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RESEARCH ARTICLE		**A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques**

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Abstract

Greenhouse crop production systems are deployed globally across diverse climatic zones. To maintain optimal environmental conditions for plant growth, greenhouses are constructed with various structural and technological components. However, greenhouses are inherently complex, nonlinear systems that regulate climate variables to promote plant productivity. In today's context, reducing energy consumption in built agricultural environments is crucial. Accurate modeling of plant growth and yield is essential for greenhouse operators and the broader agricultural sector.

This study proposes a comprehensive simulation model for evaluating the thermal and energetic performance of greenhouses in Thailand. The model incorporates artificial intelligence (AI) techniques to enhance performance prediction. Specifically, a deep recurrent neural network using long short-term memory (LSTM) architecture is deployed. A comparative analysis is conducted to assess the accuracy and efficiency of various modeling approaches. The outcomes support improved greenhouse design and energy optimization strategies.

1. Introduction

A greenhouse is an encased development that furnishes plants with an ideally controlled climate for guideline of plant development condition, to diminish cost creation and increment income. The greenhouse climate can be improved by adding ventilation and carbon dioxide supply frameworks, to give the best ecological condition. In the greenhouse enormous measure of vegetables can be created without the utilization of soil on an exceptionally restricted region working with the stockpile of food to the universes developing populace. To augment the yield get the harvests of top caliber and abatement the utilization of energy and climatic condition must be guaranteed. Among the ecological boundaries that must be painstakingly controlled are light force and dampness [01]. At scopes, greenhouse environment control requires nuclear power supply during an enormous piece of the year. Lessening the utilization of

500 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

energy is applicable both from a manageability viewpoint, as it helps to diminish the petroleum product-related outflow of ozone-depleting substances and to safeguard non-sustainable normal assets and from a monetary perspective of the producer.

Environment factors are subject to one another and now and again even a little difference in one of them may trigger the difference in another. Attentions to that for each ecological boundary, significant for the greenhouse environment control, developments are conceivable. The temperatures that can be utilized for control are those of the indoor and open-air, of the harvest, of the root zone, and the bay and return water in the warming framework. Concerning the dampness, both indoor and outside qualities are estimated [02]. The measure of sun-oriented radiation impacting the environment inside the greenhouse can be considered for control as far as worldwide radiation, net radiation, and photosynthetically dynamic radiation. At long last, the degree of carbon dioxide can be partitioned into the indoor and the open-air esteem. As it has appeared, there is an enormous assortment of components influencing the utilization of energy in a greenhouse. The central point of interest is to recognize the significance of these variables and to discover the actions that take into account diminishing the utilization of energy. The provided nuclear power is utilized in nurseries for keeping both the indoor temperature and the stickiness of the air inside an ideal reach. Other than that, the energy as power is expected to drive gear like siphons, fans, and so forth Besides, contingent upon the yield type and the topographical area of the greenhouse, it could be needed to utilize fake lights. At the northern scopes, the utilization of counterfeit lighting considers expanding the developing season. Much of the time a result of nuclear power age is carbon dioxide which after the filtration of the fumes gas can be utilized to build the pace of photosynthesis and accordingly to improve plant development [03].

In the light of the objectives received during the meeting in Kyoto, for example, targets concerning the restriction of discharges of ozone harming substances by the partaking Parties, and considering the expanding energy costs, it is exceptionally essential to execute measures focusing on the decrease of energy use. It is gainful to diminish the utilization of non-renewable energy sources and to supplant them by more harmless to the ecosystem. Sustainable power sources these days, a wide scope of fuel sources is accessible for use in nurseries. Except for petroleum products, including flammable gas, fuel oil, and coal, different elective fuel sources are being utilized: biofuel, sun-powered, geothermal and wind energy, squander warmth, and power [04]. Warmth can be likewise delivered by cogeneration frameworks joined warmth and power or provided by heat siphons extricating the energy from the air, ground, or water.
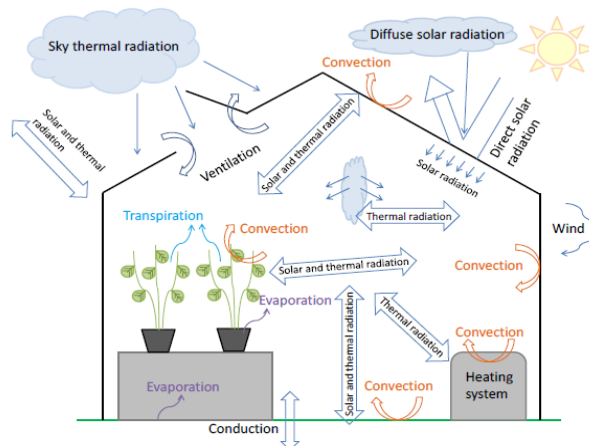
Fig.1: Heat exchanges between the components within the greenhouse and the outside environment

