



AI FOR SUSTAINABLE DEVELOPMENT: ASSESSING STUDENT INTEREST, EDUCATION, AND CAREER PATHWAYS

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ABSTRACT

Artificial Intelligence is one of the most used and efficient technologies in the world right now. When harnessed effectively, AI has the potential to address global challenges, aligning with the United Nations' 17 Sustainable Development Goals. In this study, I am exploring the career opportunities for AI engineers in India, encompassing opportunities within both corporate entities and non-governmental organizations (NGOs) committed to advancing sustainable development. It further analyzes the specific skills required to join as an AI Engineer in these organizations. As a part of this study, I also conducted a survey among engineering students to know their interest and understanding of AI in the context of sustainability. In addition, the study investigates the curricular offerings of AI programs in Indian educational institutions, assessing the extent to which they prepare students for the demands of the industry, with a particular focus on the inclusion of sustainability-related content.

KEYWORDS: Artificial Intelligence (AI), Sustainable Development Goals (SDGs)

1. INTRODUCTION

The field of Artificial Intelligence (hereafter AI) is experiencing rapid growth and holds the potential to contribute significantly to the achievement of Sustainable Development Goals (hereafter SDGs), offering various benefits to humanity. Engineering students and professionals must have a fundamental understanding of sustainable development goals and artificial intelligence and learn to combine these concepts for the betterment of our country in the future.

Every year, all 192 nations are assessed based on their progress toward attaining the 17 SDGs. According to the Sustainability Development Report for 2023^[1], India is ranked 112th, with a score of 63.45. Notably, the scores for the goals of reduced inequalities (Goal 11) and life on the earth (Goal 15) have reduced when compared to previous years. Furthermore, India's scores for achieving the goals of zero hunger (Goal 2), sustainable cities and communities (Goal 11), climate action (Goal 14), and peace, justice and strong institutions (Goal 16) stagnated. As Gurinder Kaur mentioned in her report^[2], in India, the discrimination against women starts even before she is born, the prevalence of violence against women, ranging from domestic abuse to gang rape, contributes to increased inequality. As per Air Quality Report 2023, Delhi is one of the five most polluted cities in the world. There are a lot of such problems that need immediate attention and can be solved using technologies such as AI.

In this paper, three main areas are explored: how interested and informed students are about using AI for Sustainable Development Goals (SDGs), university programs for AI and sustainability education, career opportunities in AI for sustainability, and the skills required. We should use AI effectively for our country's benefit while meeting SDGs with the right planning. There are NGOs, departments focusing on sustainability, companies focusing on energy, agriculture, disaster management, etc, using AI to meet the SDGs. As a part of this study, a survey was conducted among the engineering students.

Objective

The survey among students is for to understand the attitude of students about incorporating AI and sustainability and their willingness to work for it. This information could help with curriculum development, educational initiatives, and preparing students for the future. The intention of analyzing job opportunities is to motivate students who want to pursue AI and sustainability, which can, in turn, benefit their careers and the broader progress of the country. The AI programs provided by Indian universities is evaluated to see if include sustainability topics in their curriculum and whether they equip students with the latest AI tools, as it is necessary to foster a skilled and innovative workforce in the future.



2. METHODOLOGY USED

a. Survey

The survey is a fundamental research technique used for gathering data that facilitates the assessment of a wide array of aspects such as public sentiment, attitudes, behaviors, feedback, etc. This survey will be carried out among engineering students at APJ Abdul Kalam Technological University (KTU). This survey focuses on:

- Students' understanding of AI and SDGs.
- Student involvement in AI projects aimed at achieving SDGs.
- Student interest in pursuing careers that encompass AI and Sustainability.

Following were the survey questions:

- Are you familiar with the sustainable development goals?
- Have you heard of or studied the application of Artificial intelligence in meeting sustainable development goals?
- On a scale of 1 to 5, how interested are you in the intersection of AI and sustainable development goals, with one being not interested and five being extremely interested?
- Are you currently involved in any projects or initiatives related to AI and sustainable development goals, either academically or as a personal interest?
- Would you be interested in participating in or contributing to projects or research related to AI and sustainable development goals in the future?
- Are you interested in pursuing a career where you will work with AI to meet sustainable development goals?
- Are you aware that companies hire engineers with knowledge of AI to meet sustainable development goals?

b. Job Opportunities Research

In India, the primary job search platforms used are LinkedIn, Naukri, indeed, Glassdoor, and Internshala. Within these platforms, job listings from a diverse range of companies engaged in sustainability-focused projects, encompassing areas like renewable energy, agriculture, disaster management, and NGOs can be analyzed to understand the demand for an AI Engineer/Developer in sustainability. The skills, and qualifications mentioned in the job posts is analyzed.

c. University Programs Research

The curriculum details of AI programs in India can be found online. Two important things are analyzed here:

- If sustainability-related topics are included in the curriculum.
- whether students received instruction in industry-relevant skills. Also, these skills are compared to the essential qualifications specified in job advertisements.

