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THE APPLICATIONS OF THE GREEN BUILDING DESIGN CONCEPT IN MEDICAL BUILDING DESIGN

By

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Abstract

Green construction is widely recognized as a significant technique used by governments throughout the globe to combat environmental change and energy shortages. Despite the availability of several modern green building technologies, designers often struggle with the selection and use of green building technologies in varied contexts. The healthcare industry has a significant duty and potential to decrease greenhouse gas emissions to minimize the broad health effects of climate change. Furthermore, there has been a rise in green building design (GBD) for most new construction; nevertheless, the implications of GBD on the usage phase and occupant health have not been well researched. Hence, in this paper, we apply a machine learning algorithm for green building design in a medical building. Initially, the atmospheric and physical assets data is collected and preprocessed using the normalization method. The features are extracted using Linear discrimination analysis (LDA). The energy usage is predicted using the Multi-linear Random Forest Regression (MRFR) algorithm. The predicted energy efficiency is optimized using Boolean Ant Colony Optimization (BACO). From the predicted values, the green building can be designed. The performance of the proposed system is evaluated and compared with traditional approaches to prove the efficacy of the system.

Keywords: Green building design (GBD), medical sector, Linear discriminant analysis (LDA), Multi-linear Random Forest Regression (MRFR), Boolean Ant Colony Optimization (BACO)

INTRODUCTION

The creation of a medical building necessitates a logical and rigorous methodology that takes into consideration all of the linked components of the medical facility. The growth of the medical building should be capable to achieve good health care. Furthermore, the expansion of medical building services is closely tied to academic, financial, epidemiological, and socio-cultural challenges, all of which are features of a variety of local elements influencing the hospital. The environment must be a consideration for the hospital. As a consequence, a sustainability concept must be implemented. Furthermore, the concept of sustainability is required in responding to the problems of green hospitals, which involve a few elements including the use of environmental assets, the expansion of enhanced energy, and the usage of energy-saving devices, as well as attempts to reduce CO2 emissions both in planning and execution processes (Xue, Lau, Gou, Song, & Jiang, 2019).

The criterion specified that the medical building should establish and implement quick development strategies. Uninterested linkages among services, a need for patient contentment, and a need for competence in many medical buildings are some of the problems that often appear in hospitals. Constructions with ecological themes are essential for patients' well-being while they

deal with their illness. On the contrary situation, they will be concerned by the weight of sickness as well as the pressure of an unmanageable physical environment. Based on this evidence, the medical building is likely to confront several limits as a consequence of these disadvantages, demanding research into the sustainability idea in a green hospital design (Ying Zhang, Kang, & Jin, 2018).

A green hospital facility, according to the Indian Green Building Council, improves patient well-being and supports the healing process while using natural resources in an efficient and environmentally responsible way. Green hospitals are long-term hospitals. The notion of 'green buildings' may be traced back to the United Nations' relentless efforts over the years to bring the concept of 'sustainability' to the forefront of all facets of human growth (Boni, 2021). The use of non-toxic materials and products will enhance the air quality inside a building, which will in turn lower the number of cases of asthmatic, allergic reactions, and sick building syndrome. These substances do not release any emissions, contain almost no volatile organic compounds (VOCs), and are moisture-resistant, which helps prevent the growth of mold, spores, and other types of germs. Ventilators and materials which keep humidity under check and enable a structure to breathe are two more ways to improve the air quality within a structure. In addition to tackling the problems mentioned above, going green must provide cost reductions to a building company as well as the occupiers and meet this same wider community needs. This can be accomplished by employing local labor, providing affordable housing, and making sure the building is situated adequately to satisfy the requirements of the community (Brambilla & Capolongo, 2019). Figure 1 shows the components of green buildings.