501 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
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Khongdet Phasinam, Thanwamas Kassanuk

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≪IMCRA

In the greenhouse, diffuse warm radiation comes, among others, from the inner surface of the cladding, from the floor surface, from the plants, and the warming framework, Solar radiation episode on the greenhouse is either consumed by different greenhouse segments, including the cover, plants, soil, and water fume or lost to the outside. Concerning the radiation lost to the outside, some segment of sun-oriented energy is reflected by the greenhouse cover and a few, in the wake of being communicated to the inside however not being assimilated, is reflected by the indoor parts. A piece of sunlight-based energy that gets reflected by the indoor surfaces isn't lost – it is again reflected or consumed, this time by the internal surface of the cover, and subsequently doesn't leave the greenhouse.

A greenhouse shields the harvest from outside impacts, like a downpour, twist, low temperatures, or bugs [05]. A cutting-edge innovative greenhouse is furnished with dynamic control of actuators to establish an ideal developing environment. This comes at the expense of asset utilization. A cultivator decides the environment and water system procedure and characterizes the set focuses for all environment and water system boundaries. Actuators are worked dependent on the set focuses, and sensors give input on estimated information for the control circle. Computerized greenhouse environment control calculations have effectively been created many years prior. Today, present-day cutting-edge nurseries are outfitted with measure PCs, which can handle greenhouse actuators dependent on the set focuses physically set by the producer.

To add more computerized control, different greenhouse environment and harvest models have been created. An outline of the present greenhouse environment models is given in a past report. An outline of greenhouse crop models and displaying approaches are given in different investigations [06]. Dynamic greenhouse environment models and dynamic harvest models have been utilized to decide set focuses consequently and assume control over the choice of the producer. On the off chance that environment and harvest reenactment models are joined and associated with the sensors and actuators of a greenhouse, greenhouse environment, and yield development can be constrained via computerized calculations. Such analyses have been directed effectively with tomato and sweet pepper in The Thailand. In this analysis, outside climate conditions and climate figures were utilized for environment reproductions. Harvest development reenactments were completed alongside the trimming cycle to anticipate further yield development and advancement for various arrangements of the set focuses. The ideal set was then applied in the greenhouse naturally [07].
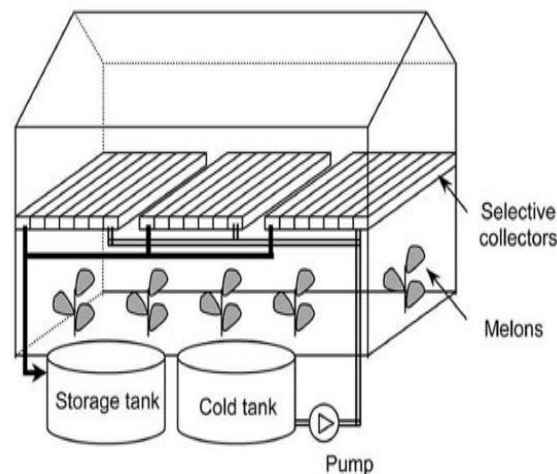
Fig.2: Agricultural greenhouse heated by the selective collectors

The calculations were rehashed each day, and thusly, crops were developed with an ideal control procedure. Different trials with tomatoes have recently been led. Another approach to assume control over pieces of the choices of a

502 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

《IMCRA

cultivator is to utilize AI calculations for greenhouse environment control. Various techniques have been applied in research, for example, K-calculations, Bayesian organizations, support vector machines relapse, neural organizations, support learning, or hereditary calculations. Be that as it may, as far as anyone is concerned AI has not been utilized at this point to control the environment and water system and settle on crop the board choices for growing a greenhouse crop self-sufficiently during a more extended period with yield levels tantamount to business practice [08].

Then again, the utilization of man-made consciousness has arrived at a significant leap forwards in a few spaces of day-by-day life and society, like clinical applications, independent vehicles, or mechanical technology. Artificial intelligence calculations have been appeared to beat people in complex choices, e.g., checkers, chess, and go. It is clear to utilize AI additionally for farming purposes. To join the utilization of current AI calculations and greenhouse environment, water system, and harvest development control, in 2018 a global test on "self-sufficient nurseries" was directed at the innovative exploration nurseries of Kasetsart University and Research in participation with five multi-disciplinary worldwide groups. The test pointed toward consolidating green skills with AI to make forward leaps in new food creation with fewer assets. The examination was laid out up to benchmark the utilization of best-in-class AI calculations for cucumber creation. In the trial existing business greenhouse hardware (actuators), standard sensors for estimation and control, and a standard business measure PC were joined with the most recent AI innovation to expand net benefit and limit asset use, while controlling greenhouse crop development distantly [09].

