

# 1. AI Components

Artificial Intelligence (AI) systems replicate human cognitive processes by combining several fundamental elements. These components empower machines to learn from data, make intelligent decisions, interpret their environment, and interact effectively.

## a. Learning

- **Meaning:** Learning refers to the AI's capability to enhance its performance over time through data exposure or practice.
- **Categories:**
  - **Supervised Learning:** The AI is trained using input data paired with known results (e.g., detecting whether a message is spam or not).
  - **Unsupervised Learning:** The AI explores datasets to uncover hidden patterns or relationships without labeled outcomes.
  - **Reinforcement Learning:** The AI interacts with its environment, learning through feedback in the form of rewards or penalties.
- **Example:** A fitness tracking app that suggests workouts based on your performance history and preferences.

## b. Reasoning

- **Meaning:** Reasoning is the AI's ability to process information logically, draw conclusions, and make decisions based on rules or data.
- **Types:**
  - **Deductive Reasoning:** Starts with a general rule and applies it to reach a specific conclusion.
  - **Inductive Reasoning:** Observes specific cases to form broader generalizations.
- **Example:** An AI-based legal adviser evaluates contract terms and deduces potential legal risks.

## c. Perception

- **Meaning:** Perception is the AI's ability to understand input from the environment using sensors or digital data sources.
- **Forms of Sensory Input:**
  - **Visual:** Image or video data from cameras.
  - **Audio:** Sounds like speech or environmental noise.
  - **Sensor Data:** Data from temperature sensors, motion detectors, GPS, etc.
- **Example:** A farming robot that detects crop health through drone images and adjusts pesticide spraying accordingly.

## d. Natural Language Processing (NLP)

- **Meaning:** NLP enables machines to interpret, generate, and respond using human language in written or spoken form.
- **Core Functions:**
  - Organizing and tagging documents

- Analyzing tone and mood in texts
  - Translating content between different languages
  - Responding to user queries
- **Example:** A hotel chatbot that answers customer questions and makes reservations through natural conversation.

## 2. Categorization of Intelligent Systems

AI systems are classified based on how closely they simulate human intelligence and consciousness.

### a. Reactive Machines

- **Characteristics:**
  - React only to current inputs
  - Lack memory of past interactions
- **Drawback:** Cannot adapt or learn from experience.
- **Example:** A calculator app that performs operations based on current numbers but doesn't store past results.

### b. Limited Memory

- **Characteristics:**
  - Can store and use short-term data
  - Adjusts behavior based on recent activity
- **Use Case:** AI in automated parking systems adjusting based on nearby vehicle positions.
- **Example:** Ride-sharing apps like Uber use recent trip data to recommend pickup points.

### c. Theory of Mind

- **Characteristics:**
  - Aims to understand thoughts, emotions, and social behavior
- **Applications:** AI therapists or educational bots that adapt tone based on user reactions.
- **Current Status:** Still experimental and under active research.

### d. Self-aware Systems

- **Characteristics:**
  - Can understand their own thoughts, intentions, and behavior
  - Would possess a level of consciousness like humans
- **Current Status:** Entirely theoretical with no real implementations yet.
- **Challenges:** Raises ethical and legal concerns about robot identity, control, and autonomy.

## 3. Real-World Applications of AI

AI is transforming how we live and work by automating tasks, analyzing data, and enhancing decision-making in various sectors.

### **a. Healthcare**

- **Use Cases:**
  - AI analysis of retinal scans to detect early signs of diabetes
  - Predicting patient readmission risks using hospital data
  - AI chatbots for mental health screening and support
- **Advantages:** Faster diagnosis, continuous care, and better resource use.

### **b. Finance**

- **Use Cases:**
  - Monitoring user behavior for suspicious banking activity
  - AI underwriting for instant insurance policy approval
  - Portfolio management using predictive analytics
- **Advantages:** Increases trust, reduces fraud, and enables quicker services.