3. CAREER PATHWAYS AND SKILLS

There are many companies in India whose product goals align with the SDGs. If we consider the renewable energy sector, Adani Green Energy, ReNew Power, Climate Connect Digital, Siemens Energy, Websol Energy System, etc, have posts for AI Engineer. These companies mentioned use AI to make their products more efficient and sustainable, but at the same time, it is helping India to achieve the 7th SDG, affordable clean energy. Also, some companies are contributing to the research of students as well. For example, the study conducted by Madhjarasan^[3] that aimed to predict wind speed for improved energy efficiency and wind farm operation relied on real-time data supplied by Suzlon Energy Private Ltd. This research, if deemed suitable, holds the potential to enhance the performance of their products.

BKC WeatherSys is an Indian company whose domains include agriculture, renewable energy, hydrology, climate, etc,^[4] contributing to four different SDGs (Goals 6, 7, 14, and 15). Here, as per their job advertisement in Naukri, knowledge of weather/agriculture is a plus. The job advertisement posted by the National Institute of Smart Government (NISG) was also somewhat similar since they need AI engineers to analyze weather for agriculture applications.

Many private companies such as PlanetSkool, Leverage Edu, 2Sigma School, Toddle, Univ.ai, and non-profit educational organizations like Pratham, Turn the Bus, etc, provide quality education, thus contributing to sustainable development goal number 4.

There are many Non-Government Organizations (NGOs) in India. They are non-profit organizations that mainly works for fixing the social issues, helping the kids, poor, and people in need. An interesting trend emerging in these organizations is their increasing adoption of AI to bolster their effectiveness. One example is Wadhvani AI, an initiative founded by Dr. Romesh Wadhvani. This organization specializes in developing and deploying AI solutions tailored to serve marginalized populations in developing countries. Their primary focus is on agriculture and healthcare, significantly contributing to Sustainable Development Goals 3 and 15. Another remarkable player in this arena is Gramener, a company specializing in data science and AI. Although not a conventional NGO, they actively collaborate with NGOs and government bodies, harnessing the power of AI for the betterment of society and



disaster management. A notable project they undertook was in partnership with SEED, a nonprofit organization in India, and Microsoft, where they employed AI to predict impending disasters and mitigate risks for vulnerable populations. UNESCO also has put job advertisement looking for AI Engineers. In addition to this, many NGOs are working with and getting help from MNCs like Google, Microsoft, etc. For example, Swasti is working with IIIT-D and Singapore Management University to apply Artificial Intelligence and Machine Learning (AI & ML) techniques to improve segmentation and outreach among key populations. This is supported by the Google AI for Good Grant ^[7].

Sector/Domain	Company/ Organization	Contribution to SDGs
Renewable Energy	Adani Green Energy	Affordable Clean Energy (SDG 7)
	ReNew Power	
	Climate Connect Digital	
	Siemens Energy	
	Websol Energy System	
	Suzlon Energy Private Ltd	Research Support for Efficiency (SDG 7)
Agriculture, Renewable Energy, Hydrology, Climate	BKC WeatherSys	Clean Water & Energy (SDG 6 & 7), Life Below Water & On Land (SDG 14 & 15)
Agriculture	National Institute of Smart Government (NISG)	Agriculture and Weather Analysis (SDG 2)
Education	PlanetSkool	Quality Education (SDG 4)
	Leverage Edu	
	2Sigma School	
	Toddle	
	Univ.ai	
	Pratham (NGO)	
	Turn the Bus (NGO)	
Agriculture, Healthcare	Wadhvani AI (NGO)	Good Health & Well-being (SDG 3), Life on Land (SDG 15)
Data Science and AI	Gramener	Disaster Management, Social Development
International Organization	UNESCO	SDGs 1 to 17
Healthcare	Swasti (NGO - collaborated with university students)	Good Health & Well-being (SDG 3), Quality Education (SDG 4)

Table 1: Companies, their domain and contribution to SDGs

The AI Engineers are expected to have skills in ^{[8][9][10]}:

- Deep Learning (CNN, LSTM, RNN, LLM, NLP, etc)
- Machine Learning
- Image Processing
- Database Management
- Python
- R

Also, they should be adept at advanced tools like

- TensorFlow
- Keras
- Pytorch, etc.