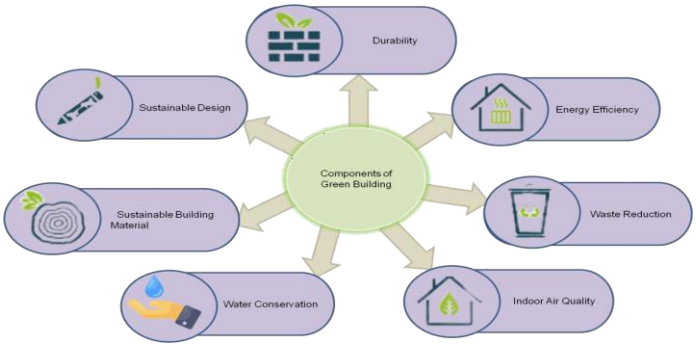

Figure 1: Components of green building

"The conservation and enhancement of the human environment is a key problem that affects people's well-being and economic growth all over the globe; it is the urgent wish of the whole world and the obligation of all governments." The green hospital building is the use of certain tools and techniques to build and operate a hospital in an environmentally friendly and sustainable way (Molloy, Johnson, & Gilding, 2021). Because a hospital is such an important element of any community, implementing green practices throughout all hospital operations may have a huge influence on society. It has become common practice to use the terms "elevated building" and "green building" indiscriminately. According to the Energy Conservation act, a tall tower entails the optimization and unification of all major performance parameters of a structure on a life cycle basis. This is done to maximize the facility's overall performance. In this context, "sustainable development" refers to practices such as reducing power use, but it also encompasses other concerns, such as the cost-benefit analysis, occupant efficiency, and operational parameters. As a result, the optimization and integration of various construction systems constitute the essential component of an elevated structure. BIM may play an important role in the generation of iteration

of the building model for optimal design choices and in boosting interaction between project team members throughout the design phase, which is necessary to accomplish the goal of constructing a high-performance building **(Chang & Hsieh, 2020)**.

Buildings use more than 40% of global energy and emit one among global emissions in both industrialized and developing countries. Every year, a large number of buildings are built, yet only a tiny percentage of them are classified as "green buildings." Despite the well-known advantages of green building certification, it is still in its infancy in society, and proper dissemination and implementation methods should be put in place to guarantee that it becomes more established. The development of required tools that will improve the development of criteria for innovative building system design and control is dependent on a knowledge of the link between both the buildings and the level of pleasure felt by their inhabitants. The performance comparison of different buildings in this respect may thus be based on the objective measurement of the indoor environment of each structure. When assessing a building's performance, the tenant of the structure, whose needs the interior environment is designed to accommodate, should be regarded as just an integral component in the process. It is very necessary to establish a complete measuring model that is indicative of how inhabitants feel about the surroundings they are living in within the structure (Nimlyat, 2018).

In this study, we use machine learning for green medical building design. The atmospheric and physical asset data is gathered and normalized first. Features are extracted using LDA (LDA). The energy use is predicted by MRFR. Energy efficiency is improved through Boolean Ant Colony Optimization (BACO).

This study attempted to present an implementation framework that may assist the certifying authority in making choices on the applications and implementation of green building design in a medical building. Further part of this paper contains part 2 Literature review, Part 3 Proposed work, Part 4 Performance analysis, and Part 5 conclusion.

LITERATURE REVIEW

The study Jiang, Wang, and Wu (2018) offered the first comprehensive appraisal of global green building research “GGBR”. The purpose of this research is to thoroughly examine and show the GGBR's province. The study results are useful in detecting and comprehending trends and patterns in the current body of literature on green construction, such as main research topics, journals, institutions, and nations, and how they are related to GB (Talha, Wang, Maia, & Marra, 2022). Evaluation of green architecture as a metric is an efficient way to represent the sustainable performance of buildings and is valuable in helping to enhance the environmental conditions, which are degrading. The report Y. Li, Song, Sang, Chen, and Liu (2019) provides a complete assessment of literature on Critical Success Factors (CSFs) for Green Building (GB) projects for a few years. According to the data, there has been an upsurge in interest in the examination of CSFs for GB projects since 2010. This category summarizes the key providers, organizations, nations, and regions, as well as the research methodology. The term "green building" (GB) refers to "the practice of developing structures and applying procedures that are ecologically sustainable and asset across the entire life-cycle of a constructing, including siting to design, building, operations, care, restoration, and demolition." The article **Yinqi Zhang et al. (2019)** examines the evolution of green building contexts and statuses in several nations. It also provides an impression of the green building development circumstances in these nations, including both outer and inner features of GB development. External impacts include things like UK expansion strategy aid,