### **c. E-commerce and Retail**

- **Use Cases:**
  - AI recommending clothing sizes based on past returns (e.g., Zivame)
  - Automated assistants helping shoppers find products
  - Real-time inventory updates across warehouses
- **Advantages:** Reduces cart abandonment, increases sales, and improves customer support.

### **d. Transportation**

- **Use Cases:**
  - AI guiding drones for delivery in remote areas
  - Traffic light systems adjusting in real time based on road congestion
- **Advantages:** Reduces traffic delays, enhances delivery speed, and improves commuter safety.

### **e. Smart Assistants**

- **Use Cases:**
  - AI apps that set reminders, send messages, and adjust smart lights
  - Virtual agents integrated with smart TVs and appliances
- **Advantages:** Provides hands-free help, saves time, and personalizes the environment.

## **4. Real-World Case Studies**

### **1. AI in Agriculture (TartanSense)**

- **Problem:** Farmers struggle with identifying weeds and applying pesticides accurately, leading to waste and crop damage.
- **AI-Based Solution:** TartanSense uses AI-powered robots that identify weeds using computer vision and apply pesticides only where needed.
- **Outcome:** Reduced pesticide usage, increased crop yield, and more eco-friendly farming.

## 2. Demand Planning in Retail (BigBasket)

- **Problem:** Inventory mismanagement due to inconsistent customer demand in different regions.
- **AI-Based Solution:** BigBasket leverages AI to forecast demand patterns, optimize storage, and plan delivery routes.
- **Outcome:** Fewer out-of-stock situations, improved delivery times, and enhanced customer satisfaction.

## 5. Summary

Category	Description	New Example
Learning	Gains knowledge from data	Email spam classifier
Reasoning	Draws logical conclusions from rules	Medical diagnosis expert system
Perception	Interprets data from environment	Surveillance camera AI
NLP	Understands human language	AI customer support chatbot
Reactive Machines	Responds without memory	Basic AI in video games
Limited Memory	Uses recent data	Adaptive traffic signal system
Theory of Mind	Understands emotions	Emotion-aware tutoring robots
Self-aware	Has consciousness (hypothetical)	Hypothetical AI with self-reflection
Applications	Industry-specific use cases	Banking, Healthcare, Retail, etc.

## Code:

```
# AI Demonstration Program

def spam_detector(email_text):
```

```
spam_keywords = ["win", "free", "cash", "click", "offer", "urgent"]

return "SPAM" if any(word in email_text.lower() for word in spam_keywords) else "NOT SPAM"

def career_guidance(field):
    suggestions = {
        "computer science": "Consider roles in software development, AI, or cybersecurity.",
        "biology": "Explore careers in biotechnology, lab research, or medicine.",
        "business": "You could look into marketing, management, or entrepreneurship.",
        "design": "Think about UX/UI design, graphic design, or animation.",
    }

    return suggestions.get(field.lower(), "Field not found. Please consult a counselor for more info.")

def shopping_assistant(query):
    responses = {
        "laptop": "We have offers on HP and Dell laptops. Looking for gaming or work-related use?",
        "shoes": "Sports, casual, or formal? I can help you find trending styles.",
        "sale": "Seasonal discounts are live! Want me to show top deals?",
    }

    for word, reply in responses.items():
        if word in query.lower():
            return reply

    return "Sorry, I didn't get that. Can you rephrase or ask about another product?"

def intelligent_system_types():
    types = {
        "Reactive Machines": "Respond only to present inputs. No memory. (e.g., simple calculators)",
        "Limited Memory": "Remember short-term events. (e.g., self-driving cars)",
        "Theory of Mind": "Future AI that can understand feelings and thoughts.",
        "Self-aware": "Theoretical systems aware of their own existence.",
    }

    return types

def main():
    print("\n=== AI Demonstration Console ===")

    while True:
```

```
print("\nChoose an AI feature to try:")
print("1. Spam Detector (Learning)")
print("2. Career Guidance (Reasoning)")
print("3. Shopping Assistant (NLP & Perception)")
print("4. AI System Categories")
print("5. AI in Real Life")
print("6. Exit")
choice = input("Your choice (1-6): ")
match choice:
    case "1":
        email = input("Enter an email message: ")
        result = spam_detector(email)
        print(f"Detection: {result}")
    case "2":
        subject = input("Enter a study field (e.g., biology, design): ")
        suggestion = career_guidance(subject)
        print(f"Career Advice: {suggestion}")
    case "3":
        user_query = input("You: ")
        reply = shopping_assistant(user_query)
        print(f"Assistant: {reply}")
    case "4":
        types = intelligent_system_types()
        for category, explanation in types.items():
            print(f"{category}: {explanation}")
    case "5":
        print("\n--- Real-World AI Applications ---")
        print("- AI-powered job resume screening tools")
        print("- Virtual tutors in e-learning platforms")
        print("- Smart refrigerators that auto-restock items")
        print("- Face recognition at airports")
```

```
        print("- ChatGPT for customer support and content creation")
    case "6":
        print("Goodbye! Thanks for exploring AI examples.")
        break
    case _:
        print("Invalid input. Please select a number from 1 to 6.")
if __name__ == "__main__":
    main()
print("\nShah Khushi\n240905041029")
```

