



# An Overview of Ambient Intelligence

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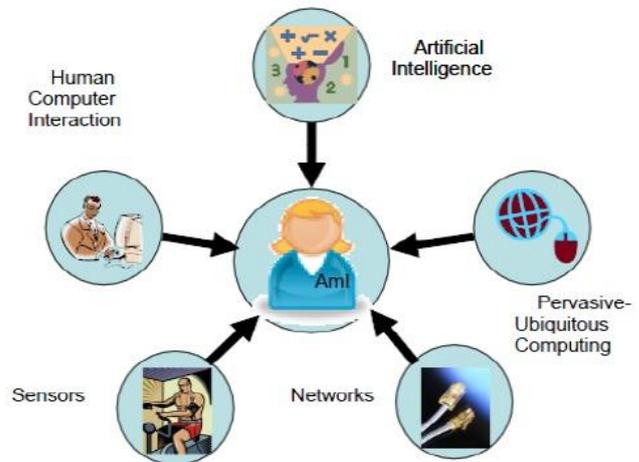
## Abstract:

Ambient Intelligence is a technology which involves embedding computers into day to day objects to make them intelligent. It is an emerging field where there is lot of room to research. The main concept of Ambient Intelligence is that its computational part is invisible to the end users. AmI does not work as traditional computing; instead it works just like a natural process while computation is being carried out in the background. We have ubiquitous computing in which a user is involved into a surrounding where computers are omnipresent. Another area of AmI is ubiquitous computing where the computational environment is invisible to the user. Additionally we have User Adaptive Interfaces where user is not limited to traditional input output, instead it involves variety of senses. We have elements of AmI which are embeddedness, transparency, context awareness and machine learning. There are a lot of advantages and disadvantages of AmI. AmI is a new concept and hence it needs to be explored more with exceeding time.

**Keywords:** Overview of Ambient Intelligence, Daily life computing environment, Ambient Computing, Ubiquitous Computing, Smart Objects, Intelligent surrounding.

## I. INTRODUCTION

Ambient Intelligence, also known as AmI is an advanced level of technology which has been under development to make Human life easy. Basically, the main concept of Ambient Intelligence is to reduce the size of computer making it more invisible. Which means AmI fits or embeds the computing system into an environment such that it is hard to distinguish the computing device as it is merged into that thing. The surroundings are made intelligent and smart as we embed computing into day to day objects such as a table, chair, wardrobe, tube lights, etc. These devices with the embedded computational capabilities are smart enough to sense the user necessities and requirements and work accordingly. These devices do not require much effort to make them learn. These devices learn on their own as per the user acts. AmI devices sense the presence of the user and can smartly know about the current mood, choices and preferences. The more user interacts with these devices, it keeps learning about the user. The best thing about AmI is that it does not make user feel uncomfortable or make him/her to perform tedious operation to carry out a certain task, instead AmI works on its own and provides user best services as he/she can expect.

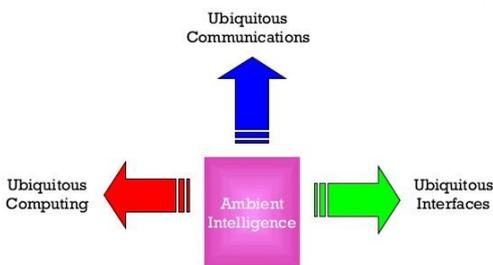


- **Ubiquitous Computing:** Ubiquitous Computing essentially means that a user is completely put in an environment where the computers are present everywhere. Even though computers being omnipresent they function in such a way that it does not grab user's attention. The computers sense each and every movement and action of the user and provide services that the user actually prefers at that moment. The human computer interaction is highly advanced such that it is not limited to a single device, rather multiple devices work simultaneously in the background according to the need of the operation. The ubiquitous computing specially works in a manner that it gives an illusion that it is moving along with the user. Thousands of invisible computers are embedded into the AmI environment and they work in such a smart fashion that the user is not aware of their existence.

- **Ubiquitous Computing:** The Ubiquitous Communication acts as a key feature when it comes to making the Ubiquitous computing devices to communicate with each other. As we are aware about the Ubiquitous Computing devices are the one that are invisible to user but perform smart operations at the background. So, these devices need to

## II. AREAS IN AMBIENT INTELLIGENCE

### Convergence of 3 Areas



"The vision is to embed intelligence into different devices, to make them smart and capable to attend to the user's need and lifestyle"

communicate with each other without the influence of wires or any physical connecting device. The Ubiquitous devices are scattered all around the working environment which may also mean quite at a distant location. Thus Ubiquitous Communication enables to solve this problem and make our AmI environment more intelligent as they can work at their full potentials.