profitable remuneration, and documentation systems. Inner features include the creation and implementation of GB information, the degree of building administration, and also how people engage with GB expertise. Marzouk, Azab, and Metawie (2018) Set out to critically examine computer model and optimization studies for lowering life cycle energy expenditure and greenhouse gas release in buildings, to identify current practices and future research requirements in this field. The construction industry is progressively embracing technologies and approaches that promote the development of sustainable constructions. Sustainability constructs were defined as structures that have minimal impacts on the environment, economy, and society. This study combines the building information modeling advanced technologies with life cycle assessment (LCA) and life cycle costing (LCC) methods again for purpose of conducting a financial and environmental evaluation of buildings. The focus of this research is on the environmental costs of the construction process. The purpose of Wu, Li, Feng, Luo, and Chen (2019) is to provide evaluation criteria for green interior decorating in the setting of China. To begin, a complete evaluation of current green building rating systems was conducted, followed by focus group sessions to filter the assessment elements and develop the fundamental structure of the proposed assessment standard. It is advised that actual interior design projects be assessed using the proposed standard to determine which evaluation items may readily be performed and which criteria are almost impossible to satisfy. The analysis of these real-life interior design projects may serve as the basis for the development of further enhancements. In Mody and Bhoosreddy (1995) most of these disorders have numerous odontogenic keratocysts. Several odonotogenic keratocysts were found in a three - years female teenagers. During the study, no further anomalies were detected. In Garg (2020) Personalized healthcare uses perfectly alright data to identify specific deviations from the norm. Using 'Virtual Twins' within a design, such emerging information health care systems were ethically and ethically examined. Phenomena were digitally linked and shown on the whole of a continuous basis. Moral differences can be discerned obtained from data forms & perceptions (Jiao & Liu, 2021). Virtual twins' social and ethical ramifications are investigated. Information has become increasingly important in the healthcare system. Since it provides practical ways for increasing equality and fairness, this strategy has the potential to become a societal equalizer. In Ahmed and Ali (2020) hypersensitivity is a lengthy worldwide epidemic, Among often the recommended therapies in Taiwanese medical centers are traditional Chinese or China drugs. Hay fever was the most common chronic condition treated by ambulatory traditional Chinese medicine. In Taiwan, allergic sinusitis is managed with a variety of old Chinese medicine and modern medications. In Shahabaz and Afzal the use of HDR brachytherapy has been shown to minimize radiation exposure, make outpatient treatment possible, and shorten the amount of time needed for various tests. By adjusting the latency at each dwell site, a human generator could improve dosage dispersal even more. Because of the short treatment periods, no data validation is possible, and errors can cause harm to people, HDR brachytherapy therapies should be performed accurately. In Z. Li (2022) presented a treatment technique and equipment for residential wastewater to improve rural communities. In Salihu and Iyya (2022) Zamfara, Nigeria, hydrophilic and organophosphate insecticides were found in soil samples collected from chosen vegetable farms. Focus on three main using GC-MS was used to assess the testing regime and outcomes.

In Shan and Hwang (2018) the goals of this work are to examine the current GBRSs in use across the globe, highlight the primary research activities undertaken by existing GBRS-related studies, and propose future GBRS research paths. Although this paper's limitations prevent it from reviewing all of the GBRSs utilized in nations throughout the globe, the results still are useful. By evaluating the current GBRSs in terms of their timeframes, peculiarities, assessment methods, and scoring systems, summarizing the significant research efforts of the established GBRS studies, and suggesting future GBRS research directions, this paper has contributed to the body of knowledge

on green building research. Moreover, the results of this article are useful in practice. As they have given industry professionals a complete picture of GBRS in both terms of application and study, deepening their comprehension of the standard.

In Dwaikat and Ali (2018) The article includes research that illustrates how a life cycle cost analysis for a green building was undertaken, as well as how life cycle cost factors were discovered and utilized to produce a life cycle budget for a sustainable building's entire 25 years life cycle. The future expenses of the researched green building are roughly 3.6 times more than the original design and construction expenditures, according to this study. Not unexpectedly, energy expenses account for 48 percent of the overall life cycle budget for a structure, and this ratio rises to almost 60% when solely considering structure running costs. Reduced power use in green buildings also is proven to become the most important element in lowering their entire life-cycle costs.

