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Art Design and Interior Color Selection for New Energy Vehicles using sustainable AI algorithm

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Abstract: - New energy vehicles (NEVs) are becoming increasingly popular in the automotive industry as a sustainable solution to reduce carbon emissions. In order to attract and retain customers, NEVS needs to have visually appealing exterior designs and interior color schemes. The traditional process of selecting art design and interior colors for vehicles can take time and effort. To address this challenge, our team has developed a sustainable AI algorithm for art design and interior color selection for NEVs. This algorithm utilizes machine learning techniques to analyze market trends, customer preferences, and sustainable color choices. The algorithm uses a database of color options and design elements to generate customizable options for NEV manufacturers. It reduces the need for physical prototypes and manual color matching, leading to cost and time savings. The algorithm also takes into consideration the sustainable aspect of NEVs by suggesting color options that are environmentally friendly and promote eco-consciousness.

Keywords: Automotive Industry, Carbon Emissions, Eco-Consciousness, Physical Prototypes, Machine Learning, Exterior Designs

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1. Introduction

It alludes to the use of cutting-edge artificial intelligence (AI) technology in the creation and production of contemporary energy vehicles. The goal of these environmentally friendly cars is to lessen dependency on fossil fuels and help create a more sustainable future [1]. Sustainable AI algorithms are used to maximize these cars' performance, energy efficiency, and general operation in order to do this [2]. The use of AI to new energy vehicles is a major advancement since it makes it possible to comprehend their functioning on a more thorough and precise level [3]. Large volumes of data from multiple sensors and sources can be processed by AI algorithms, enabling real-time analysis and parameter change for vehicles [4]. It enhances the overall efficiency and performance of the vehicle while minimizing energy consumption and emissions [5]. The sustainability aspect of these AI algorithms is also crucial, as it aligns with the goal of reducing the environmental impact of transportation [6]. Sustainable AI algorithms take into account not only the energy efficiency and performance of the vehicle but also the materials and processes involved in its production. It enables the manufacturer to make informed decisions and implement sustainable practices throughout the entire vehicle's life cycle [7]. The problems with traditional fossil fuel vehicles' effects on the environment and energy supply have been addressed by New Energy Vehicles (NEVs) [8]. By using environmentally friendly Artificial Intelligence (AI) algorithms, NEVs may perform better and have less of an influence on the environment [9]. However, there are still a number of technical issues that need to be addressed in order to fully realize the benefits of using sustainable AI algorithms in NEVs. One of the key technical challenges of using sustainable AI algorithms in NEVs is related to the complexity and diversity of real-world driving conditions [10]. Unlike traditional vehicles, NEVs rely on a variety of sensors and technologies to operate, including GPS, radar, Lidar, cameras, and ultrasonic sensors [11]. The copious amounts of data generated by these sensors must be precisely analyzed by AI algorithms in order for the vehicle to be controlled and decisions made. It calls for complex algorithms that can manage many data kinds in real time while maintaining efficiency and safety [12]. Another technical issue is related to the limited computational resources available in NEVs. Electric vehicles have smaller and lighter batteries, which cannot sustain the heavy computational requirements of AI algorithms for prolonged periods [13]. This problem is further exacerbated by the need to balance power consumption between propulsion and AI algorithms, as well as the requirement to ensure an uninterrupted power supply for critical functions in the vehicle. These technical challenges, there are also ethical and regulatory considerations that need to be taken into account when using sustainable AI algorithms in NEVs [14]. Ethical concerns surrounding the use of AI in autonomous vehicles include the potential for algorithmic bias, privacy concerns, and the question of who would be liable in case of accidents or malfunctions [15]. We are still in the early phases of developing the regulatory framework for AI algorithms and driverless cars. To guarantee the safe and responsible application of these technologies in NEVs, more development is required. The following constitutes the paper's primary contribution:

- Improved Energy Efficiency: The integration of sustainable AI algorithms in the development of New Energy Vehicles (NEVs) has significantly improved their energy efficiency. It is achieved through optimized control of various systems, such as battery management, electric motor control, and regenerative braking.

- Enhanced Safety: NEVs are equipped with a variety of sensors and cameras that collect a vast amount of data in real time. By using sustainable AI algorithms to analyze this data, NEVs can accurately identify potential hazards and provide timely warnings to the driver, thus improving safety on the road.
- Cost Reduction: The use of sustainable AI algorithms in the development and production of NEVs has resulted in cost reductions for manufacturers. By optimizing the design and performance of NEVs, AI algorithms can help reduce production costs, making these vehicles more accessible and affordable for consumers.

The next chapters make up the remainder of the research. The most current research-related efforts are described in Chapter 2. The suggested model is explained in Chapter 3, and the comparative analysis is covered in Chapter 4. Ultimately, chapter 5 presents the findings, and chapter 6 discusses the study's conclusion and future directions.

2. Related Words

Safiullah, S., et,al.[16] have discussed The robust frequency-voltage stabilization scheme utilizes artificial intelligence and a modified disturbance rejection controller to maintain stability in multi-area power systems. It incorporates electric vehicles and renewable energy sources to help regulate frequency and voltage levels, ensuring a reliable and efficient power supply. Varriale, V., et al.[17] have discussed how Digital technologies play a crucial role in production systems in achieving sustainable development goals by increasing efficiency, reducing waste, and promoting transparency. They enable real-time monitoring and optimization of resources, allowing for more sustainable production practices. Digital tools also facilitate communication and collaboration, supporting the implementation of sustainable strategies. Srivastava, P. R., et,al.[18] have discussed an explainable artificial intelligence (XAI) approach that uses transparent and interpretable methods to understand the complex relationship between economic growth, energy consumption, and sustainability. This approach allows for a deeper understanding of the factors driving energy consumption and can inform more effective policies and strategies for sustainable economic development. I. Ahmed et al. [19] have talked about An inventive IoT framework for a sustainable city that blends blockchain technology, AI algorithms, and IoT devices to create an efficient and sustainable city is made possible by blockchain and artificial intelligence. It makes safe and effective data sharing and analysis possible, which enhances resource management, urban planning, and citizen quality of life. The elderly-oriented design of HMIs in autonomous driving cars has been covered by Chen, Z. et al. [20]. They develop a user interface that is especially tailored to the requirements and skills of elderly people by combining rough set theory and backpropagation neural networks. With this method, senior users can use autonomous cars with greater safety and ease. The multi-stage model, described by Di Tommaso, A., et al. [21], uses the You Only Look Once version 3 (YOLOv3) algorithm to identify flaws in photovoltaic (PV) panels using visible and infrared pictures taken by an unmanned aerial vehicle (UAV). In the first stage of the model, YOLOv3 is used for initial detection, and in the second stage, additional processing is used to increase accuracy. Digital transformation, defined as the use of technology into every facet of corporate operations to improve productivity, creativity, and customer experience, has been covered by Malik, H., et al. [22]. This process has been considerably sped up by developments in artificial intelligence and machine learning, which automate activities, analyze data, and offer insightful information for decision-making. Businesses now have more productivity and are more competitive as a result. Foltyn, L., and others have talked about [23] The OPF method, which optimizes power flow and minimizes losses using a genetic algorithm, was implemented in a genuine Czech urban meshed distribution network. It determines the most effective network configuration by taking load demand and technological limitations into account, which lowers power losses and boosts overall performance. The ideal energy management regime for smart building clusters with electric vehicles has been covered by Shi, M., et al. [24]. Under this regime, a collection of buildings and the electric vehicles connected to them will have their energy efficiently controlled and distributed through the use of cutting-edge technology. To cut costs and advance sustainability, it entails tracking energy use, forecasting demand, and utilizing renewable energy sources. The predictive evaluation of spectrogram-based vehicle sound quality, which makes use of explainable artificial intelligence and data augmentation to improve the precision and comprehension of spectrogram images, has been covered by Kim, D., et al. [25]. This is accomplished by modifying the color, brightness, and contrast of the image, which aids in highlighting significant elements and patterns that enhance a car's overall audio quality. According to Kelm, P., et al. [26], hardware-in-the-loop validation is a testing method that uses real hardware components to mimic and validate a system's performance. In the case of energy management systems for LV distribution networks with renewable energy sources, this technique can be used to test the control algorithms and investigate how the system responds to different scenarios before to being installed in the real network. Shihavuddin, A. S. M., and associates [27] have discussed The image-based surface damage identification of renewable energy installations uses a unified deep learning technique to quickly and accurately identify and classify various types of surface defects on solar panels and wind turbines. This method allows for improved energy production and timely maintenance by automatically identifying and assessing the level of problems using artificial neural networks and image data. Ullah, I., and others have discussed [28] The Grey Wolf Optimizer (GWO) is a meta-heuristic algorithm inspired by the social behavior of grey wolves. Machine learning is used to predict the charging time of an electric car by optimizing the model parameters based on the objective function's fitness. Faster and more accurate charging time calculations are made easy with GWO, increasing performance and optimizing resource usage. In their discussion, Nath, P. C., et al. [29] Recent developments in artificial intelligence (AI) have demonstrated significant promise for transforming the agri-food sector through the advancement of sustainability. AI-powered instruments that maximize resource utilization, cut waste, and boost yields include farming robots, precision agriculture, and crop monitoring. AI can also assist ensure a more sustainable future for the sector by enhancing food safety and supply chain management. Bibliometric analysis, which entails applying statistical techniques to examine research publications, patents, and other sources in order to spot trends, patterns, and potential future developments on a certain subject, has been covered by Ullah, I., et al. [30]. This analysis can shed light on the present level of research and development as well as possible future developments in technology and adoption with regard to electric vehicles.