- **User Adaptive Interfaces:** Unlike the traditional computing which limits the user's input just by making use of primitive input devices such as the keyboard or a mouse, AmI senses the user more intuitively. The AmI can percept the users visually and by speech. It also can recognize the user's scent, touch and some other senses. The AmI records the user behavioral pattern which is also known as profiling. Those devices can also sense the situations and carry out complex algorithms to come up with a desired output.

### III. ELEMENTS OF AMBIENT INTELLIGENCE

- **Embeddedness:** Computer systems in AmI are not limited to their traditional standalone form but they are embedded into more environment and user friendly object. They are constructed and fitted in such a way that they have smart capabilities. This type of technology is mostly referred to as 'Embedded Computing'.

- **Transparency:** AmI systems provide the user with a high level of transparency. This actually states that the computational devices which are embedded into different objects are invisible to the end user. The user can freely and naturally communicate with AmI systems just like people communicate with each other.

- **Context Awareness:** The AmI systems are highly developed as much to an extent that they can understand the context completely. It fetches all the information about its surrounding to make itself adapt to that kind of behavior. It is powered with both sophisticated hardware and software sensors to detect the information of the environment.

- **Machine Learning:** Before performing some action, the AmI system checks the related historical data and then responds accordingly. If the system is dealing with new type of information then it records the information for the future purposes. It learns on its own automatically and experience plays a huge role in the learning process.

### IV. ADVANTAGES OF AMBIENT INTELLIGENCE

- **High Accuracy:** The first and foremost advantage of the AmI systems is that it has greater degree of accuracy and the results are more exact. As a result it reduces the error rate.

- **Difficult Exploration:** AmI systems can be sent to explore things in such an environment where human beings are vulnerable or they have danger to their lives.

- **Daily Application:** AmI systems are often used in our day to day routines such as the GPS for travelling and locating purposes.

- **Digital Assistance:** Humans have emotions which lead to altering the decisions whereas robots do not have the emotional barrier and hence can carry out unbiased decisions.

- **Repetitive Jobs:** Humans tend to get bored with a dull and monotonous job while an AmI system cannot get worn out with repetitive jobs. Moreover AmI can perform multiple tasks all at same time with high speed.

- **Medical Applications:** The AmI systems provide us with so many medical applications ranging from detection of diseases to performing complicated surgeries. The medical

AmI tools are very much precise and reliable and they assist a medical practitioner in highly effective manner.

- **No Breaks:** Unlike humans, machines do not get bored or tired for working long hours performing tedious job with ease.

### V. DISADVANTAGES OF AMBIENT INTELLIGENCE

- **High Cost:** The AmI systems are of very high costs. They frequently need heavy upgrades which again directly involves high cost. Lastly the repair and the damage to be covered is not cheap in any way.

- **No Replicating Human:** Even after being highly sophisticated computational systems, AmI cannot replace human's natural instinctive decision making. It even does not understand the importance of moral and the ethical values.

- **No Improvement with Experience:** As the time passes, the AmI machines start to deprecate. This ultimately affects the usual functioning. It does not have a natural brain like that of a human. Systems can easily malfunction when they get corrupted.

- **No Original Creativity:** The AmI systems lack the original creativity and the tremendous power of the imagination which humans are blessed with. These systems can only figure out the data that is fed into them and cannot come up with their own thoughts.

- **Unemployment:** With the machines trying to overtake the human capabilities may ultimately lead to replacing human. This will definitely result into high amount of unemployment which is a dangerous social evil.

### VI. CONCLUSION

We can conclude that Ambient Intelligence environment is a computational environment where the computers are fit into the everyday surroundings without involving user's awareness. The AmI technology will definitely convert a home into smart home. The AmI is aware about the presence of the user and can figure out about the needs of the user. Further it will provide a user friendly space where it involves user interaction in a more natural way. Ambient Intelligence can wisely used at home to provide better convenience, safety, security and entertainment. It saves both resources that are time and money. Ambient Intelligence can be very much helpful in the work place and organizations which will ultimately lead to enhance the profit. A lot of research needs to be carried out to make the Ambience Intelligence Technology more efficient and promising in the future.

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