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# A Brief Study on Adaptive Artificial Intelligence

**Ramakrishna Reddy Badveli, Haripriya K V, Janakiram B R**

Assistant Professor, Department of Computer Science & Applications, The Oxford College of Science, Bangalore, India

MSc Student, Department of Computer Science & Applications, The Oxford College of Science, Bangalore, India

**ABSTRACT:** Artificial Intelligence is an advanced technology that originated in the year 1950 and has been evolving since then, Several subsets of AI have become more prevalent technology and find applications in most domains. Some of the subsets of AI include machine learning, deep learning, robotics, neural networks, natural language processing, and genetic algorithms. Adaptive learning is a fourth-generation machine intelligence. Adaptive artificial intelligence is different from traditional Artificial intelligence as the former can update its code to accommodate the new changes in the real world that were not expected or known when the code was first written. This paper attempts to study the growing new technology of Artificial intelligence. Adaptive Artificial Intelligence can be seen as another milestone in the field of technology.

**KEYWORDS:** Artificial Intelligence, Adaptive Artificial I Intelligence, Continual Learning

## I. INTRODUCTION

Adaptive AI systems support a decision-making framework centered around making faster decisions while remaining flexible to adjust as issues arise. These systems aim to continuously learn based on new data at runtime to adapt more quickly to changes in real-world circumstances. The AI engineering framework can help orchestrate and optimize applications to adapt to, resist or absorb disruptions, facilitating the management of adaptive systems.

AI techniques, through data models (i.e., models learned from data), are helpful for dealing with uncertainties when process models are difficult to obtain [1]. However, considering that either the system or its environment may evolve, data models cease to be accurate, thus leading to concept drift, i.e the data model is not updated according to the distribution of the changing input data [2]. When this happens there is a need for the AI technique to adapt its data model, and the challenge is how to maintain an accurate nonlinear data model under concept drift[3].

## II. RELATED WORKS

Tumaini Kabadi et al. in their paper have summarized the future AI-enabled learning systems to solve specific learning problems and also demonstrated with use cases how to improve users' learning experiences in AAI[4]. The paper on Self-adaptive learning by Rogerio de Lemos and Marek Grzes has tried to address whether a self-adaptive machine learning system will be able to interpret and explain its data model in order for it to be controlled[5]. Bontchev and Boyan in a paper on Adaptive Artificial Intelligence have shown the adaptive artificial agents' performance in the video games[6].Dan et al. in their paper had explained how AAI can be applied for an intelligent educational system[7].

## III. DIFFERENCE BETWEEN AI AND AAI

Unlike conventional artificial intelligence (AI) systems, adaptive AI can modify its own code to account for changes in the actual world that weren't anticipated or known at the time the code was initially developed. When adaptability and resilience are included in an organization's architecture, it can respond to crises more rapidly and successfully. According to Gartner Senior Vice Analyst Erick Brethenoux, flexibility and agility are now essential as many organizations have discovered amid the current health and climate crises. When used in runtime and development contexts, "adaptive AI systems strive to continually retrain models or use other processes to adapt and learn, making them more flexible and resilient to change."

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## IV. ARCHITECTURE OF AAI

The architecture of adaptive artificial intelligence (Fig. 1) hierarchically organizes component systems for perception and action. and cognition processes. Perception processes acquire, abstract, and filter sensed data before sending it to other components. Action systems control the execution of external actions on effectors. Perception can influence action directly through reflex arcs or through perception-action coordination processes. The cognition system interprets perceptions, solves problems, plans, and guides perceptual strategies and external action. These processes operate concurrently and asynchronously. They communicate by message passing. Perception-action operations occur at least an order of magnitude faster than cognitive operations. The cognition system, which is the architecture's most substantial component, is realized as a "blackboard architecture" [8], extended to support dynamic control planning [9,10].

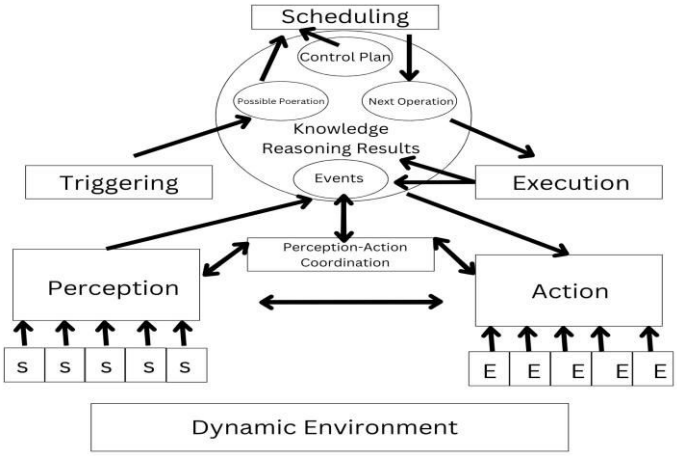


Figure 1. The architecture of AAI For present purposes, we emphasize these features:

1. Perceptual inputs and internal reasoning operations produce changes to global memory.
2. Each event triggers a number of possible reasoning operations.
3. Possible operations are scheduled for execution based on active control plans.
4. Control plans are constructed and modified by reasoning operations.
5. Possible actions and control plans are represented in a machine-interpretable language similar to English, which supports semantic partial matching of activities to plans.

## V. ADAPTIVE AI AND CONTINUAL LEARNING

AI is becoming more adaptive and capable of learning on its own as it develops. This activity gave rise to continuous learning, a type of AI that develops knowledge over time to improve. It is a powerful tool with the potential to transform numerous sectors because of its capability. This development included transitioning from static machine learning to adaptive machine learning or continuous learning. Data access and transformation for autonomous vehicles and the internet of things are unprecedented. Modern machine learning is difficult to rely on because of this capability because the data flow continues. Still, businesses don't constantly analyze models to keep up with AI's evolving capabilities.

## VI. APPLICATIONS OF AAI

- Tutoring: AI programs commonly called Intelligent Tutoring Systems (ITS) or adaptive tutors engage students in dialogue, answer questions, and provide feedback. [11]
- Personalizing Learning: ITS and adaptive tutors tailor learning material, pace, sequence, and difficulty to each student's needs. AI can also provide support for special needs students by teaching autistic children to identify facial expressions.[12]

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- Testing: Computer adaptive assessments adjust the difficulty of the next questions based on the accuracy of the student's answers, enabling more precise identification of a student's mastery level.
- Automating Tasks: AI can perform routine tasks such as taking attendance, grading assignments, and generating test questions.[13]

## VII. CONCLUSION

The idea is that adaptive AI may modify its own code in order to account for changes that weren't anticipated or known at the time the code was developed. This allows for the inclusion of adaptability and resilience into the architecture so that it can respond quickly to changes.It implies that the "learning" stage of a conventional AI system might be skipped, resulting in the AI really learning what is taking place.The ability to quickly develop, deploy, adapt, and manage AI across many organisational environments is the benefit of operationalized AI.AI models that incorporate this self-adaptation can grow more quickly and with fewer mistakes. It improves user experience by responding quickly to changing real-world circumstances.

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