## Output:

=== AI Demonstration Console ===

Choose an AI feature to try:

1. Spam Detector (Learning)
2. Career Guidance (Reasoning)
3. Shopping Assistant (NLP & Perception)
4. AI System Categories
5. AI in Real Life
6. Exit

Your choice (1-6): 1

Enter an email message: Hurry! Click here to win a free iPhone.

Detection: SPAM

Choose an AI feature to try:

1. Spam Detector (Learning)
2. Career Guidance (Reasoning)
3. Shopping Assistant (NLP & Perception)
4. AI System Categories
5. AI in Real Life
6. Exit

Your choice (1-6): 2

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Enter a study field (e.g., biology, design): Computer Science

Career Advice: Consider roles in software development, AI, or cybersecurity.

Choose an AI feature to try:

1. Spam Detector (Learning)
2. Career Guidance (Reasoning)
3. Shopping Assistant (NLP & Perception)
4. AI System Categories
5. AI in Real Life
6. Exit

Your choice (1-6): 3

You: I want to buy shoes

Assistant: Sports, casual, or formal? I can help you find trending styles.

Choose an AI feature to try:

1. Spam Detector (Learning)
2. Career Guidance (Reasoning)
3. Shopping Assistant (NLP & Perception)
4. AI System Categories
5. AI in Real Life
6. Exit

Your choice (1-6): 4

Reactive Machines: Respond only to present inputs. No memory. (e.g., simple calculators)

Limited Memory: Remember short-term events. (e.g., self-driving cars)

Theory of Mind: Future AI that can understand feelings and thoughts.

Self-aware: Theoretical systems aware of their own existence.

Choose an AI feature to try:

1. Spam Detector (Learning)
2. Career Guidance (Reasoning)
3. Shopping Assistant (NLP & Perception)



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4. AI System Categories

5. AI in Real Life

6. Exit

Your choice (1-6): 5

--- Real-World AI Applications ---

- AI-powered job resume screening tools
- Virtual tutors in e-learning platforms
- Smart refrigerators that auto-restock items
- Face recognition at airports
- ChatGPT for customer support and content creation

Choose an AI feature to try:

1. Spam Detector (Learning)

2. Career Guidance (Reasoning)

3. Shopping Assistant (NLP & Perception)

4. AI System Categories

5. AI in Real Life

6. Exit

Your choice (1-6): 6

Goodbye! Thanks for exploring AI examples.

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## **Real World Application:**

- Drug Discovery
- Credit Scoring
- Algorithmic Trading
- Inventory Management
- Dynamic Pricing
- Remote Patient Monitoring
- Language Learning Apps
- AI Tutoring Systems
- Pest Detection
- Yield Prediction