Table 1: Comprehensive Analysis

Authors	Year	Advantage	Limitation
Safiullah, S., et. al [16]	2022	Improved stability and dynamic performance due to reduced sensitivity to frequency and voltage variations in the system.	The high computational cost and complexity of implementation of AI-based controllers for large-scale power networks with numerous renewable energy sources and electric vehicles (EVs) may be one drawback.
Varriale, V., et. al [17]	2024	Digital technologies allow for efficient use of resources and data analysis, leading to better planning and decision-making for achieving sustainable development goals.	Limited access to digital technologies and internet connectivity in developing countries hinders the implementation of sustainable development goals.
Srivastava, P. R., et. al [18]	2023	Allowing for more transparent decision-making and accountability in addressing complex issues of energy consumption and sustainability.	Interpretability of results may be biased or incomplete due to reliance on pre-defined models and data.
Ahmed, I., et. al [19]	2022	Streamlined data management and decision-making processes due to automated analysis, leading to more efficient and effective resource allocation for sustainability.	High energy consumption and scalability issues may hinder the widespread adoption and implementation of the framework.
Chen, Z. et. al [20]	2024	Improved comfort and safety for elderly drivers due to user-	Possible user discomfort or unfamiliarity due to the use

		friendly HMI design based on advanced technologies.	of advanced technology and complexity of the interface.
Di Tommaso, A., et. al [21]	2022	The multi-stage model increases accuracy and reduces false positives by combining results from both IR and visible images.	Limited ability to detect defects in smaller or very faint PV panel components due to low resolution and lack of sensitivity in the imaging techniques used.
Malik, H., et. al [22]	2022	Increased efficiency and productivity through automation of repetitive and complex tasks, allowing for better allocation of resources and enhanced decision-making capabilities.	Limited access to resources and technologies may exclude certain individuals or organizations from fully benefiting from AI and ML advancements.
Foltyn, L., et. al [23]	2021	OPF solution with genetic algorithm can efficiently optimize complex Czech urban distribution networks while considering multiple constraints and uncertainties.	Genetic algorithm OPF may not be able to capture the complexities of real-time operation and control in the distribution network.
Shi, M., et. al [24]	2024	Efficient energy allocation leads to reduced overall energy consumption and cost, benefiting both the building clusters and electric vehicle users.	The study only considers a single type of energy management system and does not account for potential variations or alternatives.
Kim, D., et. al [25]	2022	Data augmentation provides a larger and more diverse training dataset, allowing for more accurate and robust evaluation of vehicle sound quality.	One limitation is that the color adjustment may not accurately capture the subtle variations in sound quality that humans can perceive.
Kelm, P., et. al [26]	2022	HIL validation allows for real-world testing of complex scenarios that may be difficult or unsafe to replicate in a physical system.	Inability to accurately simulate real-world weather conditions and grid interactions with multiple DERs, leading to incomplete validation of the system.

Shihavuddin, A. S. M., et. al [27]	2021	Accurate and automated identification of surface damage helps to increase efficiency and reduce maintenance costs for renewable energy installations.	Dependency on accurate and comprehensive training data, which may not always reflect real-world conditions and thus affect model performance.
Ullah, I., et. Al [28]	2023	The Grey wolf optimizer-based algorithm can handle high-dimensional data and nonlinear relationships, making it suitable for complex EV charging data.	As this algorithm is based on trial and error, it may not always converge to an optimal solution and can be sensitive to initial parameters.
Nath, P. C., et. al [29]	2024	Improved precision and efficiency in various tasks such as crop monitoring and yield prediction leading to resource conservation and increased productivity.	Dependence on data and access to technology can create inequalities and exclude smaller farmers from benefiting.
Ullah, I., et. Al [30]	2023	Bibliometric analysis provides a comprehensive and systematic overview of existing research, facilitating identification of knowledge gaps and future research directions.	Reliance on published literature may exclude important developments or innovations that have not yet been published or are not easily detected through bibliographic databases.

- Lack of data: In order to develop effective and accurate AI algorithms for new energy vehicles, a sufficient amount of data is required. However, there currently needs to be more data available for these vehicles, as they are still relatively new in the market.
- Accuracy and reliability: The accuracy and reliability of AI algorithms used in new energy vehicles are crucial for the safe and efficient functioning of these vehicles. However, there may be instances when the algorithms fail to accurately predict or respond to specific situations, leading to potential safety hazards.
- Limited battery life: AI algorithms used in new energy vehicles rely heavily on battery power, which is limited. This can lead to challenges in prolonging battery life and optimizing energy usage, ultimately affecting the overall performance and efficiency of the vehicle.

It is evident in the constant evolution of techniques and technologies used in the creative process. It involves the use of advanced software and tools, as well as the incorporation of different elements, such as lighting and texture, to achieve depth in the final design. In addition, the integration of psychology and color theory helps in selecting the most suitable colors for a specific space, considering factors such as lighting, function, and mood.

2. Proposed system

A. Construction diagram

- **Questionnaire Survey :**

A popular research technique for gathering data and information from a large number of people is the questionnaire survey. In order to collect data from respondents, a structured questionnaire with a number of questions is used. Finding the target audience and the study objectives is the first stage in conducting a questionnaire survey. This entails figuring out the precise data that must be acquired as well as the traits of the population that will be surveyed. Creating the questionnaire is the next stage after determining the goals and target audience.

The hybridization factor (HF) can be used to define and characterize the maximum EM power to ICE power ratio.

$$XP = \frac{F_{GN}}{F_{ICE} + F_{XGT}} = \frac{F_{GN}}{F_{XGT}}. \tag{1}$$

The drive cycle or vehicle trip, cooling, and the device's temperature tolerance are the primary factors that control the EM's performance.

Performance indicator Qi of the b_{th} The whole set of standardized attribute estimations with the weight of the criteria was identified as the alternative.

$$S_b = \sum_{a=1}^{m} z_a . l_{ba}, \tag{2}$$

The homogeneous function of the two arguments is the basis for creating a performance indicator of alternatives in the aggregation technique. S_{+b} and S_{-b} :

$$S_b = Q_{+b} + \left(\frac{\sum_{b=1}^{n} Q_{-b}}{Q_{-b} \sum_{b=1}^{n} \left(\frac{1}{S_{-b}} \right)} \right), \tag{3}$$

This necessitates giving considerable thought to the questions' phrasing and sequence in addition to the study objectives. To guarantee accurate and comprehensive answers, the questionnaire should be simple to read, brief, and easy to understand. The next stage after designing the questionnaire is to choose a sample of the intended audience. A representative sample is a subset of the population that encompasses the complete group. Sampling techniques like random and stratified sampling are used to ensure that the sample is representative and unbiased. The actual process of gathering data starts when the questionnaire and sample are finished. Surveys can be conducted using a range of methods, such as phone interviews, online questionnaires, in-person interviews, and mailed questionnaires.

- **CMW analysis :**

CMW (Continuous Multi-wavelength) analysis is a powerful technique used in atmospheric science to measure and study the properties of clouds and aerosols. It involves measuring the amount of light scattered by particles in the atmosphere at multiple wavelengths and using this data to determine the size, composition, and concentration of these particles.At the heart of CMW analysis is the principle that different types of particles scatter light differently depending on their size and composition. For example, large particles, such as raindrops or ice crystals, scatter light more strongly at longer wavelengths, while smaller particles, such as water droplets or tiny aerosols, scatter light more strongly at shorter wavelengths. By measuring the amount of light scattered at multiple wavelengths, researchers can gather information about the size and type of particles present in the atmosphere.

A homogeneous function was employed to ascertain the alternate Qi's performance indicator:

$$S_b = \frac{Q_b^-}{Q_b^+ + Q_b^-}, \tag{4}$$

The group utility S and maximal R techniques are expressed as follows:

$$L_b = \max_b h_{ba}; L* = \min_b Q_b; L^- = \max_b L_b \tag{5}$$

$$S_b = t.\left(\frac{Q_b - Q*}{Q^- - Q*}\right) + (1-t).\left(\frac{L_b - L*}{L^- - L*}\right). \tag{6}$$

Option A1, which was suggested as a compromise solution, was best evaluated by Q (minimum) provided the two supplementary requirements were satisfied:

To perform a CMW analysis, researchers use a spectrophotometer, a device that measures the intensity of light at different wavelengths. The spectrophotometer is pointed towards the sky and measures the amount of light scattered in different directions by particles in the atmosphere. This data is collected at multiple wavelengths, typically spanning from ultraviolet to infrared, and can cover a wide range of particle sizes.

