

Creating a “Sustainable Future” Through Secure AI

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Abstract

It is imperative in the present world that we figure out a way to move toward a sustainable future. However, a sustainable future from an energy standpoint can only be built by a sustainably intelligent society. Yet, individuals who come together to form a society tend to neglect discussions around sustainability, considering it something that should be driven in a top-down manner. In reality, with the rapid emergence of artificial intelligence (AI) in recent years, the scope of intelligence has expanded. Nowadays, intelligence is viewed as a combination of two components: natural human intelligence and artificial intelligence. However, we cannot proceed blindly with AI to build a sustainable future; while using AI, we must remain cognizant of cybersecurity aspects. Hence, this research paper attempts to propose a secure AI-based approach, focusing on individuals, to build a sustainable future.

Keywords: Artificial Intelligence (AI), cyber security, generative AI, predictive AI, secured-AI based model, sustainable technology

INTRODUCTION

This study aims to explore how individuals who come together to form a society and the world can play significant roles in building a sustainable future. Artificial intelligence (AI) has been baked into every aspect of our lives. Hence, it is impossible to exclude AI from any discussion that we have carried out today. Therefore, AI must play a role in building a sustainable future. Keeping this context in mind, this particular research paper attempts to explore the concept of broad categories of AI, namely predictive AI and generative AI, through a literature review. The literature review also covers prominent aspects of sustainable technology and cybersecurity, as embracing any new technology without considering cybersecurity can be disastrous. As this study primarily explores the bottom-up usage of secured AI to build a sustainable future, a field survey was conducted among multiple strata of society to understand the as-is state of sustainable intelligence in society. The findings of the survey are used to create a detailed secured-AI-based model that, when followed at an individual level, promises to lead to a sustainable future.

Objectives and Research Questions

The key challenges that this study attempts to address are captured by the following research questions:

1. What are the roles of predictive AI and generative AI in building a sustainable future from an energy standpoint?
2. What are the cybersecurity concerns in moving towards an AI-enabled sustainable future?

METHODOLOGY

The steps below have been followed to construct this paper.

1. A literature review was performed from multiple sources to understand the roles of the different components of artificial, which are relevant in building a sustainable future.

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2. A field survey was conducted among different individuals using convenience sampling to understand the state of AI adoption in the present society.
3. A focus group was simulated to develop an implementation–benefit analysis to understand the ease of implementation of the action items identified from the above field survey, vis-à-vis the benefit it could yield.

LITERATURE REVIEW

The concept of sustainability is often considered in conjunction with green practices and technology. Hence, as a part of this literature review, let us understand the implications of green practices and the skills that are known as green skills. In simple terms, green skills are those skills that are to be taught, especially to students, to embrace green technology and are essential to drive practices that will lead to a sustainable future [1, 2].

With this understanding of green skills, one point that becomes obvious is that to move to a green or sustainable future, the engagement of consumers of energy becomes critical. Obviously, the engagement of these individuals needs to occur in an intelligent way. Having said that, for most individuals, this intelligence will not be sufficient if we rely only on natural human intelligence, and exactly that is where the role of AI comes into play. Artificial intelligence has the power to push the baseline of overall intelligence; therefore, as a subset of overall intelligence, it can also push the limit of sustainable intelligence. Thus, now that we are speaking about artificial intelligence, it is critical to understand the theoretical concept of Artificial Intelligence before we delve further.

Artificial intelligence is a form of intelligence exhibited by a system, which can often be a software system [3, 4].

If we consider the overall evolution of AI, we can understand that the broad wings that form AI are (a) predictive AI and (b) generative AI. Therefore, as the next step in this literature review, let us try to understand these two concepts.

Predictive AI is built based on historical transactional data collected and primarily helps predict the outcome of a future activity, an activity that is yet to be performed [5].

On the other hand, generative AI is a comparatively recent concept. This form of AI is groundbreaking in multiple ways, and it can create new content that can be in the form of text, audio, video, or any other form of media file, depending on the requirement. This is also performed on the basis of historical data points or data files [5, 6].