In Jia, Komeily, Wang, and Srinivasan (2019) the study examines cutting-edge initiatives and IoT adoptions for the development of smart structures in both academic and industrial settings. The broad IoT principles are offered, providing both the required breadth and the appropriate subject depth that is directly related to building automation. The current state of IoT enabling technologies, particularly those applied to buildings and associated sectors, are summarised, with three levels based on the traditional IoT architecture. Following that, various current IoT applications on buildings that contribute to the important objectives of smart buildings are chosen and shown. Lastly, the benefits and problems of IoT for building automation are examined. Furthermore, this study highlights future research issues to promote IoT technology adoption both in the construction and operating stages of buildings. The article claims that a mature adoption of IoT technologies in the construction sector has yet to be reached, and hence asks for further application-focused research from experts in relevant domains.

Problem statement

Even though the construction sector has acknowledged the advantages of the "green building design concept," there seem to be several obstacles to its implementation. The present tools' blunt character and the assumption that existing tools are simpler than using green building design concepts are the key barriers to greener Adoption of green building design concepts. Although the green building design concept is viewed as a transdisciplinary instrument, connectivity problems remain to stymie diverse green building design concept implementations in the business. One of the most pressing objectives for green building design concept researchers is to solve the interoperability issues of various green building design concept platforms. Green building design concept organizations and programmers have developed several database design interchange protocols to address interoperability problems. Industrial Middle Classes (IFC) is the only open, quasi data structure used by governments and agencies throughout the globe. It IFC has provided the groundwork for data standardization. IFC has a class structure and holds a full building information model, as well as the shape of a structure in a coordinate system as well as the characteristics of construction materials. IFC may therefore simulate a wide range of architectural features and forms. Green building design concept researchers and engineers have been using Application Program Interface (API) for customized information sharing and development of green building design concept capability in addition to these mainstream data exchange formats to overcome compatibility difficulties for the green building design concept process. green building design concept API allows green building design concept programmers to be extended using a programming language, including Visual Basic.

PROPOSED WORK

In this study, we apply an algorithm for machine learning to the process of developing green buildings for use in medical facilities. In the beginning, data on the atmosphere and the physical assets are gathered and then preprocessed using the normalization approach. A linear discriminate analysis is used in the process of feature extraction (LDA). The Multi-linear Random Forest Regression (MRFR) technique is used to make projections on the amount of energy used. The Boolean Ant Colony Optimization technique is used to maximize the accuracy of the expected energy efficiency (BACO). The environmentally friendly structure may be created using the projected values. To demonstrate that the suggested system is more effective than other methods, its performance is analyzed and contrasted with that of more conventional methods. Figure 2 depicts the general layout of the planned work.

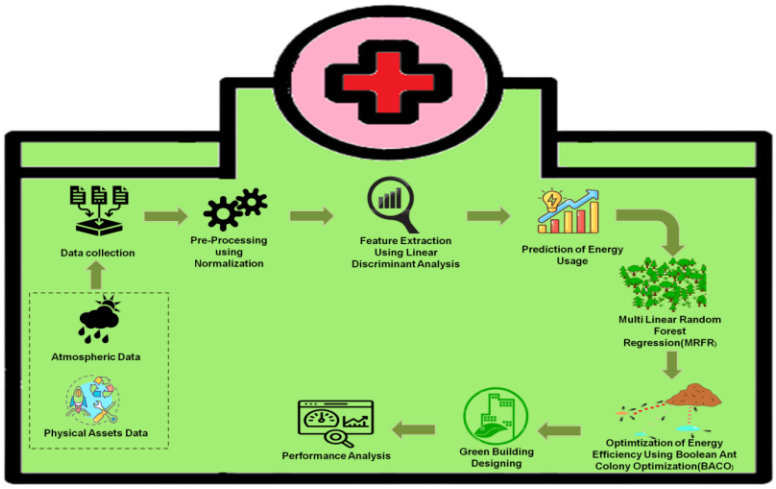

Figure 2: General layout of the planned work

Data collection

We have taken the atmospheric data and physical assets data of the Chinese medical building for this paper. The primary component of the study was a hand-administered survey that was three pages long and included several topics. During the phase in which the data were analyzed, a complete set of standards including pleasure, wellness, production, and manageability was reviewed. This building is home to around 250 people who are employed in office jobs. The study received responses from 182 individuals, which represents 73 percent of the entire population. There have been a total of 131 respondents who were under the age of 30, making up 73% of the total, while the rest of the respondents were beyond the age of 30. 95 of the respondents were male (representing 53% of the total), while 84 (representing 47% of the total) were female. Approximately 58 percent of those who responded had been employed in the building for a year or longer, while 42 percent had worked there for a period that was less than a year. Just 14 of the participants had jobs that required them to work alone or in rooms, they shared including one or two persons; the remaining jobs were all performed inaccessible workplaces [20].