- **Convergent validity :**

Convergent validity is an essential concept in research methodology, particularly in the field of psychology and social sciences. It refers to the extent to which two or more methods of measuring the same construct or phenomenon produce similar results. In other words, it assesses whether different measures of the same thing are consistent with one another. The process of establishing convergent validity involves comparing multiple measures of the same construct or variable. These measures can include self-report questionnaires, behavioral observation tasks, or other forms of data collection.

$$S\left(J_2\right)-S\left(J_1\right)\geq\frac{1}{\left(n-1\right)}, \tag{7}$$

Determine the difference between the model estimates for the two items and the inclination records V.

$$c_{bq}=j_{ba}-j_{qa};X_a\left(c_{bq},f,s\right);T_{bq}=\sum_{a=1}^{m}z_a.X_a-\left[n\times m\right]matrix \tag{8}$$

Dual-step Res-algorithm for converting cost credits into benefit attributions

$$L_{ba}=Norm\left(j_{ba}\right),\forall a=1,...,m \tag{9}$$

wherein the technique of linear normalization Index j* satisfies the cost criterion after the first step was applied to both the benefit and cost characteristics.

The critical factor is that they all aim to assess the same underlying construct. To determine the convergent validity of the measures, researchers typically use statistical techniques such as correlation analysis. This entails figuring out how closely related or associated the various measures are. The measures are assumed to be assessing the same thing and to have convergent validity if the results indicate a strong positive correlation between them. A crucial component of evaluating convergent validity is taking the measures' dependability into account. The consistency or stability of the outcomes generated by a measure is referred to as reliability. Convergent validity is unlikely to occur if the measures lack reliability. This is due to the requirement that inconsistent or unstable outcomes appropriately represent the underlying construct.

- **Discriminant validity :**

A statistical concept known as discriminant validity is applied in research to evaluate how dissimilar several measurements of a construct are from one another and how they do not measure the same underlying construct. Construct validity, or the degree to which a measure accurately captures the intended theoretical concept, is a crucial subject to understand. The following figure 1 displays the construction diagram.

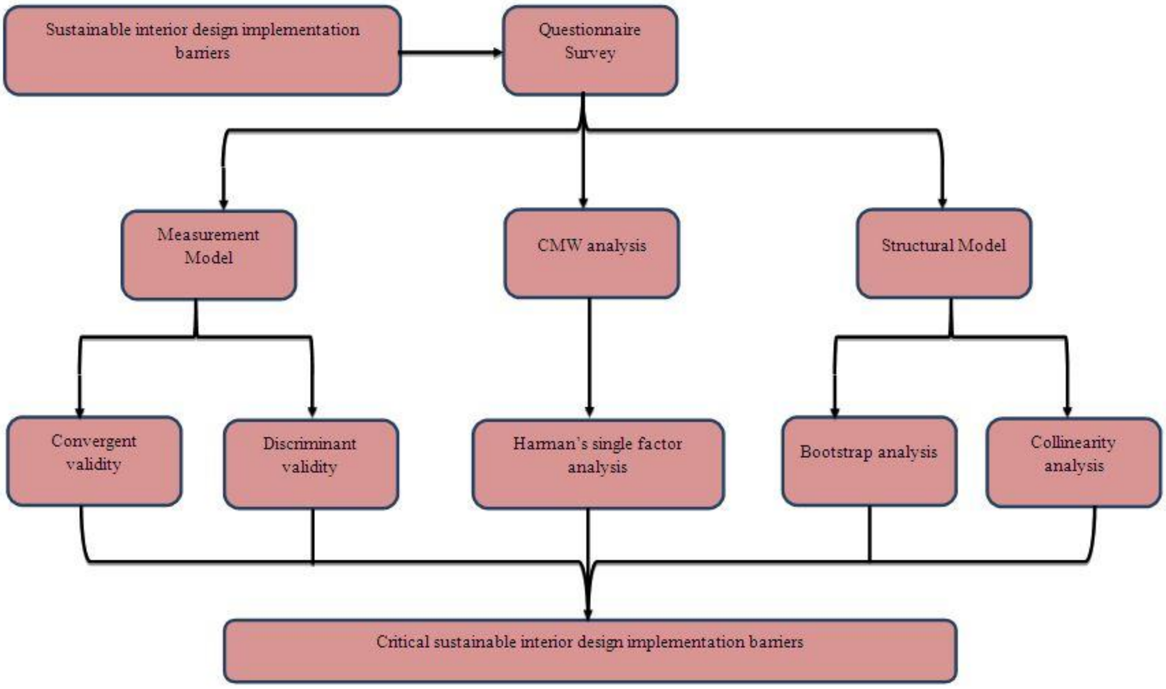

Figure 1: Schematic of construction

It is crucial to comprehend the idea of convergent validity before attempting to comprehend discriminant validity. The degree of positive correlation between various measures of the same construct is known as convergent validity. This is significant because it could mean that distinct measures of the same construct are not drawing from the same underlying concept if their relationships are not positive. Conversely, discriminant validity is the antithesis of convergent validity. It is the degree to which there is no correlation between two different measures of two different constructs.

Calculate weights of criteria:

$$z_a = t_a / \sum_{a=1}^{m} t_a \quad (10)$$

The values of the P in this case study were presented in Tab. 6.

Determine relative deviation matrix $T = (T_{ba})[n \times m]$matrix

$$t_{ba} = \frac{(j_{ba} - i_a)}{(i_a - v_a)}. \quad (11)$$

In other words, discriminant validity ensures that measures of one construct do not overlap with measures of another construct. While there are other methods for evaluating discriminant validity, confirmatory factor analysis (CFA) is the most widely used technique.

CFA is a statistical method used to verify or disprove a set of variables' proposed component structure.

- **Harman's single factor analysis:**

The major factor method, sometimes referred to as the single-factor method or Harman's single-factor analysis, is a statistical methodology that finds the underlying factor structure in a set of data. It is predicated on the idea that the bulk of the common variance between the variables may be explained by a single dominant factor. Gathering a set of variables thought to be connected to a certain construct or idea is the first stage of Harman's single-factor analysis. Surveys, questionnaires, and other data sources may provide these factors. Compute the correlation matrix for these variables as the following step.

Find vector (c) and compute the weight of the wk criterion.

$$d_y = Qv_y . \sum_{a=1}^{m} \left(1 - Dl_{ya}\right), y = 1, ..., m \tag{12}$$

Determine the weight assigned to each criterion:

$$\omega_a = \frac{1 - g_a}{m - \sum_{a=1}^{m} g_a}, a = 1, ..., m \sum_{a=1}^{m} \omega_a = 1. \tag{13}$$

The internal intensity of contrast or the degree of divergence of each criterion's internal information is represented by the value (1−ej).

The relationship between each pair of variables, both in intensity and direction, is represented by this matrix. Using the principal component analysis (PCA) method, a factor analysis is then carried out on the correlation matrix. PCA is a statistical method that tries to preserve as much of the original variance as possible while condensing a large number of variables into a smaller set of elements. A single factor is taken out of the data in Harman's single-factor analysis. The procedure of factor extraction entails figuring out each factor's eigenvalue. Eigenvalues show how much of the variance is accounted for by each component.

- **Bootstrap analysis :**

Bootstrap analysis, also known as the bootstrap method, is a resampling technique used in statistical analysis to assess the variability and accuracy of a parameter estimate or statistical model. Bradley Efron developed it in the late 1970s, and it has since become a widely used tool in data analysis. The fundamental idea behind bootstrap analysis is to generate new datasets of the same size as the original by repeatedly sampling the existing dataset with replacement. This process is known as resampling. Resampling allows for the evaluation of the variability and uncertainty of a statistical estimate or model by replicating the process of data collection. Each of these new datasets is then used to estimate the parameter of interest, such as mean, median, or regression coefficients. This results in a distribution of estimates called the bootstrap distribution. By examining the spread of this distribution, we can gain insight into the accuracy and variability of the original estimate. The fact that bootstrap analysis doesn't make any assumptions about the data's underlying distribution is one of its key benefits. In real-world data, when the distribution might not be known, this is frequently the case. Bootstrap analysis also accounts for the potential bias in the original estimate, which small sample sizes or non-normal data can cause.

- **Collinearity analysis :**

Regression models employ multicollinearity analysis, also known as collinearity analysis, as a statistical tool to assess the association between independent variables. It is a crucial stage in the regression analysis process since high levels of collinearity may affect the computed coefficients' stability and reliability as well as our ability to understand the relationship between the independent and dependent variables. The first step in the collinearity analysis procedure is to find the correlation matrix between each pair of independent variables using the Pearson correlation coefficient.