Thailand is one of the Southeast Asian countries which spare an area of around 200,000 square miles of area. It is the heart of the Indochinese peninsula with more than 70 million people. The climatic conditions along with the huge population are responsible for the development of a huge number of plants across the nations and the improved gardening practices all over the nation. The objective of this paper is to depict the outcomes acquired by groups concerning net benefit and asset use, to examine contrasts in the environment and harvest developing systems utilized, and to research which exercises can be gained from the outcomes for the future, as far as streamlining crop returns and net benefit.

2. RELATED WORKS

Independent greenhouses are meant to consolidate cultivation ability with man-made consciousness to make a forward leap in new food creation with fewer assets. Actuators were worked by a cycle PC control set focuses were distantly controlled by utilizing this calculation. Various sensors persistently gather the estimations. Set focuses and estimations are traded through an advanced interface. The overall artificial intelligence reasoning performed well in controlling the greenhouse. The calculation can contend with experienced manual producers and can even outflank them [10]. The greenhouse creation can conceivably improve crop creation in the area where information is restricted.

A test examination of two distinct kinds of galaxies utilized for warming horticultural nurseries. The principal framework utilized sun-based level plate authorities, introduced outside a polyethylene-covered greenhouse. The subsequent framework, in light of the specific retention of sun-based energy by a warmth, move liquid, utilized polyethylene alveolar straightforward arrangement authorities, introduced inside a glass-covered greenhouse [11]. Examinations on the two frameworks were at the same time led, more than a few days.

The test system has been created utilizing the SIMULINK instrument inside the MATLAB climate on the foundation of the work depicted, yet warmed constantly framework. Chen and Liu considered the warmth move and wind current in latent sun-based warning room with greenhouse and warmth stockpiling. Warm protection of sunlight-based warning room effects affected temperature dissemination and wind stream in the warming office of this nearby planetary group. Warmth move and wind current in a stone bed were likewise considered. The non-straight actual marvels administering the elements of the temperature and dampness on such framework hard to be demonstrated and controlled utilizing the customary method. The proper methodology carries out the non-straight various

503 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

information different yield regulator for the guideline of both temperature and moistness inside the greenhouse. Additionally reasoned that even a slanted reflecting surface can't decrease the loss of sun-based radiation to nothing, some sun-powered radiation misfortunes will consistently happen [12]. Accessibility of complete sun-powered radiation and thought about sun-oriented radiation floor of the greenhouse diminished with set of sun based bowl is put on the nursery rooftop to decrease the nursery cooling load and to create the required crisp flooding water by sunlight based refining. It was created to warm the greenhouse of the 179m floor region. The framework comprised most of five units: level plate sun-powered air authorities, inactive warmth stockpiling unit, test greenhouse, heat move unit, and information securing unit. The outside heat assortment unit is comprised of 26.7m of south-bound sun-oriented air radiators mounted at a 54.9_ slant point. New water is the quintessence of life and is a fundamental human necessity for homegrown, Mechanical and horticulture purposes. The global fast turns of events and populace blast everywhere on the world have brought about a huge acceleration of interest. For new water. Then again, the surface water (streams and lakes) contamination caused by mechanical, horticultural, and homegrown squanders, restricts the appropriateness of new water accessibility in numerous locales. By the start of this century, new water deficiencies what's more, quality turned into a global issue standing up to human gatherings and nations. To defeat these challenges, the utilization of nurseries can give an appropriate climate to plant development. In warm environments, notwithstanding, the nursery inside temperature can reach so high worth that forestalls its use or, something else, an expensive mechanical cooling framework ought to be utilized. [14].

Natural effects of transport are generally perceived by society. Be that as it may, the greater part of the accentuation is put on the activity of vehicles. Anyway, it appears to be that a critical piece of energy utilization is gotten from development, upkeep also, the activity of the different parts of the foundation, assembling, and upkeep of vehicles, just as fuel creation. The car and transport non-operational parts are overwhelmed by power creation, steel creation, and truck and air transport of materials in vehicle fabricating and support. Rail modes have the littlest part of operational energy use to add up to energy use because of their low power prerequisites per traveler kilometer comparative with their huge supporting frameworks.

The development and activity of rail mode foundation result in about twice as huge energy necessities contrasted with the activity of rail mode framework. The effect classes included for appraisal of railroad and air transport frameworks are nonrenewable what's more, inexhaustible material and energy assets, environmental change, eutrophication potential, fermentation potential, photochemical ozone, ozone deterioration, dangerous squander, other waste, and NOx emanations. Energy use was determined by the utilization of diverse energy assets. While figuring energy use, the cycle of electric force creation was considered. The emanation estimations from the electric force creation depended on a IRENA blend that essentially comprises hydropower and atomic force. The creator accepted that the effectiveness of atomic force creation was 80 %. and played out an information yield examination of transportation in Thailand (with the accentuation on metropolitan transport and rail traveler transport). He determined energy use and GHG emanations considering the periods of immediate and circuitous energy use.