Preprocessing using normalization

Data preprocessing is a job that entails the preparation and transformation of data into a format appropriate. Preprocessing data seeks to minimize data size, establish data relationships, normalize data, eliminate outliers, and extract data characteristics.

Data cleansing, integration, transformation, and minimization are some of the strategies used.

The primary goal of data normalization is to reduce or eliminate redundant data. Min-Mix Normalization is a method for performing linear transformations on a set of data. This is a technique for keeping the original data connected. Min-Max normalization is a simple method for fitting data into a pre-defined boundary.

$$S' = \left(\frac{S - minvalue\ of\ S}{maxvalue\ of\ S - min\ value\ of\ S}\right) * (Z - W) + W \quad (1)$$

Here,

- S, - has min-max normalized data one,
- [Z,W] is a pre-defined boundary
- S – original data range

K-score Normalization is a method that uses concepts like quantitative variables to obtain normalized values or sets of information from unstructured data.

As a result, the K-score parameter may be used to normalize unstructured data, as presented in the following equation:

$$q_a^{'} = std\_\_\_\_\_ qa^{-}\ (B^{\bar{B}}) \quad (2)$$

- $q_a^{'}$ - K score normalized one's value
- q_a - the value of row $\bar{B}$

$$std^{(B)} = \sqrt{\frac{1}{(r-1)}\sum_{j=1}^{r}(q_a - \bar{B})^2} \quad (3)$$

$$\underline{B} = \frac{1}{r}\sum_{j=1}^{r} q_a \quad (4)$$

The technique that gives a scale from -1 to 1 is known as decimal scaling. The decimal scaling procedure, as a consequence,

$$q^a = \_\_^{q_x} \quad (5)$$

- q^a - scaled value
- q - range of values x- smallest integer Max($|q^a|$)<1

Using min-max normalization, the original data is converted linearly. Assume that min_x and Max_x are the lowest and maximum values for variable E.

By computing: [new-min_x, new-max_x], A value e of E is transferred to e' in the range through min-max normalization. [new-min_x, new-max_x].

$$E' = ((e - min_x)/(max_x - min_x)) * (new - max_x - new - min_x) + new - min_x \quad (6)$$

The values for variable E are normalized using the mean and standard deviation of E in w-score normalization. E value e of E is normalized to e' using the following formula:

$e' = ((e - \overline{X})/\sigma_X)$ (7)

Where e and σX are the mean and standard deviation of variable e, respectively. When the real minimum and maximum of variable e are unknown, this approach of normalizing is beneficial.

The decimal point of values of variable e is moved during normalization using decimal scaling. The number of decimal points shifted is determined by e' absolute maximum value. A value e of E is normalized to e' using the following formula:

$e' = (e/10^i)$ (8)

Where 'i' is the smallest integer such that Max (|e'|) < 1.

Feature extraction using Linear Discriminant Analysis (LDA)

LDA is founded on a fundamental idea. Provided the training examples set, LDA aims to reflect the data onto a single direction with interclass sample distribution points as close as possible to each other and intraclass example projections points as far apart as possible. While classifying, we projected a new sample onto the same line. This sample's category is determined by the position of the projected point. LDA's challenge is to create data points more distinguishable after dimension reduction.

Prediction of energy usage

The challenge of predicting energy usage is a job that involves series data regression. Predicting a contractor's power use for the following month based on a limited experience of that client is the focus of this activity. The use of machine learning techniques has shown some promising outcomes in solving several issues, such as those involving time-series data and regression. The prediction of personal energy usage may assist in improving the energy distribution and can make the process of scanning electrical meters lower prone to errors due to human intervention.