The ranking-based MCDM model for each elective Ai establishes a certain exhibition level of the choices Qi based on the ranking of the other options, and the consequent decision-making was obtained.

$$J_b \xrightarrow{P} S_b, b = 1, ..., n, \tag{14}$$

$$S = P\left(J, D, C, \omega, mn, cn, fl\right), \tag{15}$$

The alternatives were ranked according to the aggregate performance indicator of the alternatives, or Q. The SAW ranking model can be expressed simply as follows:

$$S_b = \sum_{a=1}^{m} z_a . l_{ba} . \tag{16}$$

Where are the regular estimations of the qualities, obtained via the use of one of the standardization approaches, standardized? There was no clear argument to F in any of them.

e. It was wise to identify a relative indicator to evaluate the distinguishability of alternatives, given that they were ranked based on where they fell in the ordered list of performance indicators:

$$cS_f = \left(S_f - S_{f+1}\right) / rng\left(S\right).100\%, \; f = 1, ..., n-1. \tag{17}$$

where; s_f is the value of the performance indicator corresponding to the p-rank alternative, $\text{rng}(S) = S_b - S_n$.

This shows the linear relationship (values ranging from -1 to +1) between the variables. Strong positive correlations are shown by high positive values, and strong negative correlations are indicated by high negative values. The variance inflation factor (VIF) and the tolerance value are next examined in order to determine the degree of correlation between the variables. The variance inflation factor (VIF) calculates the extent to which collinearity with other independent variables inflates the variance of an estimated coefficient. Every variable in the model is regressed against every other variable to calculate it. While a VIF of 5 or higher is frequently seen as harmful, a VIF of 1 implies no collinearity.

B. Functional working model

- **Search control :**

The Search control is a feature that allows users to easily find specific content or information within a system or platform. This operation is typically used in website search bars, database systems, and even mobile applications. It utilizes a set of complex algorithms and processes to efficiently retrieve relevant data based on the user's search query. To begin with, the Search control works by first indexing all the content or data within the system. This means that the search engine creates a structured database of the information contained in the system, using specific keywords and metadata to organize and categorize the data.

In the Laplace domain, the electrical equation of the Thevenin model (1RC model) is as follows:

$$T_v(Q) = T_{od}(q) - B_R(q)\left(L_o + \frac{L_f}{1 + L_f D_f q}\right) \quad (18)$$

In [38], several Thevenin-type battery devices are reviewed. The battery model's accuracy may be increased by adding more RC networks, but doing so also makes it more complex.

Figure 6 shows an example of a system with an impedance-frequency plot. This system's equivalent impedance can be found with the help of the following equation:

$$W_g = L_o + \frac{L_1}{1 + a\omega L_1 D_1} \quad (19)$$

When Z is the frequency, j is the unit imaginary number, and the remaining parameters are as shown in the picture.

When the coefficients are listed in Table 5, where K is the total resistance and the two parameters, C and, are defined as follows.

$$D_{+} = 21\frac{\partial O}{\partial d_{s,g+}}, D_{-} = 21\frac{\partial O_{-}}{\partial d_{q,g-}} \quad (20)$$

$$Y = \frac{L_{dv+}}{jd_{q+}}\frac{1}{J\delta_{+}} - \frac{L_{dv-}}{j_{q-}}\frac{1}{J\delta_{-}} - \frac{L_{p}}{J} \quad (21)$$

In other words, a ROM has been found for the analytical model that the G transfer function presents.

When a user starts a search, the indexing process helps the search engine find and get pertinent content fast. The search control then analyzes and determines the most relevant results for the user based on a combination of algorithms and ranking factors once the user inputs a search query. In order to precisely match the search terms with the indexed material, a procedure known as "query processing" entails segmenting the search query into individual keywords, getting rid of stop words, and using linguistic variants. The search control also considers other ranking elements, like how frequently the search term appears in the material, how close the keywords are to one another in the content, and how well-liked the content is based on user engagement metrics.

- **Search Engine :**

A search engine is a software system designed to retrieve information from a vast collection of data, commonly known as the World Wide Web. Its goal is to provide users with relevant and valuable results when they enter a query or search term. The process of search engine operations can be divided into three main stages: crawling, indexing, and ranking. Firstly, the search engine starts by sending out a crawler, also known as a spider or bot, to gather data from different web pages. The crawler follows links and navigates through the web, collecting information and storing it in the search engine's database. The functional block diagram is displayed in fig. 2.

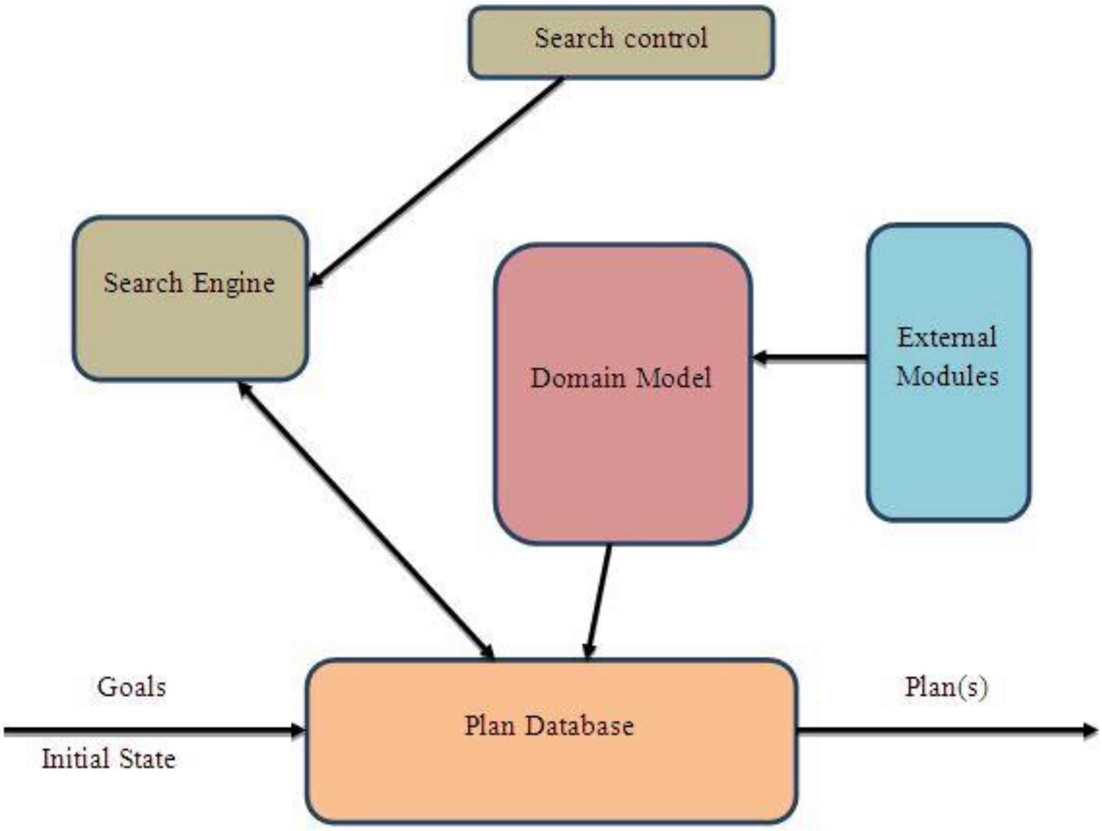

Fig 2: Functional block diagram

Once the data has been collected, the indexing stage begins. Indexing involves organizing the collected information into a structure that makes it easy and efficient to retrieve later. This process includes creating an index of keywords and phrases from each page, assigning them relevant categories, and storing them in the search engine's database.

The parameters vector (T) in the PEM algorithm is chosen to minimize the prediction error, which is defined below.

$$\varepsilon\left(v_y,\theta\right)=k\left(v_y\right)-k\left(v_y\left|v_{y-1};\theta\right.\right) \quad (22)$$

where 1 is the expected value of the output at time k using the parameters T, and k y t is the goal output at time k. The optimal values for the model parameters must then be determined by applying an iterative minimization process.

The Gauss-Newton search strategy performs effectively in this situation since battery characteristics are within a narrow range and a reliable initial estimate is supplied.a As a result, the following is how a scalar fitness function is minimized:

$$G_M(\theta) = Det\left(\frac{1}{M}\sum_{y=1}^{M}\varepsilon\left(v_y,\theta\right)\varepsilon^V\left(v_y,\theta\right)\right) \quad (23)$$

Because battery SOC has a major impact on battery behavior, it is the most often utilized variable in battery models. This indicates that each model parameter is viewed as a function of SOC in the following ways:

$$h_b = p_b\left(QUD\right), b = 1, 2, ..., M \quad (24)$$

where N is the number of parameters, x is the model parameter, and f is the function that links x to SOC.

Ranking is the last phase of a search engine's activity. Here, the search engine evaluates each indexed page's value and relevancy to a specific search query using intricate algorithms. The number of times a keyword appears on the page, the relevancy and quality of the content, and the website's authority are only a few of the variables the search engine takes into account.

- **External Modules :**

External modules in TypeScript are reusable code units that can be imported into a TypeScript project. These modules can contain classes, interfaces, functions, and variables that other parts of the code can use. They allow for the organization and separation of code, making it easier to maintain and modify projects. When importing an external module, the TypeScript compiler will look for a definition file, typically denoted by the extension .d.ts, which contains information about the module's types and functions.