The period of aberrant energy utilize included such cycles as extraction, refinement, stockpiling, and conveyance of energizes, just as energy epitomized in labor and products essential for the activity of transport. The creator presumed that circuitous periods of energy use and ozone harming substance emanations structure a huge piece of the complete necessities for all methods of transport.

Birgisdottir et al (2006) played out a street development in Bangkok. Two situations of street development were performed: development with virgin materials and with base debris. The accompanying stages were remembered for the investigation: the creation of materials, street development, activity, and destruction of a street. The aftereffects of this examination showed the ecological effects of the street. Development in two situations is almost something similar. Anyway, the creator presumed that there are contrasts in the area of streets and landfills, in this manner natural

504 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

expenses from moving any type of development materials ought to be considered. Stem distance across is considered as one of the significant boundaries portraying the development of plants during the vegetative development stage. Likewise, the variety of stem breadth has broadly been utilized to infer intermediaries for plant water status and, is subsequently applied in enhancement techniques for plant-based water system planning for a wide scope of animal types. Plant stem width variety alludes to plant stem occasional shrinkage and recuperation development during the day and night, and this intermittent variety is identified with plant water content and can be utilized as a marker of the plant water content change. During dynamic vegetative development and advancement, crop plants depend on the carb acquired from photosynthesis and the movement of photographs absorbs from the site of amalgamation to sink organs.

3. METHODOLOGY

In the proposed strategy, AI strategies conjecture the warm and lively presentation of the greenhouse in a total model.

3.1 LONG SHORT TERM MEMORY

The inner secret state model is kept up by the Recurrent Neural Network which is a class of neural organization. The cyclic association between its unit is coordinated by the worldly conduct of the plan with arbitrary length. The long transient memory is otherwise called the secret Markov model augmentation. The demonstrating long-haul fleeting conditions are accomplished by utilizing a non-direct change work. By adding three gated in the RNN neuron the LSTM is expanded the three layers are the neglected door neuron, input entryway neuron, and the yield entryway neuron. The neglect entryway neuron controls the present status if to neglect, the yield door neuron expresses the yield, and the information door neuron states if the information ought to be perused. The succession in the drawn-out conditions is realized when these entryways are empowered. The repetitive secret layer is successfully multiplied with the assistance of these three entryways and this doesn't influence the yield. The issues or the disadvantage in the RNN has been overwhelmed by the LSTM, which is a viable technique when contrasted with RNN.

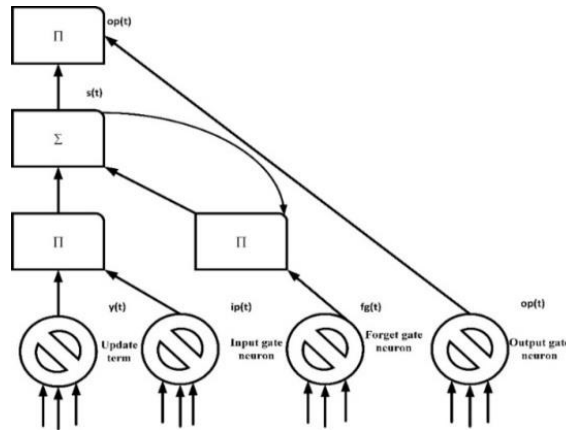$$i_t \;=\; \sigma(W_i X_t \;+\; U_i h_{t-1} \;+\; b_i) \tag{1}$$

$$f_t \;=\; \sigma(W_f X_t \;+\; U_f h_{t-1} \;+\; b_f) \tag{2}$$

$$O_t \;=\; \sigma(W_o X_t \;+\; U_o h_{t-1} \;+\; b_o) \tag{3}$$

$$\bar{C}_t \;=\; \tanh(W_c X_t \;+\; U_c h_{t-1} \;+\; b_c) \tag{4}$$

In the above condition i_t, f_t, O_t are the information, neglect, and yield doors at time t separately. W indicates loads that map the secret layer contribution to the three entryways of information, neglect, and yield. U indicates are the weight grids that guide the secret layer yield to entryways. b_i, b_f, b_o, b_c are vectors.

505 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

Fig.3: Long short term model network
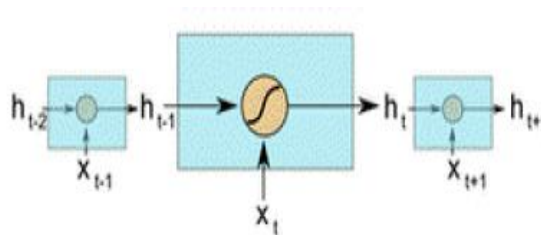
The schematic diagram addresses the framework outline of the LSTM calculation. Three neuron entryways are associated with the op(t) and s(t). Each LSTM comprises an update term, input entryway, neglect door, and yield door. Each door is interconnected to one another.