With this basic knowledge of AI, the obvious thought that comes to mind is that it can do wonders in driving the present and subsequent generations towards a sustainable future. However, the biggest challenge in embracing AI is that the roadblock is cybersecurity. Now, let us understand the concept of cybersecurity.

Cybersecurity threats from an AI standpoint are the probability of unwanted events that can cause risk to a machine-driven setup integrated with an artificial intelligence system [7, 8].

Since the premises of artificial intelligence are strongly built on systems that are repositories of historical databases, the use of artificial intelligence-enabled systems evidently increases the risk of cyber threats.

Field Survey

As part of this research, a field survey was carried out for 15 days in the month of January 2025 during the February 1–15, 2025, phase using a convenience sampling method. During this phase, we received 126 responses from respondents belonging to different strata of society. Even though

convenience sampling was used, a homogeneous mix of respondents was ensured to avoid any bias in the responses and consequent inferences drawn. 56 Of the respondents, 56% were male, and 42% were female, while the remaining 2% opted not to disclose their genders [9]. The age group ranges were evenly distributed across multiple groups. Among the respondents, 48% were from the student community, while working professionals, homemakers, and self-employed individuals formed the remaining 52% [10].

Key Findings

The key objective of conducting the field survey was to understand the present degree of making AI a way of life in society. As part of this survey, we arrived at interesting findings. The findings are as follows.

AI-App Usage Efficiency

We asked the survey participants to provide a self-rating as far as their AI app usage comfort was concerned. Figure 1 presents a summary of the self-ratings. As shown in Figure 1, 39% of the participants rated themselves 4 on a scale of 1–5 and 12% rated themselves 5 on a scale of 1–5 regarding their own AI app usage efficiency. Therefore, 51% of the participants believed they were quite comfortable when it came to the usage of AI-driven apps.

Finding the Set of Mostly Done Energy-Consuming Household Activities

As the next part of the survey, we tried to understand that the list of household work that consumes energy can potentially have a direct impact on building a sustainable future world. Nine such activities were found. These activities are listed below.

1. *Managing light usage in the house:* This is an activity that deals with discipline in terms of switching household lights on and off domestically.
2. *Managing the usage of geysers:* Using geysers to heat water is a common practice, and this turned out to be one of the most common household practices involving energy usage.
3. *Monitoring household energy consumption:* Currently, a significant segment of society has started monitoring household energy consumption. Interestingly, this activity requires high energy consumption.
4. *Recycling waste:* Although recycling waste or overall waste management may not directly require energy from a household perspective, it has an indirect impact on energy usage and can go a long way to make the future world sustainable.
5. *Planning waste management:* This activity was closely related to previous activities. However, the two factors are not the same. While recycling focuses more on specific items that can be recycled, waste management planning emphasizes the overall management of all waste items.

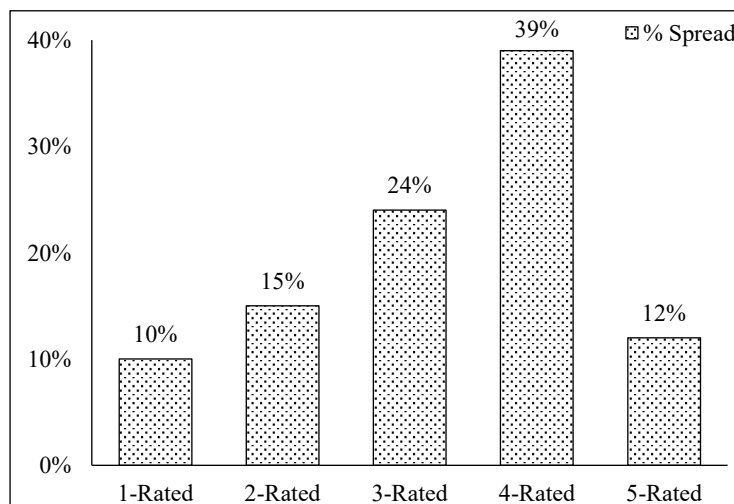


Figure 1. Spread of self-rating of AI-App users in terms of ease of AI-app usage.