With temperature added as the second variable to the f function, the battery model's parameters would be as follows.

$$h_b = p_b\left(QUD, V\right), b = 1, 2, ..., M \quad (25)$$

Another factor that might affect battery behavior is the current rate. Experiments demonstrate that the total energy collected from the battery during discharging varies when the current rate is changed while keeping all other parameters constant.

Tables [44] and [73] illustrate how the model has to include one extra variable in order to account for this phenomena.

$$h_b = p_b\left(QUD, V, B\right), b = 1, 2, ..., M \quad (26)$$

We would have a fairly ideal model if we took into account all SOC, temperature, and current rate variables.

In general, a metric known as battery state-of-health (SOH) can take into account battery degeneration (caused by aging or other factors). By including SOH in the model, we obtain:

$$h_b = p_b\left(QUD, V, B, QUX\right), b = 1, 2, ..., M \quad (27)$$

If we considered all the variables related to SOC, temperature, and current rate, we could create a nearly perfect model.

When the power generated from renewable energy and batteries falls short, distributed generation (DG) is employed in a hybrid energy system to fulfill the load demand. According to Equation 5, the fuel consumption of DG depends on its output power at each time step.

$$P_{cons} = j.F_{CE} + i.F_{CE\_l} \quad (28)$$

where a and b are constants (L/kW), representing the coefficients of fuel consumption, with standard values of 0.08415 and 0.246, respectively. In the equation, p(t) represents the power generated by DG (kW) at each hour (t), Fcons stands for fuel consumption (L/h), and PDG_r represents the rated power of DG generated at each hour (t).

This is important as TypeScript is a statically typed language and needs to know the type information of imported modules in order to perform type checking and provide type completion. Once the module has been imported, its contents can be accessed and used in the importing file. This is done by using the import keyword followed by the name of the module and the specific entities to be imported within curly braces. For example: 'import {ClassName, functionName} from './module." This allows for flexibility, as only the needed entities can be imported instead of the entire module. One benefit of using external modules is that they can be shared between multiple projects. This is particularly useful when working with large or complex projects that require different pieces of code to be reusable.

- **Domain Model :**

A conceptual depiction of a system or organization's problem domain is called a domain model. It encapsulates the domain's pertinent behaviors as well as its key entities and relationships. This model is the cornerstone upon which software systems are developed and is essential to guaranteeing the precision and coherence of the system's design. Finding the pertinent entities inside the issue domain is the first stage in creating a domain model. These entities, which stand in for the essential components of the domain, are usually modeled on actual people, places, or things.

It is possible to ascertain a battery's state of charge in both the discharge and charge settings.

$$G_i\left(v+1\right) = G_i\left(v\right) \times \left(1-\sigma\right) - \left(\frac{G_r\left(v\right)}{\mu_{cnv}} - G_e\left(v\right)\right) \times \mu_{IC} \quad (29)$$

where the power generated and energy demand are represented by El (t) and Eg (t), respectively. The discharge and charge efficiencies of the battery are denoted by ηBD and ηBC, respectively.

The implementation of RF establishes the minimum level of renewable energy that the HRES must provide in relation to the total load. RF can be evaluated by using.

$$LP(\%) = 1 - \frac{\sum f_{CE}}{\sum F_{FT} + F_{ZV} + F_{CE}} \tag{30}$$

Each particle in the swarm can have its position and speed changed using the following methods:

$$X_{y+1}^{b} = H_{y}^{b} + t_{y+1}^{b} \tag{31}$$

where in iteration k, X represents particle position and v represents particle velocity:

$$t_{y+1}^{b} = \left[\omega t_{y}^{b} + D_1 l_1 \left(f_{y}^{b} - H_{y}^{b} \right) + D_2 l_2 \left(f_{y}^{e} - H_{y}^{b} \right) \right] \tag{32}$$

where I is the inertia, which causes the particle to travel in a specific direction at a given speed. The learning parameter is denoted by the phrase $C1r1(Pki - Xki)$.

Each entity is defined by its attributes, which further describe its characteristics and properties. Once the entities have been identified, the relationships between them are determined. These relationships define how the entities interact with each other and represent the dependencies within the domain. There are different types of relationships, such as associations, aggregations, and compositions, each with its characteristics and constraints. After defining the entities and their relationships, the next step is to specify the behaviors of the domain. This includes the actions that the entities can perform and the rules that govern those actions.

- **Plan Database :**

Plan Database (PDB) is a vital component of a telecommunications network management system. It is a centralized repository that stores and manages all the network planning data for a company or service provider. The PDB is designed to cater to the complex requirements of managing network planning processes by providing reliable and efficient data storage, retrieval, and sharing capabilities. The primary purpose of the PDB is to keep track of all the network elements and resources required for network planning, such as equipment, circuits, and cables. It also stores information like network topology, subscriber information, and service provisioning rules. This vast amount of data makes the PDB an indispensable tool for planning, designing, and optimizing networks. Three primary categories can be used to categorize PDB operations: data input, data storage, and data retrieval.

The second phase involved using Equation to evaluate the net electric load at each time step associated with the constructed profiles.

$$G_{mR} = G_R + GT + XF + GI + GB \tag{33}$$

where: El is the electrolyser to cover the H2 load; EV is the electric demand of the EV; HP is the driving power of the HP; and EB is the power consumption of the EB.

When hunting, grey wolves encircle their victim. The encircling behavior of grey wolves is seen in the following equations.

$$\vec{C} = \left| D.\vec{H}_f(v) - \vec{H}(v) \right| \tag{34}$$

$$\vec{H}(v+1) = \vec{H}_f(v) - J.\vec{C} \tag{35}$$

If A and C are the coefficient vectors, t represents the current iteration, XP stands for the prey's position vector, and X stands for the position vector of a grey wolf.

The PDB receives data from various sources, such as network management systems, inventory systems, and manual inputs from network engineers. This data is then organized and stored in a structured format in the PDB using a standardized data model. This data can include information about network elements, their locations, attributes, and relationships with other network elements. The PDB uses a combination of database management systems and customized software to store all the planning data.

C. Operating principles

- **Building performance simulation :**

Building performance simulation, or BPS, is a potent instrument that helps experts in the field of construction assess and maximize a building's performance over the course of its lifetime. In order to model and simulate many characteristics of a building, such as its energy consumption, thermal comfort, daylighting, and indoor air quality, computer software is used.a Building performance predictions and decision-making can be aided by the application of BPS throughout a building's design, construction, and operating stages.

The additional coefficient vectors for A and C are expressed by

$$J = 2jl_1 - j \tag{36}$$

$$j = 2 - v \frac{2}{\max\_iter} \tag{37}$$

where an is a linearly declining coefficient from 2 to 0, $\boldsymbol{U}1$ and $\boldsymbol{U}2$ are equally distributed random values 0 and 1, and Matrix is the maximum number of repetitions.

In every iteration, the optimal solutions from alpha (α), beta (β), and delta (δ) are preserved, and the remaining omega (ω) wolves adjust their placements in response to them. A grey wolf's revised positions are shown in Figure 5. Regarding this, the following formulas are suggested:

$$\vec{C}_{\alpha} = \left| D_1 . \vec{H}_{\alpha} - \vec{H} \right| \tag{38}$$

$$\vec{C}_{\beta} = \left| D_2 . \vec{H}_{\beta} - \vec{H} \right| \tag{39}$$

$$\vec{C}_{\delta} = \left| D_3 . \vec{H}_{\delta} - \vec{H} \right| \tag{40}$$

The location vectors of alpha (α), beta (β), and delta (δ) are denoted by the symbols $X\alpha$, $X\beta$, and $X\delta$, respectively. The vectors $C1$, $C2$, and $C3$ are produced randomly, whereas X is the position vector of the individual in question.

At its core, BPS works by simulating the physical behavior of a building and its systems using mathematical equations and algorithms. These equations are based on physical principles such as heat transfer, fluid dynamics, and thermodynamics. The software takes into account the building's geometry, construction materials, weather data, occupancy patterns, and equipment to accurately simulate its performance. One of the critical operations of BPS is the creation of a detailed 3D model of the building. This model is the basis for all the simulations and must accurately reflect the building's geometry and construction properties. To create this model, building information modeling (BIM) software is often used. BIM allows for the integration of different building systems and components into a single, detailed model, making it an ideal starting point for BPS.

- **Generative design :**

Using sophisticated algorithms and computer processing, generative design is a powerful computational method that produces designs for structures or objects. This technology is not like the old design processes that use human input and artistic vision to manually create designs. With generative design, the computer takes over the majority of the design process, using a set of rules and parameters to create multiple design options within a specified set of constraints. The first step in generative design is the creation of a design space, which defines the parameters and specifications for the design. This can involve elements like the characteristics of the material, limitations on size and shape, and performance standards. The operating flow diagram is displayed in fig. 3 below.