Multilinear random forest regression

The Multilinear Random Forest Regression model is a classifier composed of a collection of basic classifiers known as "Decision Trees," which are defined as exponentially distributed random vectors that vote for the most popular class in the input. In multilinear random forest regression, the employment of sets of trees, each of which is grown as per a random parameter, resulted in significant increases in regression accuracy. By integrating all of the trees into a single entity, the final predictions are obtained. To provide an unbiased assessment of the error. Because it is inherent in the strategy, Multilinear Random Forest does not need the use of cross-validation techniques or verification on a different set of variables. In reality, each tree is constructed using a separate validation set of the original information, with the instances that were not chosen for tree construction being used to evaluate the model's defects. Because it only requires two variables (the number of parameters in the subgroup of unknown parameters used per node and the quantity of trees in the forest) and is not overly sensitive to their values, this model is simple to utilize. This approach computes the analyst variable's relevance and offers a measure of the data's underlying structure (proximity). Because of the likelihood of interaction with other variables, determining the variable's importance is challenging. This strategy provided four separate metrics for determining the significance of each component. The first approach evaluates relevance by analyzing how much the prediction error increases when the values of the researched variable change while all others remain constant in out-of-bag (OOB) situations. In the following two procedures, the margin of the nth statistical unit is taken into account at the end of the simulation.

The margin is calculated by deducting the percentage of votes cast for its real class of membership (note) from the greatest variance in the ratios of votes cast for the other classes. The m-th variable is acquired in a second way as the mean of the margins that are decreased for every incidence whenever the m-th factor is modified. The third method shows the number of margins reduced minus the number of margins raised. Finally, one of the components is used to create the subdivision for each subdivision in a fourth way. The sum of all forest reductions induced by definite parameters, normalized by the number of trees, is used to calculate the measure. Figure 3 shows the prediction value for Multilinear random forest regression analysis.

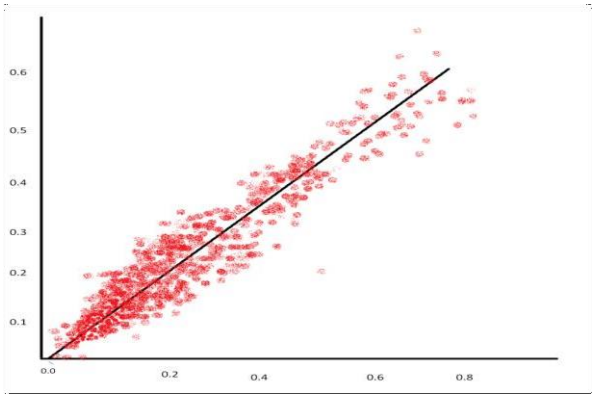

Figure 3: Prediction value for Multilinear random forest regression analysis**.**

Optimization of energy efficiency

Energy optimization relates to the procedure of using, as well as avoiding the use of, power in the building design to maximize advantages for both the ecosystem and for humans. Effective Use of Electricity Rising energy efficiency is mostly in already constructed structures.

Boolean Ant Colony Optimization (BACO)

Boolean Ant Colony Optimization (BACO) is best for the optimization process to get mired down in local convergence and miss the true global optimal value. Second, the hunting zone's reduction rule is very mechanical, and the true global ideal value may readily escape the hunting zone. Finally, when using the Boolean Ant Colony Optimization (BACO) approach, optimal results are prone to stalling in the middle or later phases of the optimization process due to the coupling effect between the inversion parameters.

The BACO algorithm's hunting zone reduction strategy is highly mechanical, shrinking to half its size every repetition while remaining focused on the best path at current iteration $B_{1st}(p)$. Due to the obvious joint effect between both the inversion parameters, one or more true values may jump out of the searching zone during the optimization process of many parameters, resulting in the true value of the inversion parameter being overlooked. As a consequence, the reduction rule has to be revised.

The BACO algorithm's reduction rule is as follows:

$$down_a(p+1)=\frac{min\{b_{a,1st}(p),b_{a,2nd}(p),b_{a,3rd}(p),b_{a,best}\}}{-\frac{\Delta range_a(p)}{2}} \quad (9)$$

$$up_a(p+1)=\frac{max\{b_{a,1st}(p),b_{a,2nd}(p),b_{a,3rd}(p),b_{a,best}\}}{+\frac{\Delta range_a(p)}{2}} \quad (10)$$

where $b_{a,1st}(p)$, $b_{a,2nt}(p)$, and $b_{a,3rd}(p)$ signify the a^{th} inversion parameter's.

