**NASARAWA STATE UNIVERSITY, KEFFI**

**FACULTY OF NATURAL AND APPLIED SCIENCES**

**DEPARTMENT OF COMPUTER SCIENCE**

**NAME:**

**MATRIC NUMBER:**

**CMP 421 (ARTIFICIAL INTELLIGENCE)**

**COURSE LECTURER: DR. AHMED MUSTAFA**

**ASSIGNMENT QUESTIONS**

1. Type of Agents (How do they work, What are they use for, and examples)
2. Challenges and limitations surrounding AI (Issues of AI system).
3. Discuss on the Ethical Consideration relating to the Issue of Job Loss and Data Bridges in AI systems.
4. Discuss on the Factors to Consider with regards to Technical Limitations of AI.
5. Discuss on how smoke detectors work or function in relation to the sensory organ of Man vs Machine.

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# 1. TYPES OF AGENTS

In artificial intelligence, an **agent** is any system that perceives its environment through sensors and acts upon it through actuators. Agents can be classified based on their capabilities and the level of complexity involved in their decision-making processes.

**Types of Agents:**

- **Simple Reflex Agents:**
    - **How they work:** These agents select actions based on the current percept, ignoring the rest of the percept history. They function using condition-action rules (if-then statements).
    - **Use case:** Ideal for systems where the environment is fully observable and straightforward.
    - **Example:** Thermostat systems that react solely based on temperature readings.
- **Model-Based Reflex Agents:**
    - **How they work:** They maintain an internal model of the environment and make decisions based on the current percept and the history of percepts.
    - **Use case:** Suitable for environments where conditions may change over time or be partially observable.
    - **Example:** Autonomous robots that track the position of objects over time.
- **Goal-Based Agents:**
    - **How they work:** These agents are driven by a goal and make decisions that move them closer to achieving that goal.
    - **Use case:** Used in systems where outcomes matter more than immediate actions.
    - **Example:** GPS systems that calculate the optimal route to a destination.
- **Utility-Based Agents:**
    - **How they work:** In addition to having a goal, these agents also have a utility function that evaluates the desirability of various states. They choose actions that maximize the overall utility.
    - **Use case:** Useful in complex systems where trade-offs between multiple options must be made.
    - **Example:** AI for stock market prediction, optimizing returns while minimizing risks.

## 2. CHALLENGES AND LIMITATIONS SURROUNDING AI (ISSUES OF AI SYSTEMS)

AI has made significant strides in recent years, but several challenges and limitations hinder its full potential:

- **Data Dependency:** AI models, especially machine learning systems, rely heavily on large volumes of high-quality data. Lack of sufficient data, poor data quality, or biased datasets can lead to inaccurate predictions and unreliable models.
- **Interpretability:** Many AI models, particularly deep learning algorithms, function as "black boxes," meaning their decision-making processes are difficult to understand. This lack of transparency can raise concerns when deploying AI in sensitive domains like healthcare or criminal justice.
- **Generalization:** AI systems are often trained for specific tasks, meaning they struggle to perform well when exposed to unfamiliar conditions or environments outside their training data.
- **Ethical Concerns:** AI systems can exacerbate biases if the training data used reflects societal inequities. Furthermore, issues like surveillance, privacy, and job displacement are significant ethical challenges associated with AI.
- **Computational Limitations:** The need for immense computational power to train and run AI models can make AI inaccessible for many small enterprises or institutions with limited resources.

## 3. ETHICAL CONSIDERATIONS: JOB LOSS AND DATA BREACHES IN AI SYSTEMS

**JOB LOSS:**

The automation of tasks through AI systems has led to concerns about job displacement, particularly in industries like manufacturing, customer service, and logistics. While AI can increase efficiency and reduce costs, it also threatens traditional roles. This raises ethical questions about:

- **Economic inequality:** As more jobs become automated, workers in low-skilled positions may be disproportionately affected, exacerbating socioeconomic disparities.
- **Retraining and reskilling:** Ethical AI development should consider the human impact and prioritize retraining programs for displaced workers.

**DATA BREACHES:**

AI systems often require vast amounts of personal data, making them attractive targets for cyberattacks. Data breaches in AI can have serious consequences, including:

- **Loss of privacy:** Personal information can be stolen or misused.
- **Accountability:** Determining who is responsible when an AI system is compromised remains a challenge. Ethical AI systems must prioritize strong cybersecurity measures to prevent data breaches.
- **Informed consent:** Users should be made aware of how their data will be used, and systems should be transparent in their data collection practices.

## 4. FACTORS TO CONSIDER REGARDING TECHNICAL LIMITATIONS OF AI

While AI is powerful, it has several technical limitations that must be considered when deploying systems in real-world applications:

- **Scalability:** Many AI systems require large computational resources, making them difficult to scale efficiently. This can be a problem for businesses with limited IT infrastructure.
- **Data Quality and Availability:** AI models can only perform as well as the data they are trained on. Poor data quality, including incomplete or biased data, can lead to flawed decision-making.
- **Real-time Processing:** Some applications require real-time decision-making, such as in autonomous vehicles or medical diagnostics. AI systems may struggle to process data quickly enough in these scenarios due to technical constraints.
- **Adaptability:** AI models are typically trained for specific tasks and environments. When exposed to new or unfamiliar data, these systems may underperform or require significant retraining.
- **Ethical and Regulatory Constraints:** Ethical considerations, such as fairness, privacy, and bias, often impose technical limitations on AI development. Regulatory compliance may also limit the capabilities of AI systems.

## 5. HOW SMOKE DETECTORS WORK IN RELATION TO SENSORY ORGANS OF MAN VS MACHINE

Smoke detectors and human sensory organs serve similar functions in that both detect environmental changes and respond appropriately, but they do so in very different ways.

**Human Sensory System:**

- **Nose**: Detects smell of smoke
- **Eyes**: Sees smoke or fire
- **Skin:** Feels heat from fire
- **Ears**: Hears crackling of fire or alarms

**Smoke Detector (Machine):**

**Function:** Smoke detectors are designed to sense smoke particles in the air and trigger an alarm to alert humans of potential fire hazards.

- **Photoelectric sensor**: Detects light scattered by smoke particles
- **Ionization sensor:** Detects changes in electrical current due to smoke particles
- **Heat sensor**: Detects rapid temperature increases
- **CO sensor**: Detects carbon monoxide levels

**Key differences:**

- **Sensitivity:** Smoke detectors are designed to detect only smoke and are far more sensitive to specific particles than the human nose. However, they lack the broader range of detection found in human olfactory senses, which can distinguish a wide array of smells.
- **Response Time:** Smoke detectors can often react faster than human sensory organs, triggering alarms without the need for human intervention.
- **Automation vs. Conscious Decision:** Smoke detectors function automatically without requiring conscious thought, while humans must process sensory information and consciously decide to take action.
- **Consistency:** Machines maintain constant vigilance, while humans may sleep or be distracted.
- **Integration:** Human senses work together to provide context, while smoke detectors often focus on specific inputs.