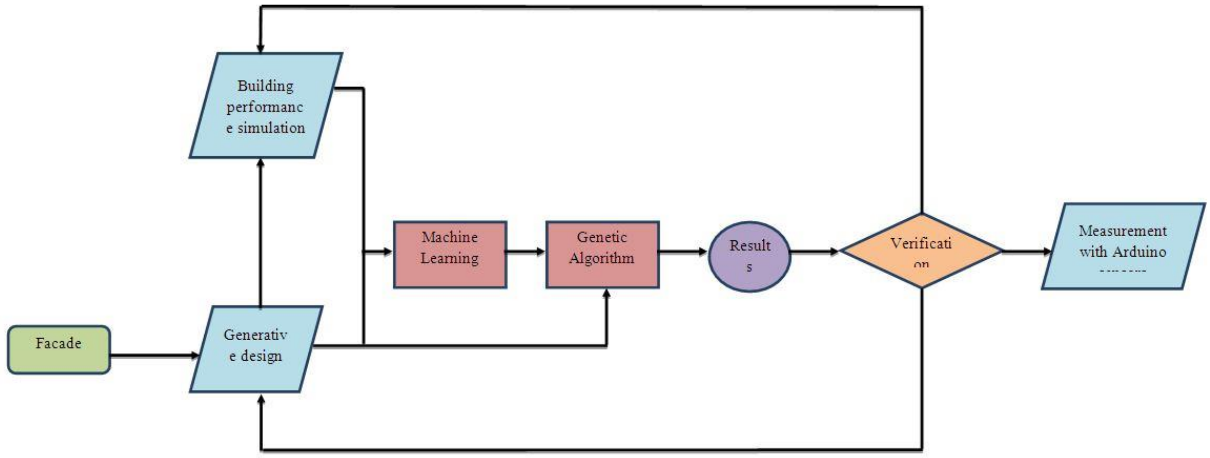

Fig 3: Operational flow diagram

Once the design space is established, the computer uses mathematical algorithms to generate a vast number of potential design solutions. These solutions are not copies or variations of existing designs but rather unique and optimized options that meet the specified criteria. The generative design process uses a combination of algorithms, such as evolutionary algorithms, machine learning, and artificial intelligence, to generate and evaluate potential designs.

where the vectors $A1$, $A2$, and $A3$ are produced at random. A new position (solution) is created by combining the three best positions.

$$\vec{H}(v+1) = \frac{z\vec{H}_1 + z\vec{H}_2 + z\vec{H}_3}{3} \quad (41)$$

The weight is represented by the coefficient w to x1, x2, and x3. In this investigation, an equal coefficient is taken for granted.

These algorithms develop and analyze designs using a range of mathematical and computational methods, such as randomized mutation, simulated annealing, and iterative optimization. These algorithms operate constantly, improving the designs in response to criticism and examination.

- **Machine Learning :**

A subfield of artificial intelligence called machine learning aims to teach computers how to learn and form opinions without the need for explicit programming. Computers may use this technique to scan through massive volumes of data, look for patterns and correlations, and then utilize that information to make predictions or take action. Algorithms and statistical models are used to accomplish this, enabling the machine to continuously improve its performance based on the data it receives. Any machine learning process starts with gathering and preparing the data. This entails determining which data are pertinent to the current issue and then cleaning and formatting them to make sure they are in a manner that can be used.

Given a dataset consisting of M distinct samples satisfying both $xi \in Rd1$ and $yi \in Rd2$, the hidden neuron network (SFNN) may be defined as follows.

$$\sum_{b=1}^{M} \beta_b p\left(Z_b^V H_a \mid +i_b\right), a \geq N \geq 1$$

(42)

where f stands for the activation function, Yi for the output weight, bi for the bias, and Yi for the weight connecting the input and hidden layers.

In an ideal world, the ELM structure would resemble the output data:

$$\sum_{b=1}^{M} \beta_b p\left(Z_b^V X_a + i_b\right), a \geq N \geq 1$$

(43)

Each neuron weights and summarizes the inputs, which are then sent to a transfer/activation function—also known as the neuron function. During regular functioning, there is no input between layers.

$$T_y = \sum_{a=1}^{m} z_{ya} H_a$$

(44)

For DP deterministic implementation (DDP), this cost function, A, can be written as

$$A = \sum_{y=0}^{M-1} e_y\left(h_y, o_y, z_y\right) + e_M\left(h_M\right)$$

(45)

where N g denotes the terminal cost, k g represents the additive cost incurred at time k, and X, U, and W stand for system states, control decisions, and disturbances, respectively.

This data could consist of both unstructured information like text, photos, and videos, and structured information like numerical or category values. The prepared data is then loaded into a machine-learning model, which is essentially a mathematical model of an actual situation. Machine learning models come in a variety of forms, each having advantages and disadvantages, including regression, decision trees, and neural networks. The data is fed into an algorithm to train the model, which modifies the model's parameters to maximize accuracy or minimize error rate.

- **Genetic Algorithm :**

The heuristic optimization method known as the Genetic Algorithm (GA) is modeled after the natural selection process in evolution. In several domains, including artificial intelligence, machine learning, and optimization, this well-liked and effective technique is employed. The key idea behind GA is to mimic the process of natural selection by creating a population of potential solutions, evaluating their fitness, and selecting and breeding the fittest individuals to generate new and improved solutions. The GA algorithm starts with a randomly initialized population of potential solutions, known as individuals or chromosomes, each representing a possible solution to the problem at hand.

In statistical words, the cost function in SDP is therefore reformulated as expected cost.

$$A = G_z\left[\sum_{y==0}^{M-1} e_y\left(H_y, O_y.z_y\right) + e_M\left(H_M\right)\right]. \quad (46)$$

The algorithm used in SDP and DDP with estimated cost is the same [3]. This method was proposed to lessen the PHEV EMSs' reliance on drive cycles.

This enables the unification of gasoline and energy consumption into a single goal and illustrates the fact that electricity accumulated in the battery is not "free" when going from the engine recharging mode.

$$\min\left(\sum_{v=1}^{M} n_{foq}\left(v\right)\right)\forall v \quad (47)$$

$$n_{foq}\left(v\right) = n_p\left(v\right) + m_{foq}\left(v\right) = n_p\left(v\right) + q\left(v\right)\frac{F_{ball}\left(v\right)}{S_{LHV}} \quad (48)$$

Only when the temperature parameter meets the Boltzman criterion and decreases monotonically are new solutions accepted:

$$f\,' < \exp\left(\frac{-\Delta G}{V}\right); withV\left[y+1\right] = \alpha, V\left[y\right] \quad (49)$$

where V and α represent a random uniformly distributed value, the iteration's temperature, the cooling parameters, and a comparison between the current and candidate solution, respectively.

However, because of its short runtime, this technique could produce less-than-ideal results and does not formally impose constraints, which should be taken into account by adding penalty functions to the fitness function.

These individuals are encoded as strings of bits or other data structures, depending on the problem. For example, a binary string can represent a solution for a problem with binary variables, while a real-valued array can represent a solution for a problem with continuous variables. The assessment of these people's fitness is the next phase in the GA. It is carried out by a fitness function, which gives each person a fitness value according to how well they answer the problem. Stated differently, the fitness function establishes an individual's proximity to the ideal solution.

- **Measurement with Arduino sensors :**

Measurement with Arduino sensors involves a variety of operations that allow for accurate and precise data collection in a wide range of applications. In order to understand the operations of measurement with Arduino sensors, it is essential first to understand what an Arduino sensor is and how it works. An Arduino sensor is a device that measures some physical quantity, such as temperature, light, or pressure. It converts it into an electrical signal that an Arduino microcontroller can read. These sensors typically consist of one or more transducers, which convert a physical input into an electrical output, and a microcontroller, which processes and interprets the signal. The first step in using an Arduino sensor is to choose the appropriate sensor for the application.

$$P(h) = \frac{1}{A(h)} + \sum_{b=1}^{m} \alpha_b . F_b(h)$$

(50)

In order to penalize for violating restrictions, F is minimized while the objective function, positive constant penalization, and penalty function are maximized, respectively.

A detailed discussion of the weight matrix's sensitivity may be found in Section 5.3. Lastly, the approach utilized in Fuzzy TOPSIS to determine the coefficient of closure is extended to characterize the system's flexibility using EIPD.

$$Flexibility = \frac{1}{1 + G(IPD)}$$

(51)

The total amount of time needed for simulation (V Sim) and optimization (V Tot) equals the total computing time.

$$V_{Tot} = V_{opt} + V_{sim}$$

(52)

Taking into account the GPU computation's stochastic model, V opt is relatively low in comparison to V Sim. The computational time grows linearly with the number of scenarios for the same reason.

Numerous types of sensors are available, each with unique properties and sensing capacities. After selecting a sensor, its input pins are linked to an Arduino microcontroller. These pins are made to take in an electrical signal from the sensor and transform it into a digital value that can be handled by the microcontroller. The sensor has to be calibrated after it is linked to the microcontroller. The process of calibrating a sensor involves modifying its output to take into consideration any errors or fluctuations in the measurement.