3.2 RECURRENT NEURAL NETWORK

Profound learning calculations are an example of AI calculations where the reason for existing is to find different degrees of the portrayal of info information. Multi-feature repetitive neural organizations are a class of neural organizations that are useful in displaying arrangement information. Gotten from feed-forward network repetitive neural organization displays comparative conduct to how human mental capacities. The repetitive neural organization produces prescient organization in successive information that other calculations can't. It consolidates the criticism and feed-forward associations of neural organization. It is a neural organization with circles associating the yield reaction to the information layer. Consequently, the yield reaction of the organization is capacitated by an extra information variable. It is a class of counterfeit neural organization where the association between hubs from a coordinated diagram along a worldly succession. Gotten from feed-forward neural organization it can utilize their interior state to handle variable and groupings of information. Besides, RNNs are amazing models for successive, and they utilize the past yield to foresee the following yield. For this situation, the actual organizations have monotonous circles. At long last, the blunders are returned in reverse to refresh the loads. In this investigation, four accessible RNN designs are utilized.

$$ht = g(Wxt + Uf\, ht - 1 + b) \qquad (5)$$

In the above equation g(·) indicates an actuation capacity, U and W are adaptable weight grids of the h layer, b is an inclination and x is an information vector.

Fig.4: Recurrent neural network

A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

The figure addresses the overall design of intermittent neural organization models. The yield of a specific layer and taking care of this back to the contribution to request to anticipate the yield of the layer.

3.3 ARTIFICIAL NEURAL NETWORK

The Artificial Neural Network gets the information signal from the outside world as an example and the picture as a vector. Every one of the information is then duplicated by its comparing loads. Essentially, it's a computational model. That depends on the designs and elements of organic neural organizations. Albeit, the design of the ANN is influenced by a progression of data. Thus, neural organization changes depended on information and yield. It is the piece of a registering framework intended to re-enact how the human cerebrum investigates and measures data. It is the establishment of computerized reasoning (AI) and tackles issues that would demonstrate inconceivable or troublesome by human or measurable principles. It is comprised of numerous perceptron layers; that is the reason it has the name 'multi-facet perceptron. These neurons get data in the arrangement of information sources. You consolidate these mathematical contributions with an inclination and a gathering of loads, which at that point delivers a solitary yield. Neural organizations are figuring frameworks with interconnected hubs that work similarly to neurons in the human mind. Utilizing calculations, they can perceive covered-up examples and connections in crude information, bunch and order it, and – over the long haul – constantly learn and improve. neural organizations are utilized for taking care of numerous business issues, for example, deals anticipating, client research, information approval, and hazard the board. For instance, at Statsbot we apply neural organizations for time-arrangement expectations, oddity location in information, and normal language understanding.
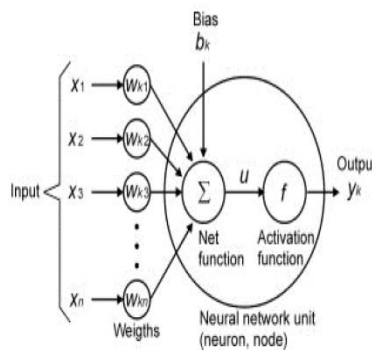
Fig.5: Artificial neural network

N is the input neuron are given from x1 to xn, Wk1 to Wkn are the weights. The weights are multiplied by their inputs, and then they are summed with the bias.

$$u = \sum w * x + b \qquad (6)$$

At that point, the actuation work is adjusted on u, i.e., f (u); at last, the last yield esteem is gotten as yk = f(u) of the neuron. In this investigation, feed-forward neural organizations were utilized.

3.4 MULTI-LAYERED PERCEPTRON NEURAL NETWORK

The construction of the network organization is variable because of the utilization of various quantities of delays. Contingent upon the construction of these fake neural organizations, distinctive organization models can be produced. A multi-layered perceptron is a profound, counterfeit neural organization. It is utilized for an assortment of errands, like stock investigation, picture ID, spam identification, and political race casting ballot expectations. It is a class of feed-forward counterfeit neural organization. MLP uses an administered learning procedure called back propagation