The BACO algorithm's route is established amid one subinterval, which lowers the actual value hit ratio. As a consequence, a few new ants are needed, and the eigenvalue is picked at random from the subinterval. Because the fresh ants may search for more areas in the subinterval, the stagnation of the best results is effectively alleviated. As the number of ants rises, so will the searching time for each iteration. An excessive quantity of new ants is bad.

The number of new ants is usually set as Sr = Sm/Sn +1.

New ants in the BACO algorithm use the eigenvalue of the subarray as:

$feature_{s,c}(p)=down_a(p)+$ (c− and) $\Delta range_a(p)$
(11)

where $feature_{a,c}(p)$ is the eigenvalue of the c^{th} subinterval of the a^{th} inversion parameter at iteration p, and random is a uniform random integer in the range [0,1].

The homogeneous component raises the possibility of each subinterval being greater than zero, and the probability formula for the BACO method is as follows:

$$T^{s}_{a,c}(p)=\frac{\zeta}{N_n}+(1-\zeta)\frac{[c_{a,c}(p)]^{\alpha}\cdot[y_{a,c}(p)]^{\beta}}{\sum_{k=1}^{N_n}[c_{a,k}(p)]\cdot[y_{a,k}(p)]}$$
(12)

where ζ is a parameter in the range [0, 1].

PERFORMANCE ANALYSIS

This paper gives a green building design concept for the medical building. This paper discusses the Boolean Ant Colony Optimization (BACO) based green building design system for the medical building. We examined the performance of this system like efficiency, system throughput, prediction level, and accuracy. These parameters' performance compared with the other three existing methods such as Support Vector Machine (SVM), Bee Colony Algorithm (BAO), and Niche Genetic Algorithm (NGA).

Efficiency

The word efficiency refers to the highest level of performance attained by employing the fewest number of inputs to create the largest amount of output. Figure 4 shows the comparative analysis for efficiency.

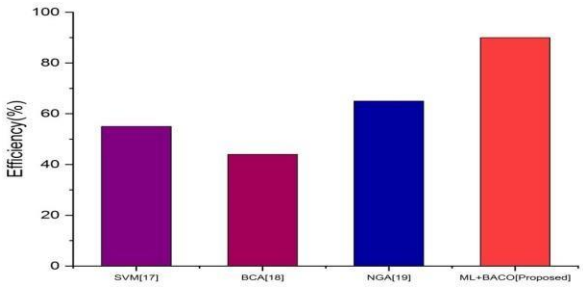

Figure 4: Comparative analysis for efficiency

In the process of enhancing the energy efficiency of green buildings, the proposed method is more efficient when compared to existing methods ["Support Vector Machine (SVM), Bee Colony Algorithm (BAO), and Niche Genetic Algorithm (NGA)"]. The efficiency of a building can be explained as the extent to which the energy usage per gross internal floor area is comparable to the energy usage benchmarks that were formed for the specific type of construction that is being evaluated while being subjected to the climate patterns that have been specified.

System throughput

Throughput is the number of units of information that a device typically handle in a given length of time. It is generally used for systems spanning from devices and networks to organizations. We have compared the system throughput of the proposed system with other existing systems. From that throughput level of the proposed method is higher than others. Figure 5 shows the comparative analysis for system throughput.

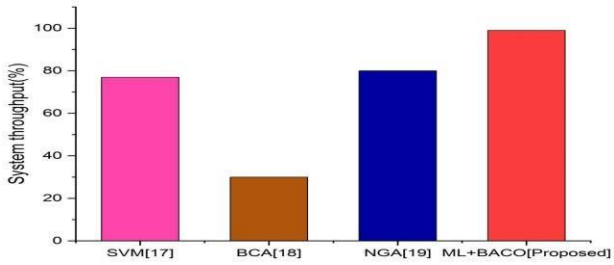

Figure 5: Comparative analysis of System throughput

Prediction level

A prediction, often known as a forecast, is a forecasted statement about a future event or data. They are often, but not always, based on prior experience or skill. This paper mainly focuses on the prediction of energy in green buildings. When compared to other current approaches, the suggested method has a greater prediction level. Figure 6 shows the comparison of analysis for prediction level.