4. Result and Discussion

The performance of proposed method Eco-Friendly Art and Color Selection Algorithm for New Energy Vehicles (EFAACS-NEV) have compared with Sustainable Design and Color Recommendation Algorithm for New Energy Vehicles (SDCR-NEV), AI-driven Sustainable Color and Design Selection Algorithm for New Energy Vehicles (AISCDSA-NEV) and Energy-Efficient Art and Color Selection Algorithm for New Energy Vehicles (EEACS-NEV).

4.1. Efficiency of AI algorithm:

The performance of the AI algorithm used for Art Design and Interior Color Selection should be evaluated based on its efficiency in gathering and analyzing data. It includes speed and accuracy in identifying design options and color palettes that align with the sustainable characteristics of new energy vehicles. Table.2 shows the comparison of Efficiency between existing and proposed models.

Table.2: Comparison of Efficiency (in %)

No. of Images	SDCR-NEV	AISCDSA-NEV	EEACS-NEV	EFAACS-NEV
100	59.83	60.96	51.70	74.25
200	61.57	62.54	53.12	75.54
300	63.91	64.74	54.38	76.55
400	64.72	66.37	56.37	77.44
500	67.01	67.51	58.84	77.81

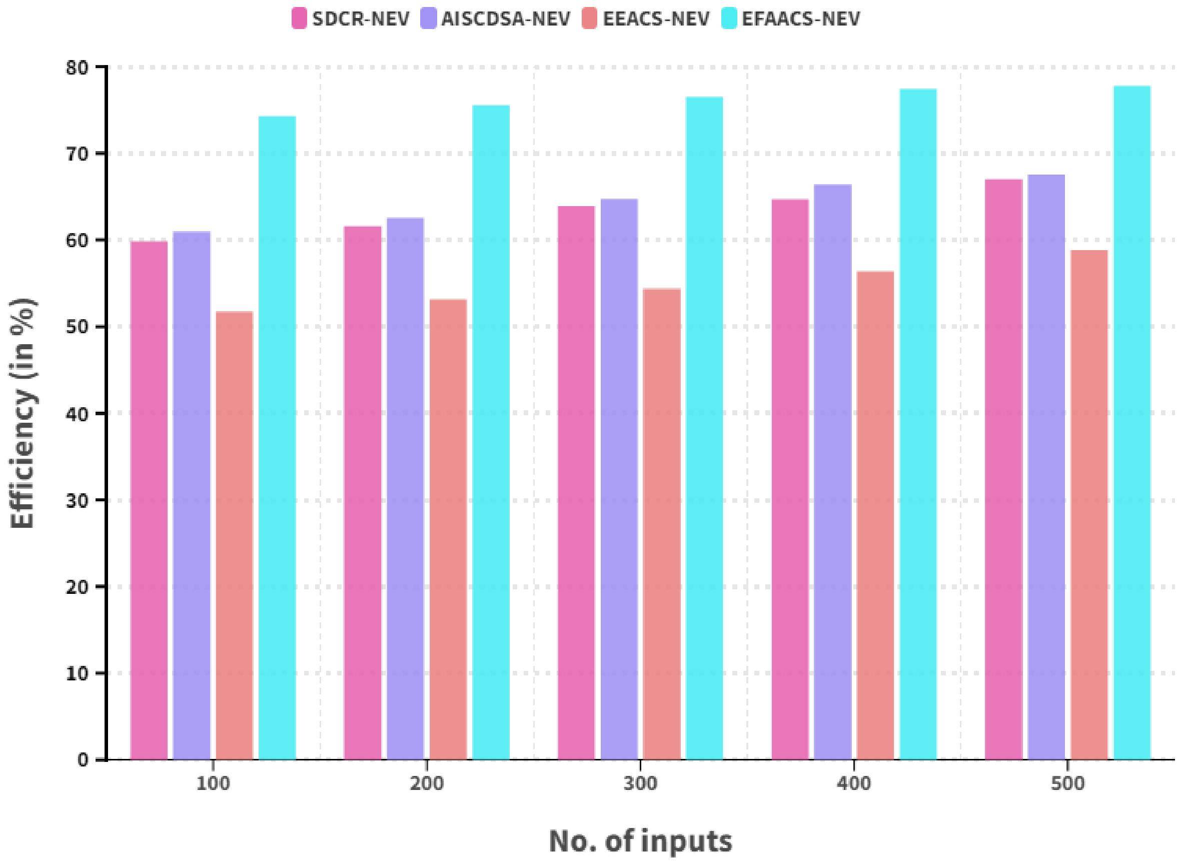

Fig.4: Comparison of Efficiency

Fig. 4 shows the comparison of Efficiency . In a computation cycle, the existing SDCR-NEV obtained 67.01 %, AISCDSA-NEV obtained 67.51 %, EEACS-NEV reached 58.84 % Efficiency. The proposed EFAACS-NEV obtained 77.81 % Efficiency.

4.2. Compatibility with sustainable criteria:

The AI algorithm should be able to integrate sustainable criteria, such as energy efficiency and the use of eco-friendly materials, into the design and color selection process. It should also be able to adapt to different sustainability standards and guidelines. Table.3 shows the comparison of sustainable criteria between existing and proposed models.

Table.3: Comparison of sustainable criteria (in %)

No. of Images	SDCR-NEV	AISCDSA-NEV	EEACS-NEV	EFAACS-NEV

100	63.83	64.96	55.70	79.25
200	65.57	66.54	57.12	80.54
300	67.91	68.74	58.38	81.55
400	68.72	70.37	60.37	82.44
500	71.01	71.51	62.84	82.81

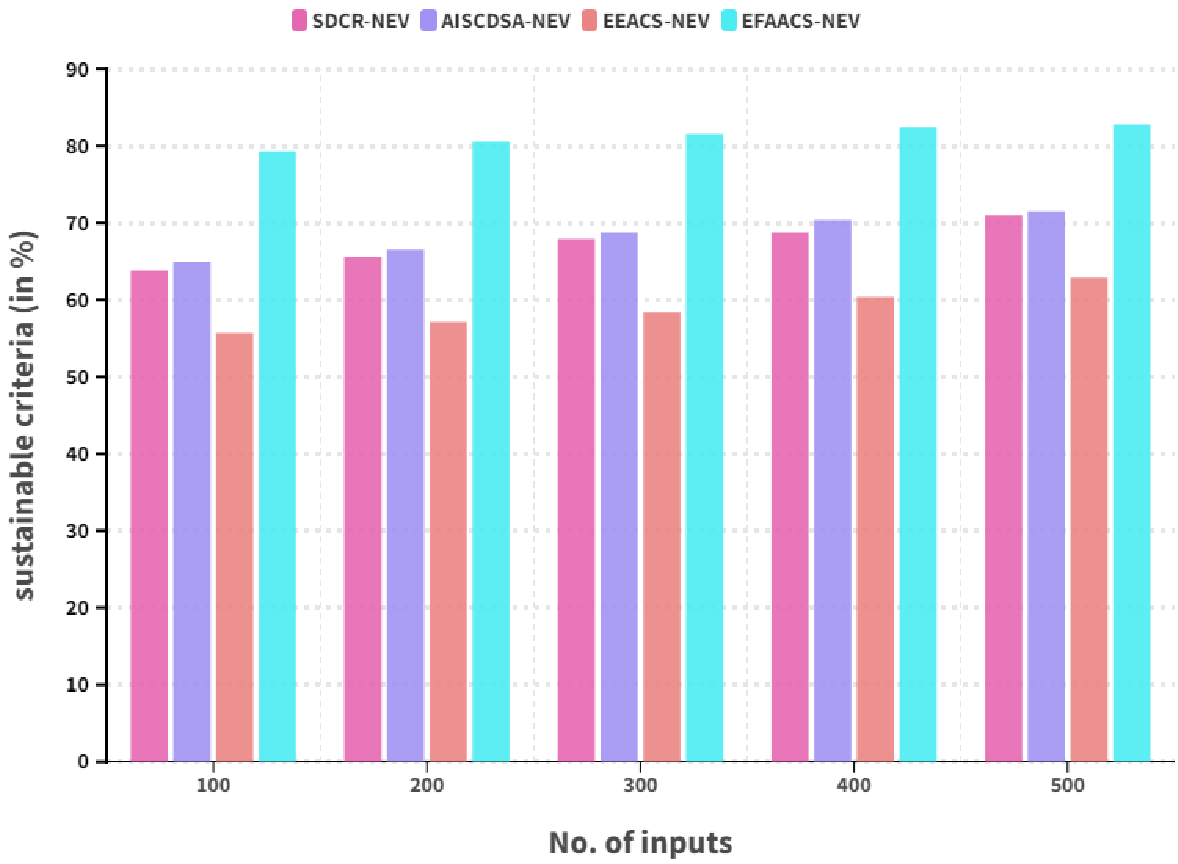

Fig.5: Comparison of sustainable criteria

Fig. 5 shows the comparison of sustainable criteria . In a computation cycle, the existing SDCR-NEV obtained 71.01%, AISCDSA-NEV obtained 71.51 %, EEACS-NEV reached 62.84 % sustainable criteria. The proposed EFAACS-NEV obtained 82.81% sustainable criteria.