507 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

for preparing. Its various layers and non-straight actuation recognize MLP from direct perception. It can recognize information that isn't directly divisible. MLP is a profound learning strategy. A multi-facet perceptron is a neural organization interfacing numerous layers in a coordinated diagram, which implies that the sign way through the hubs just goes one way. The network of tried qualities for the secret layers was somewhere in the range of 0 and 4. Interestingly, the matrix of qualities for the secret neurons was made out of explicit numbers dependent on the equations which consider the size of the example and the number of information sources and yields of the organization. Moreover, for this situation, because of the intricacy of the issue, this network of neurons must be extended.
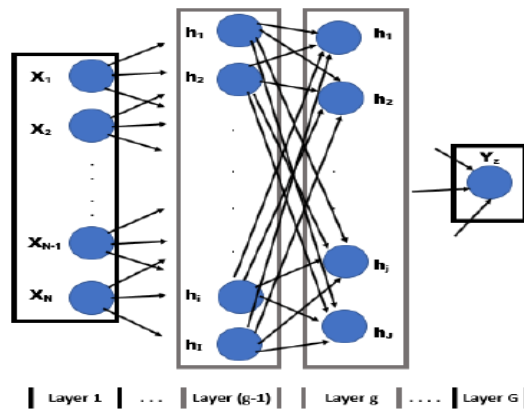
Fig.6: Multi layered perceptron neural network

The MLP neural organization preparation is finished with a retrogressive spread calculation; mistakes are proliferated through the organization and adjusted to the secret layers. Hence, mistake adjustment learning is utilized to prepare the ANN. There are a few different ways to play out the preparation yet, the approach utilized in this work comprises of refreshing the loads with a normal update of the loads, which is accomplished by consolidating every one of the examples in the info document and amassing all the weight refreshes. There is likewise a requirement for a top standard. Even though there are different alternatives, like an edge for the mean square mistake or a constraint on the greatest number of cycles, the most generally utilized is cross-approval. This technique is best in halting preparing when the best speculation is accomplished. It comprises of isolating a little piece of the preparation information and utilizing it to assess the prepared organization. In this manner, preparing should stop the second the organization's execution, measured by the mean square blunder, starts to diminish or deteriorates.

Ultimately, in all MLP models made in this paper the enactment work chose was the reLU work, the bit initializer was typical and the streamlining calculation was the versatile second assessment. Then again, the cluster size used to prepare the MLP neural organizations was equivalent to 64 smaller than usual group inclination plunge and the persistence was 100 ages.

3.4.1 PREPROCESSING DATA

The information accessible in this examination are hourly perceptions of two factors identified with the environment and two identified with the energy execution of the structure. A nonstop example without enormous arrangements of missing qualities was fundamental because of the utilization of hourly delays as contributions to the models. This implies that to prepare a model, other than the data of the autonomous factors at a given second, the data of past

A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

moments of specific factors are likewise presented. These three factors don't give any extra data being deferred because of their fake nature.
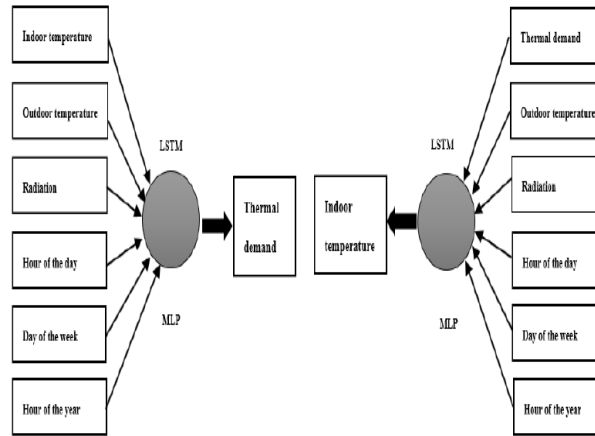
Fig.7: The variable used as input into the models to predict thermal performance

For the most part, as the number of delays thought about builds, the intricacy of the model requirements to change. In this manner, a cycle dependent on reiteration was done to track down the best boundaries for each model and every one of the distinctive slacked designs examined. This cycle comprises of rehashing a forecast of a similar test multiple times with each model, preparing with a piece of similar information, to separate the normal execution of every one of them and have the option to look at them. Consequently, the best design for each construction of slacks and to every one of the numerical models utilized is gotten.

3.4.2 DATA ACQUISITION SYSTEM

The information securing framework in the structure is additionally depicted in different articles by Cacabelos and Fernández. The pace of this framework is one moment. There are a few divider module temperature sensors; six of them are set on the ground floor, four on the principal floor, and one on the subsequent floor, every one of them from the maker Honeywell. Furthermore, the warm zone temperature is determined as the normal temperatures of each sensor from each floor. Then again, nuclear power utilization is estimated with nuclear power. The meteorological information was assembled from a climate station situated at 42.17_ N scope and 8.68_ E longitude at a height of 460 m. This station has a place with the climate station network from the Environment, Land Planning and Infrastructures Department, and it is found just 500 m from the structure.

3.4.3 ROOT MEAN SQUARE ERROR

The mistake measure considered in this paper to evaluate the exactness of every one of the proposed models is the coefficient of variation of the root mean square blunder.

$$CV = \frac{1}{\gamma}\sqrt{\frac{\sum_{i=1}^{N}(Yi-Yi)^2}{N}} \qquad (7)$$

This action was utilized both to track down the best construction relying upon the number of delays presented in the models and, additionally, to contrast the various models and the test tests.