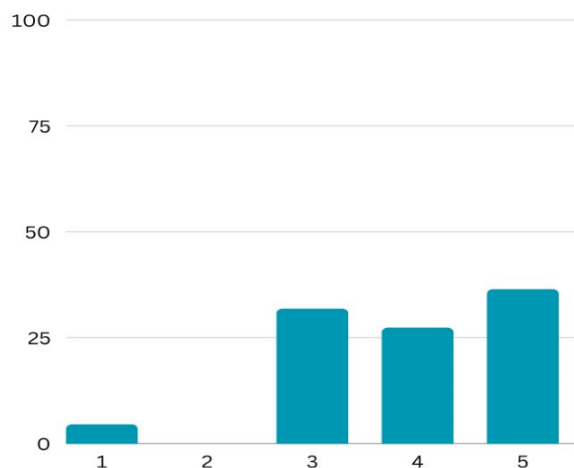
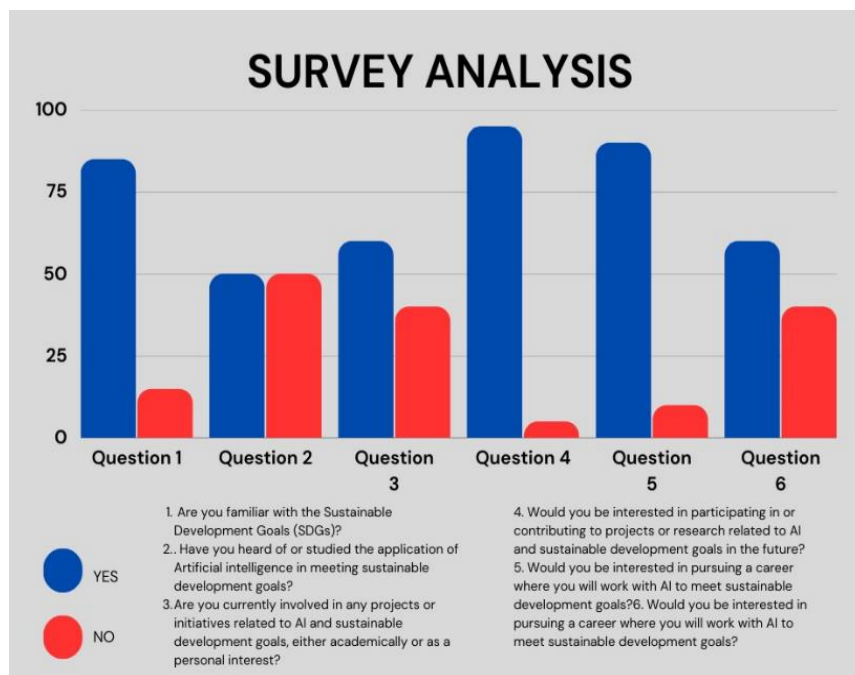
In addition to these examples, numerous companies are actively contributing to the achievement of Sustainable Development Goals (SDGs). While their core objectives may not revolve around sustainability, they employ AI to enhance the efficiency of their products, consequently making progress towards SDGs. Nokia is using AI to reduce the network energy usage by 30% and to reduce the carbon footprint of telco networks. Similarly, ABB has adopted BrainBox AI's innovative HVAC technology, which leverages AI to create smarter, more eco-friendly, and highly efficient buildings. Schneider is making client-specific AI applications for the collection, aggregation, and visualization of client energy consumption. It also predicts energy cost and usage based on weather and seasonality. Hence, integrating sustainability education alongside AI skills proves advantageous for one's career development.