4.3. Diversity of design options and colors:

An essential aspect of Art Design and Interior Color Selection for new energy vehicles is providing various options that cater to different customer preferences. Therefore, the technical performance parameter for the AI algorithm should include the range and diversity of design options and colors generated. Table.4 shows the comparison of Diversity of design between existing and proposed models.

Table 4. Comparison of Diversity of design (in %)

No. of Images	SDCR-NEV	AISCDSA-NEV	EEACS-NEV	EFAACS-NEV
100	67.83	66.96	59.70	83.25
200	69.57	68.54	61.12	84.54
300	71.91	70.74	62.38	85.55
400	72.72	72.37	64.37	86.44
500	75.01	73.51	66.84	86.81

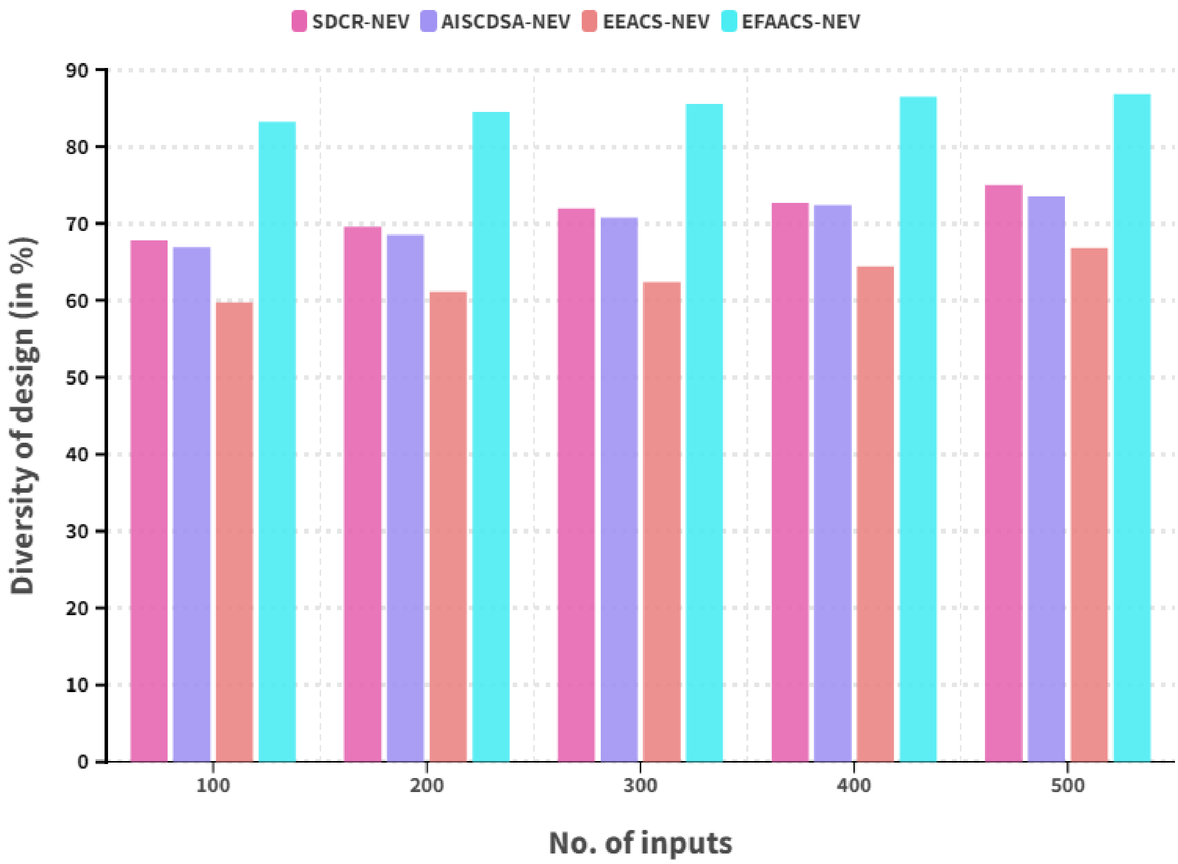

Fig.6: Comparison of Diversity of design

Fig. 6 shows the comparison of Diversity of design. In a computation cycle, the existing SDCR-NEV obtained 75.01 %, AISCDSA-NEV obtained 73.51 %, EEACS-NEV reached

66.84 % Diversity of design. The proposed EFAACS-NEV obtained 86.81% Diversity of design.

4.4. User-friendliness:

For the AI algorithm to be widely adopted, it should have a user-friendly interface that is easy to navigate and understand by designers and car manufacturers. It could include explicit visual representations of design and color options and user-friendly tools for customization and experimentation. Table.5 shows the comparison of User-friendliness between existing and proposed models.

Table.5: Comparison of User-friendliness (in %)

No. of Images	SDCR-NEV	AISCDSA-NEV	EEACS-NEV	EFAACS-NEV
100	73.83	76.96	66.70	86.25
200	75.57	78.54	68.12	87.54
300	77.91	80.74	69.38	88.55
400	78.72	82.37	71.37	89.44
500	81.01	83.51	73.84	89.81

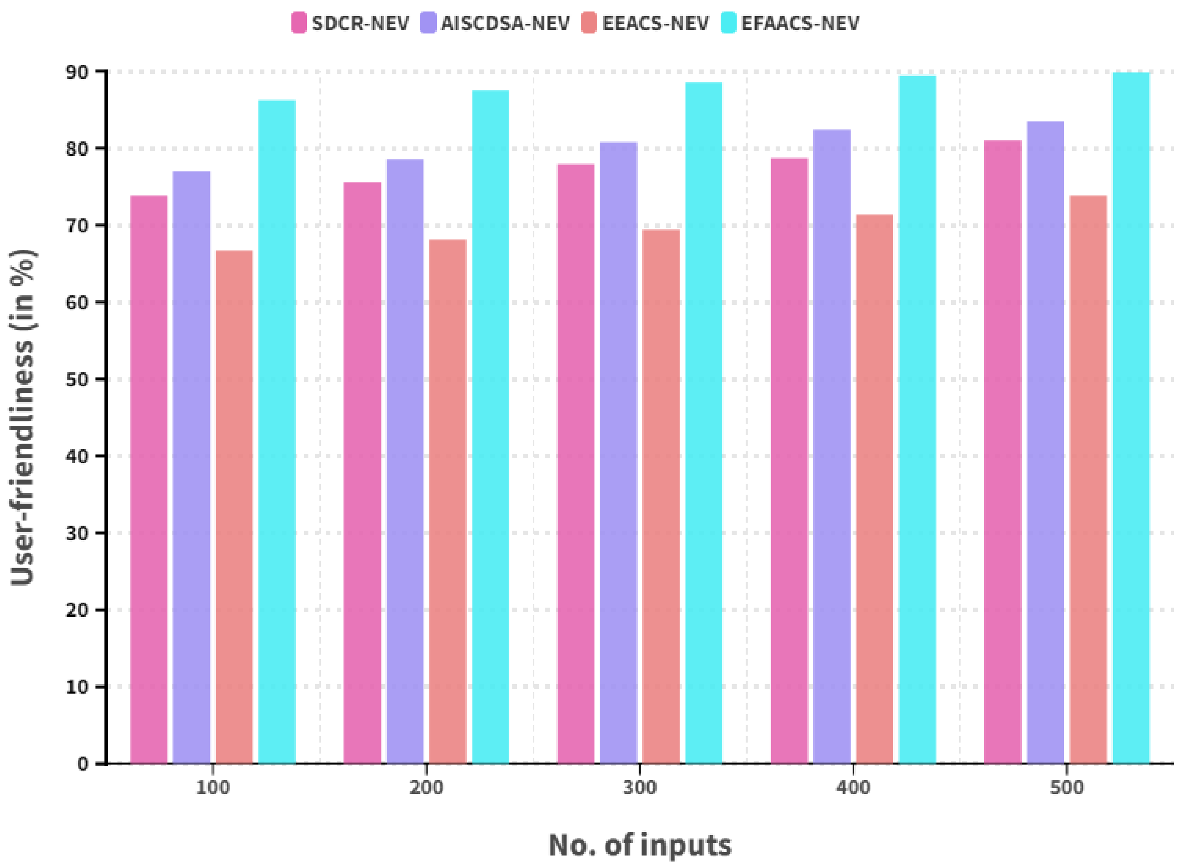

Fig.7: Comparison of User-friendliness

Fig. 7 shows the comparison of User-friendliness . In a computation cycle, the existing SDCR-NEV obtained 81.01 %, AISCDSA-NEV obtained 83.51 %, EEACS-NEV reached 73.84 % User-friendliness. The proposed EFAACS-NEV obtained 89.81 % User-friendliness.

5. Conclusion

This study demonstrates the effectiveness of using sustainable AI algorithm for selecting art design and interior colors for new energy vehicles. The approach not only promotes sustainable practices, but also enhances the overall aesthetic and functionality of the vehicles. Through careful consideration of various factors, the algorithm effectively creates designs that align with the brand image and appeal to target consumers. Overall, incorporating sustainable AI into the design process of new energy vehicles can lead to more environmentally-friendly and visually appealing products.

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