6. *Managing water usage in the house* is one of the most common activities where everyone in the house plays a role. This again can go a long way, if done correctly, to ensure the right balance between usage and reuse.
7. *Procurement of household consumable items*: In the majority of cases, no proper planning is performed while procuring household consumable items. However, these items, if not stocked correctly, can lead to unnecessary energy consumption, leading to unwanted energy wastage.
8. *Deciding on the menu for lunch and/or dinner*: This is an apparently trivial task. However, after the procurement of consumable food items, we often end up making incorrect sustainable decisions when it comes to preparing our lunch and/or dinner.
9. *Planning daily travel*: The last key action item, which becomes a part of this list, is about planning daily travel. As one can understand, this planning, and subsequently the choices made, plays a significant role in the overall energy consumption of a family and society.

AI-App Usage Proficiency Vis-à-vis Actual AI-Usage

This is one of the key conclusions of this study. Table 1 presents a 3×3 matrix with nine clearly defined grids. Let us try to understand these grids individually. For ease of explanation, we term the top-most grid on the left as Grid 1, the one on its right as Grid 2, and finally the bottom-most right grid as Grid 9. Grids 3 to 8 represent the remaining segments. The implications of these grids are briefly explained.

1. *Grid 1*: Anyone who is part of this grid can very quickly start using AI to make a difference in ensuring a sustainable future. If we look at the percentage proportion, 41% of the respondents belong here. Therefore, we need to ensure that the AI app usage percentage goes up for these people.
2. *Grid 2*: Similar to Grid 1, this represents a segment that is a low-hanging fruit when it comes to switching to the usage of AI to ensure green practices across the most popular household work.
3. *Grid 3*: This represents the ideal grid to drive green practices across society from a bottom-up standpoint. We must ensure that 100% of the population moves into this bracket.
4. *Grid 4*: This is a segment where the required improvement is two-fold. First, awareness of the power of AI must increase. Second, these people must be incentivized when it comes to the use of green practices.
5. *Grid 5*: The natural movement from Grid 4 is supposed to be to Grid 5 because the usage level of AI apps simply cannot move from low to high straight away. Among the samples studied, it is interesting to observe that the percentage present in Grid 5 is 0%.
6. *Grid 6*: This is the second-best grid among the nine segments shown in Figure 2. We had 2% of the sample included in this study. Again, people at Grid 6 can be moved to Grid 3 through proper AI training.
7. *Grid 7*: Those who are part of this grid are the first set of potential candidates who need to be trained from an AI usage standpoint to drive daily household work. Currently, the proportion of people belonging to this region is alarmingly high, at 25%. Ideally, over the next year, this percentage must decrease drastically.
8. *Grid 8*: This is an interesting grid, where ideally, we will not want the presence of any person because, without proper knowledge of AI apps, the usage of AI can lead to issues of different types.
9. *Grid 9*: Just like the segment represented by Grid 8, we would like to have 0% of the population belonging to Grid 9. One of the major aspects that must be kept in mind for the people belonging to Grids 8 and 9 is cybersecurity. Cybersecurity can be a major point of consideration for people who belong to Grids 8 and 9.

Cyber Security Awareness for AI-App Users

As part of this research, we sought to understand the level of cybersecurity awareness among those using various mobile apps, including AI apps, to gain more productivity in their household work. Figure 2 presents a summary of the data presented in Table 2.

Table 1. AI-App usage proficiency versus actual AI-usage.

Ease of AI-App usage			
Can easily use AI (self-rating of 4 and 5)	41%	7%	4%
Can moderately use AI (self-rating of 3)	21%	0%	2%
Cannot use AI (self-rating of 1 and 2)	25%	0%	0%
	No usage	Moderate usage	High usage
Actual Usage of AI to Manage Household Work			

Table 2. Sustainability solution matrix.