4. STUDENT ATTITUDE TOWARDS AI AND SDGS: SURVEY ANALYSIS

Around 160 students from APJ Abdul Kalam Technological University actively participated in this survey. There were 7 questions were included in it. Following are the observations from the survey:

- Approximately 15% of the surveyed students indicated a lack of familiarity with the concept of sustainable development and the Sustainable Development Goals (SDGs).
- Only 50% of students have heard of or studied about the application of AI in meeting SDGs.
- Encouragingly, around 60% of the students expressed keen interest in utilizing AI for the advancement of SDGs and were actively engaged in related initiatives.
- Around 10% of the students are not interested in pursuing a career where they will have to use AI in meeting SDGs. At the same time, 50% of students were not aware of the fact that they have career opportunities in this field.

Graph 1: Survey Analysis



Graph 2: Interest of students in using AI to meet SDGs on a scale from 1 to 5.



5. UNIVERSITY PROGRAMS AND CURRICULUM ANALYSIS FOR AI EDUCATION

In India, there are around 200 colleges offering a bachelor’s degree in Artificial Intelligence. Among them, I analyzed the curriculum of top 10 colleges. The curriculum covers essential topics like basic programming languages required, deep learning, machine learning, data structures and algorithms, image processing, etc However, these programs generally lack instruction on newer, advanced tools like TensorFlow and do not include any content related to sustainability. Nevertheless, some universities offer intriguing courses that focus on specific applications of AI, such as

- Machine Learning in Drug Discovery
- Artificial Intelligence in Medical Images
- Brain-Machine Interface

These specialized courses equip students with in-depth knowledge in these areas, enabling them to pursue careers or advanced studies with a specialized focus.

College	Course
IIT Hyderabad	B.Tech Artificial Intelligence
Chandigarh University	B.E - Artificial Intelligence and Machine Learning
Indraprastha Institute of Information Technology	B.Tech Computer Science and Artificial Intelligence
Great Lakes International University	B.Tech Artificial Intelligence
SRM Institute of Science and Technology	B.Tech Artificial Intelligence
Vellore Institute of Technology	B.Tech Artificial Intelligence and Robotics
DY Patil International University	B. Tech Data Science and Artificial Intelligence
University of Petroleum and Energy Studies	B.Tech - Artificial Intelligence and Machine Learning
Jain University	B.Tech - Artificial Intelligence and Data Engineering
GH Rasoni College	B.Tech Artificial Intelligence

Table 2: Top colleges offering AI Bachelors programme^[14]

There are around 84 colleges in India offering MTech in AI. While the majority of these programs concentrate solely on artificial intelligence, some integrate AI with fields such as Robotics, Electronics and Telecommunication, Data Science, and more. Notably, there are currently no colleges that offer specialized courses in AI for sustainability.

Most of the skills mentioned in the job advertisement are covered in the program curriculum, but practice with industry-relevant tools is not covered in the program. It is worth noting that across all the analyzed courses, sustainability is not integrated into the AI curriculum. This absence of sustainability education may contribute to students' limited exposure to Sustainable Development Goals (SDGs) and their reluctance to consider AI in sustainability as a viable career path.

6. CONCLUSION

In India, there are many companies that are contributing to sustainability with the help of AI. However, there is a notable absence of universities or online programs that specifically concentrate on the intersection of AI and sustainability. After a thorough examination of university programs, it is apparent that no institution currently offers an AI curriculum that integrates sustainable development principles. The survey analysis and the analysis of university AI programs curriculum reveals that students are generally unfamiliar with the concept of combining AI with sustainability. Additionally, approximately 40% of the surveyed students express reservations about pursuing a career in this field. Furthermore, it's evident that while some organizations contribute to certain Sustainable Development Goals (SDGs), few, if any, are effectively utilizing AI to address pressing issues in India, such as gender inequality, poverty, and sustainable infrastructure. Some of the suggestions to overcome this situation are:

- Integrate sustainable development into AI program curricula to ensure that students acquire a comprehensive understanding of AI's potential in this context.
- Indian universities could establish programs similar to the 'AI for Sustainable Development' initiative offered by University College London. This would enable students to specialize in using AI to address societal challenges and potentially foster the development of startups dedicated to achieving SDGs.
- Encourage collaboration between the Indian Government, NGOs, companies, and students to harness AI for meeting SDGs like reduced inequalities, life on earth, zero hunger, where India's performance is lacking.



- Organize seminars and conferences can be conducted to pique the interest of students to utilize AI for sustainable development, fostering a deeper appreciation of the possibilities in this field.

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