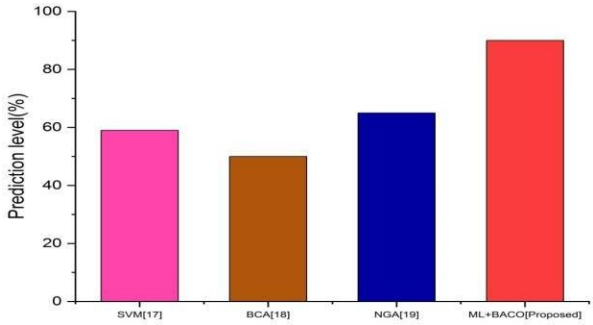

Figure 6: Comparative analysis for prediction level

Accuracy

The term "accuracy" refers to the certainty that the model is effective and mistake-free. Accuracy refers to the capacity of a measuring device to precisely determine the value being measured. To put it another way, it refers to how closely the value that was measured corresponds to a benchmark or the actual value. Figure 7 depicts a comparison of the accuracy of the proposed strategy vs. the present method.

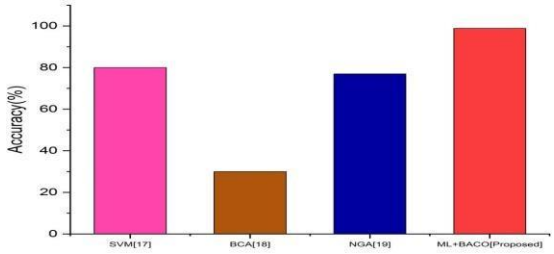

Figure 7: Comparative analysis for accuracy

When compared to the existing ["Support Vector Machine (SVM), Bee Colony Algorithm (BAO), and Niche Genetic Algorithm (NGA)"] the proposed method has greater accuracy.

Discussion

The link between health and behavior is complicated. It is neither simple nor straightforward. Even though health and behavior are opposed, they have a stronger relationship in a medical system owing to the good atmosphere organization. A medical building is made up of several human capitals that are all linked together. They are multidisciplinary individuals who must interact with one another in the health-care scheme; thus, the interactions need special behavioral sciences that shift significantly in the bio-atmosphere, which is referred to as the green building system. When the data set has more noise, the authority to select categories coincides, and the Support Vector Machine (Westermann & Evins, 2019) does not perform well. When the selection of attributes for every dataset is higher than the number of trained data samples, the SVM will underperform. Bee colony algorithm Q. Wang and Zeng (2020) requires inadequate utilization of secondary data; new fitness tests on new algorithm parameters are required. A greater number of objective function evaluations are performed, when sequential processing is used, it is slow. Niche genetic algorithm (K. Wang & Mao) is computationally costly, which means it takes time. The Machine Learning-based proposed Boolean Ant Colony Optimization (BACO) is an efficient energy predictor in Green buildings.

CONCLUSION

For medical services and patient satisfaction in a green medical building, dependability is of the utmost importance. The capacity and clinical programmed techniques employed as a method in this research determined that the medical building needed the establishment of various substantial structures and notable centers of excellence. In line with the medical building's business strategy plan and the attainment of the Hospital Balanced Scorecard, the idea of sustainability is required in the hospital's enlargement, which includes issues of individual capital, economic organization, and the corporeal surroundings. The proposed Boolean Ant Colony Optimization (BACO) execution of environmental notions, contemporary and municipal

personality presence, ecofriendly security access notion for the elderly and disabled people, minimal maintenance concept, energy resource minimization, alternative energy utilization, negative environmental impact minimization, the Integrated Design Process, environmentally parking area concept, heat island effect anticipation efforts, and green building application (carbon dioxide).

Even though the green construction sector in China has a bright future thanks to government policies and regulations, the industry nevertheless confronts significant challenges. China is lacking in "hard" technology such as development, execution, and manufacturing, and also "soft" skills such as rules, governance, regulations, and supervision. Nevertheless, it is critical to make people more aware for people to have a better grasp of the benefits of green construction and use green technology more effectively. The study's key weakness is that although the overall number of the sample respondents is high enough just to produce credible data on the present state of environmental initiatives, the number of professionals within every category is insufficient to make a detailed comparison. Future research should broaden the scope of the study and include more professionals from diverse groups so that comparisons may be conducted in many areas, like those related to green school attainment. It is extremely feasible to determine several similarities and variances that exist in groupings. Green construction is expected to include more people, more methods, and more needs, requiring existing project management practices to evolve. A future study might look at what these improvements are, such as if and to what degree an earlier included by building a team and better communication assist. The cost advantages of green construction are usually significant.

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