Ease of AI-App usage			
Can easily use AI (self-rating of 4 and 5)	AI app specific hands-on competency building	Predictive AI Apps exposure	AI and Cyber Ethics Training
Can moderately use AI (self-rating of 3)	AI awareness training	Now AI Apps with lesser complexity	AI awareness training
Cannot use AI (self-rating of 1 and 2)	AI awareness training	AI and Cybersecurity Skill Building	AI awareness Cybersecurity Awareness AI Apps training
	No usage	Moderate usage	High usage
Actual Usage of AI to Manage Household Work			

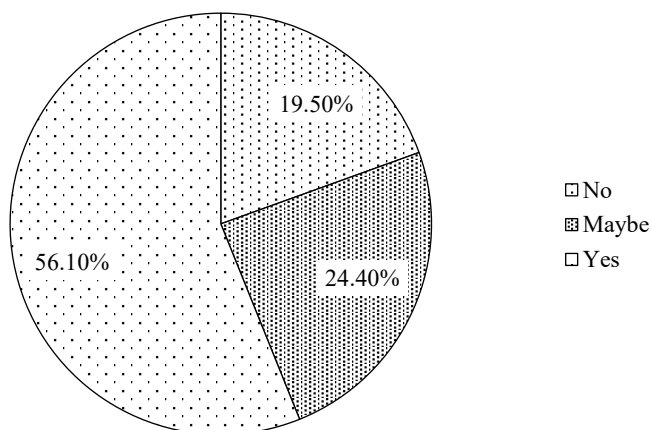


Figure 2. Cybersecurity awareness of AI users.

CONCLUSIONS

Now, the overall work done through this research can again be summarized by using a ‘Solution Matrix’ which gives a ‘Summary Roadmap.’ This ‘Solution Matrix’ is also a 3×3 matrix with nine grids. However, instead of focusing on the spread of people across different buckets, this matrix focuses on the different action items that can be implemented to drive ‘Sustainability’ through AI. With this background, we examine this solution matrix.

Let us now explain the above solution matrix, referring to each of the grids one after the other. For ease of reference, we refer to each of the grids using the same numerals as in the case.

1. *Grid 1:* This group will need hands-on experience with the most commonly used AI apps. Once they have proper experience, the movement of these people is from Grid 1 to Grid 2 and subsequently to Grid 3, which is the most desired segment.

2. *Grid 2*: People belonging to this particular grid lack exposure, mostly on the predictive side of AI. Hence, this segment must focus on predictive AI skills.
3. *Grid 3*: Grid 3 people are already in the desired bracket as far as skills are concerned. However, the major focus for this segment must be the ethical aspects of both Artificial Intelligence and cybersecurity facets. The absence of these two elements can be disastrous from a long-term perspective.
4. *Grid 4*: For this grid, the major focus must be on AI awareness training. Post-training, people can slowly be upgraded to grids numbered 1–3.
5. *Grid 5*: For this segment, the primary focus needs to be on new AI apps that are less complex from a usability standpoint. Thus, the development of new AI tools or AI apps is of utmost importance.
6. *Grid 6*: Similar to Grid 4, for this segment of people, the main focus must be on AI awareness training so that a transition occurs from Grid 6 to Grid 3.
7. *Grid 7*: The primary strategy of Grid 7 coincides with that of Grids 4 and 6. Hence, the major action item to be driven here is basic AI awareness training from a user standpoint.
8. *Grid 8*: This is a tricky segment. For this group, upskilling cannot involve Artificial Intelligence. For this bucket, awareness building must be twofold, involving the upskilling of AI as well as cybersecurity.
9. *Grid 9*: Grid 9 should cover all action items involved in Grid 8. In addition, grid 9 people will require handholding on the usage of AI apps. These apps can be generative AI apps or predictive AI apps, depending on the context and degree of usage required by an individual.

Future Scope of Work

This research work can be further developed, and a few points that can be taken up immediately are as follows:

1. The sample size used to conduct the field survey can be further expanded to strengthen the conclusions drawn.
2. For each of the identified household work items consuming the highest bandwidth of individuals, focus needs to be given to building AI-driven apps that can be easily used by a larger group of people in society.

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