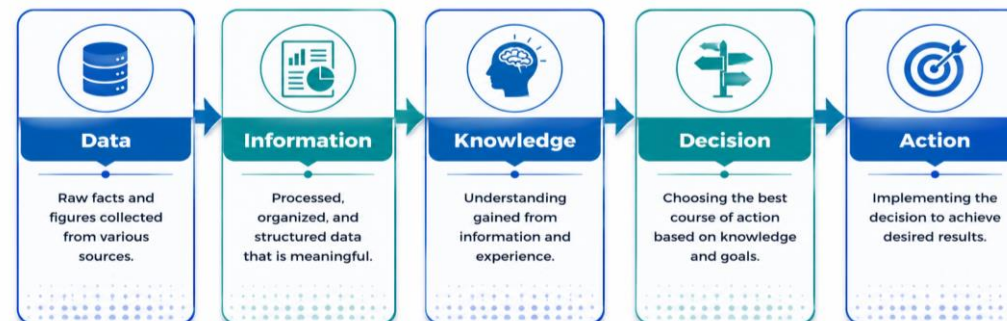
The authors propose that information is one of the basic building blocks of the universe, alongside matter and energy.

AI depends on the acquisition, transformation, storage, and use of information.

Information becomes valuable when it supports action, prediction, or decision-making.

Business AI systems convert raw data into strategic knowledge.

In real estate, information quality determines the value of AI outputs.



**Chapter  
01****5. Fundamental Framework for AI**

Artificial Intelligence is commonly developed through three major approaches:  
symbolic AI, neural-network AI, and Bayesian AI.

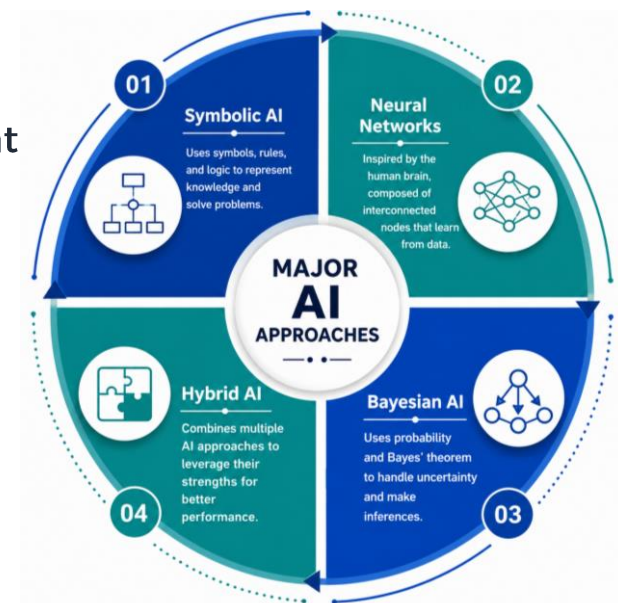
## Chapter 01

### Three Main AI Approaches

Three important approaches in Artificial Intelligence are Symbolic AI, Neural Networks, and Bayesian AI.

- Symbolic AI is based on formal logic and deductive inference.
- Neural Networks are inspired by the brain and use inductive learning from data.
- Bayesian AI uses plausible or abductive inference under uncertainty.

The best approach depends on the problem being solved.



**Chapter  
01****Symbolic AI**

Symbolic AI is closest to traditional computer science and formal logic.

It represents knowledge explicitly through symbols, rules, and relationships.

Expert systems are a major example of symbolic AI.

Symbolic AI is easier to explain because the reasoning steps can often be traced.

It is useful where rules are clear, such as compliance, contracts, diagnosis, and structured decisions.

**Chapter  
01****Bayesian Approach**

The Bayesian approach uses probability to reason under uncertainty.

It asks: given the evidence, how likely is a hypothesis to be true?

This approach is valuable when decisions must be made with incomplete or uncertain information.

Bayesian reasoning supports risk analysis, forecasting, and updating beliefs as new evidence arrives.

Business decisions often require this kind of probabilistic thinking.

**Chapter  
01****Applying the Framework to Real Estate Management**

Real estate decisions involve uncertainty, regulations, financial constraints, and human preferences.

Symbolic AI supports rule-based decisions such as compliance and eligibility checking.

Neural networks support forecasting, valuation, image analysis, and demand prediction.

Bayesian AI supports risk assessment and decision-making under uncertainty.

A strategic real estate AI system should combine these approaches according to the decision problem.

**Integrated case**

For a new mixed-use development, AI can predict demand, check regulations, estimate risk, recommend pricing, and support investor communication.

**Case Application****Study Focus**

**Chapter  
01****Key Takeaways from Chapter 1**

AI is difficult to define because intelligence is complex and multidimensional.

AI history developed through computation, cryptography, symbolic reasoning, neural networks, expert systems, and learning.

The field moved from brute-force power toward knowledge and learning because real-world problems are complex.

Expert systems industrialized AI by turning expert knowledge into practical decision systems.

The fundamental AI framework includes symbolic AI, neural networks, Bayesian reasoning, and hybrid approaches.

**Final real estate message**

AI is not a single tool; it is a strategic decision infrastructure for valuation, forecasting, smart buildings, investment, and organizational learning.

**Case Application****Study Focus**

**Chapter  
01****Discussion Questions**

- ☐ Is AI truly intelligent, or does it only imitate intelligent behavior?
- ☐ Which approach is more useful in real estate: symbolic rules, neural networks, Bayesian reasoning, or hybrid AI?
- ☐ Why did early AI optimism fail, and what lessons does this provide for today's AI adoption?
- ☐ How can AI improve real estate investment decisions without replacing human judgment?
- ☐ What practical implementation details might cause a strong AI model to fail in a real organization?



**Thank You**