509 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

4. RESULT AND DISCUSSION

In this paper, the warm and vivacious execution of a greenhouse in a total model was examined in Thailand. The different AI procedures are utilized to anticipate the presentation of the greenhouse and logical examination is talked about to assess the exhibition by utilizing various strategies.

4.1 ENERGY NEEDS

A nursery is a structure that is warmed with sun-powered radiation, to such an extent that it can remain warm in any event, during cold long stretches of winter. Light from the Sun goes through the glass rooftop to warm plants and the ground inside the nursery. These articles at that point discharge infrared radiation, which is caught up in the glass rooftop. It should Nursery farming is an exceptionally effective strategy for food creation that can incredibly advantage from supplemental electric lighting. The required power related to nursery lighting adds up to about 30.1% of its working expenses. As the light level of LED lighting can be effortlessly controlled, it offers the possibility to diminish energy costs by decisively coordinating with the measure of supplemental light gave to current climate conditions and a yield's light requirements and mugginess. One of the most effortless and most economical choices for warming nurseries in the colder time of year is to make a warm mass or warmth sink. These are objects that retain heat during the day and delivery it during the crisp evening hours. A famous strategy for making a warm mass is putting compartments of water in the nursery. Sun-oriented energy ingested at Earth's surface is transmitted once more into the climate as warmth. As the warmth clears its path through the climate and backs out to space, ozone-depleting substances retain a lot of it. They transmit the warmth back to the Earth's surface, to another ozone-harming substance particle, or out to space. the best material arrangement is the protected rooftop and the usefulness of green rooftops is at the most minimal level because of the moistness and the dampness that straightforwardly discharge the warmth transition rate; in any case, in cooling periods, green rooftops better affect cooling loads just as on the temperature of the rooftop. Roof nurseries in the warming time frame perform marginally better compared to green rooftops; significantly, the housetop greenhouse during the warming time frame is reenacted with no opening and concealing. As noticed, during the cooling time frame, the exhibition of the planned roof greenhouse is the best by half decrease since it gives concealing, protection by soil, and wind stream through openings, which thusly prompts a cooler rooftop surface throughout the mid-year. It is a typical conviction that green inclusion consistently improves energy needs for cooling; by and by, the aqueous model shows that, in a Mediterranean environment, the dampness in green rooftops can unfavorably affect the cooling loads.
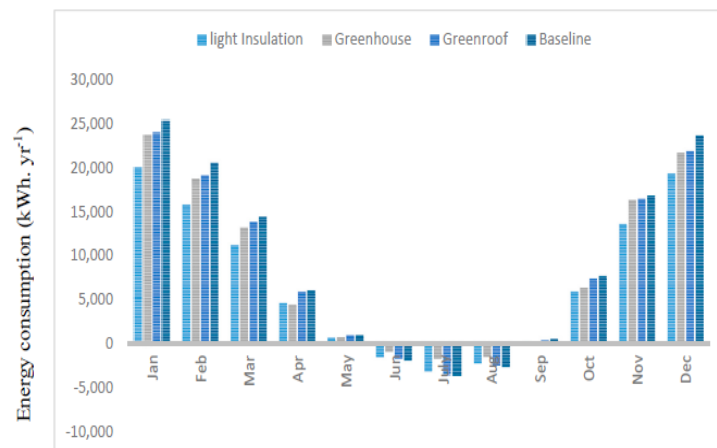

Fig.8: Energy consumption in different scenario

510 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

4.2 THERMAL DEMAND ANALYSIS

The aftereffects of the warm interest expectations for the two examples examined, through which the warm latency of the structure was investigated in this segment. In particular, the aftereffects of the LSTM models and the consequences of the MLP models. Each delay structure examined is addressed in the figures through the expectation with the most minimal mistake among the 11 redundancies of the examination.

A warm model is proposed to recognize the appropriate environmental condition for the development of different assortments of rice and cocoa. Rice is the primary yields in the southeast region, wherein around 8,082 km development are done, individually. The trial study was completed during the time of December. The proposed warm model is useful to demonstrate the hourly energy equilibrium and normal temperature appropriation inside the nursery. The nursery was read for east-west direction. The consistent state examination was used to discover additional nuclear power other than sunlight-based radiation expected to keep the plant temperature alluring. Exploratory approval of the model was done in an even range nursery. A numerical model is proposed to research the warm presentation of the nursery. To foster the model, energy balance conditions were determined to anticipate the natural condition. The model advancement is finished with specific suspicions: (1) Steady-state conditions were thought of, (2) one-dimensional warmth stream in the ground, (3) ignored the capacity limit of the nursery cover plant, (4) ignored the warmth limit and absorptivity, (5) warm properties of the plant are thought of to be something very similar in nursery and water, (6) dismissed the radiative warmth trade between the divider and nursery rooftop. This examination was led for even range type 2.44 m to 3.64 m nursery arranged at Pibulsongkram Rajabhat University in Thailand with 800 m height over the ocean level. The model's information boundaries included hourly information of the surrounding air temperature, vector position of the sun, and episode sun-powered radiation on different dividers/top of the east-west situated nursery. The information boundaries were chosen dependent on the environment and nursery conditions alongside the distributed writing. The reaction boundaries considered were sun-oriented radiation, plant temperature, and encompassing temperature. The reactions were recorded on the web through different instruments.

An organization endeavors to anticipate results as precisely as could be expected. The worth of this exactness in the organization is acquired by the expense work, which attempts to punish the organization when it comes up short. The ideal yield is the one with the most minimal expense. In this examination, for the applied organizations of MSE, the expense work is utilized.
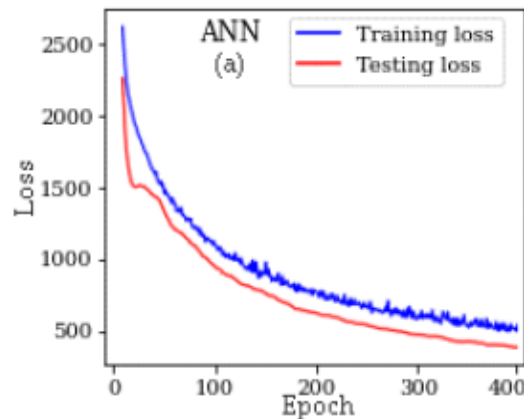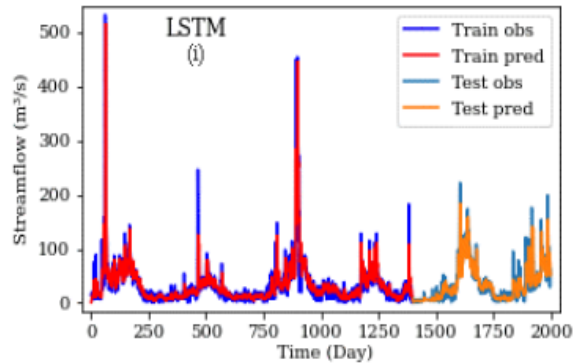

Fig.9: Loss function plot of ANN

The above graph shows that the loss plot function observed for artificial neural network in training and testing stages.

511 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

IMCRA

Fig.10: Stream flow function of LSTM

The above graph shows that the steam flow function of long short term memory in training and testing stages.
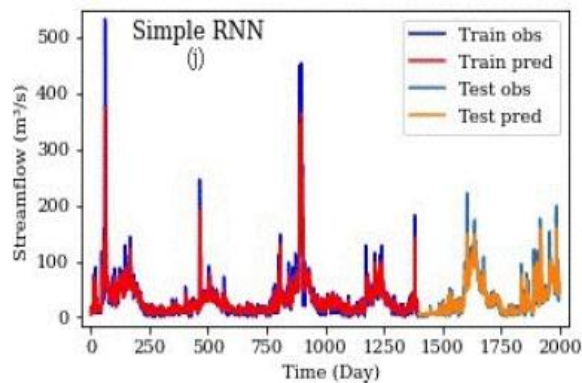
Fig.11: Stream flow function of simple RNN

The above diagram shows that the stream work noticed and figured time arrangement for straightforward intermittent neural organization model in preparing and testing stages. One significant explanation of this is that stream wealth has not very many high qualities, and the organization can't as expected learn them. This happens even though the stream wealth has a few low qualities, so the model can effectively and precisely be learned in the preparation stage. The long transient strategy is superior to different techniques.

5. CONCLUSION

The machine and profound learning calculation and another system are used to dissect the presentation of nuclear power. The strategy utilized in the examination depends from one viewpoint, on an exemplary AI model differentiating the improvement in the expectation precision given by the warm and vigorous presentation. The long momentary neural organization was brought out through a comparable investigation. This paper intended to introduce an exact procedure for investigating the presence of a greenhouse. It utilized profound long transient model organizations in comparative exploration and exhibited that these organizations perform better compared to the next arrange and can be utilized in a hydrological recreation as an application strategy. The intermittent neural organization incorporates less component similarity. It can deal with obituary info and yield length. This technology holds a major

512 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

Sci. Educ. Innov. Context Mod. Probl.| ISSN p (e): 27900169; 27900177

≪IMCRA

role in Thailand and the model simulates the thermal and energetic performance in the nation which can be explored with better practices.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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513 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
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Khongdet Phasinam, Thanwamas Kassanuk

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514 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk

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515 – www.imcra.az.org, | Issue 9, Vol. 8, 2025
A Comprehensive Simulation Model for Evaluating the Thermal and Energy Performance of Greenhouses in Thailand Using Machine Learning Techniques
Khongdet Phasinam, Thanwamas Kassanuk