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DESIGN AND IMPLEMENTATION OF SOCIAL SECURE MODEL USING MACHINE LEARNING

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Abstract

Knowledge of artificial intelligence (AI), and more specifically machine learning (ML), is essential if one wants to effectively analyse these data and construct the associated smart and automated applications. In the field of machine learning, there are many different kinds of learning algorithms to choose from, including supervised, unsupervised, semi-supervised, and reinforcement learning. The use of network technology to connect physical systems and computer systems enables the control of several physical systems at the same time and provides intelligent applications for those systems. Nevertheless, increasing connection results in increased attack vectors through which cybercriminals might get into the network and perform cyber-physical attacks, therefore remotely affecting CPS operations. As a result, a significant amount of research on cyber-physical security is currently being carried out across a variety of domains, including physical, network, and computing system environments. Additionally, because large-scale and complicated CPSs make it difficult to analyse and identify cyber-physical assaults, machine learning (ML) approaches have lately been embraced for cyber-physical security. This is due to the fact that large-scale and complex CPSs make it difficult to analyse and detect cyber-physical attacks.

keywords:*Implementation, Social, Machine, Learning*

INTRODUCTION

Because of the growing importance of networks in modern life, study in the subject of cyber security is becoming increasingly relevant. Anti-virus software, firewalls, and intrusion detection systems (also known as IDSs) are the primary components of cyber security measures. These methods defend networks against assaults from both inside and outside the organisation. An intrusion detection system (IDS) is one variety of detection system that is among those that play a significant part in the protection of cyber security by monitoring the states of software and hardware that are operating within a network.

In 1980, the very first proposal for an intrusion detection system was made. Since that time, a great number of developed IDS products have emerged. In spite of this, many IDSs continue to have a high false alarm rate, which causes them to produce a large number of warnings for relatively harmless scenarios. This increases the workload for security analysts and makes it more likely that a potentially catastrophic assault would go unnoticed. As a result, a significant number of academics have been concentrating on the creation of IDSs that have greater detection rates and lower rates of false alarms. Existing intrusion detection systems (IDSs) suffer from the additional shortcoming of being unable to identify previously unidentified assaults. Because of how fast network settings may shift, there is a continual emergence of new and different kinds of assaults. As a result, it is essential to design IDSs that are able to identify previously unidentified threats.The aforementioned issues have motivated academics to shift their attention towards developing IDSs through the application of machine learning techniques. Machine learning is a subfield of artificial intelligence that refers to a set of algorithms that, when applied to large datasets, can automatically extract meaningful information. When there is sufficient training data available, intrusion detection systems that use machine learning can reach excellent detection levels. This is only possible when machine learning models have sufficient generalizability to detect attack variations as well as unique assaults. In addition to this, IDSs that are based on machine learning do not rely extensively on prior domain knowledge; as a result, it is not difficult to develop or build them. Deep learning is a subfield of machine learning that has proven to be capable of producing exceptional results. Deep learning methods are superior to more standard approaches to machine learning in terms of their ability to handle large amounts of data. In addition, the methods of deep learning may automatically train feature representations from raw data and subsequently output results; they function in an end-to-end manner and are useful. Deep learning is distinguished by the presence of a deep structure, which is comprised of a number of layers that are concealed from view. On the other hand, conventional machine learning models like the support vector machine (SVM) and the k-nearest neighbour (KNN) have either no hidden layers at all or only one hidden layer. These classic approaches to machine learning are sometimes referred to as "shallow models" for this reason.

This survey's goals are to categorise and summarise the machine learning-based intrusion detection systems that have been suggested to date, to abstract the key principles of applying machine learning to issues in the security domain, and to analyse both the existing obstacles and potential future advances. For the purpose of this study, we chose publications that were representative and were published between 2015 and 2019, as these years reflect the most recent development. Several earlier studies have categorised different research efforts according on the machine learning methods that were utilised. The primary goal of these surveys is to familiarise readers with a variety of machine learning methods that have been used to IDSs. This information can be useful to machine learning researchers. On the other hand, this particular taxonomic system places a greater emphasis on certain implementation technologies as opposed to cyber security domain challenges. As a consequence of this, these surveys do not directly address the question of how to use machine learning to solve challenges in the IDS area. In this survey, we suggest a new data-centered IDS taxonomy as a solution to this challenge and then describe the associated research that follow this taxonomy. We hope that this will be helpful.

In IDS, data objects are the most fundamental building blocks. The characteristics that are associated with attack behaviours are carried by data items. Because the types of features and the techniques for extracting features are diverse across the various data pieces, the most appropriate machine learning models are likewise distinct for each data element. As a result, this study does an exhaustive investigation of the data that is processed in the field of cyber security and categorises IDSs according to the data sources. This taxonomy shows a process including data–feature–attack behavior–detection model, which makes it easier for readers to identify study ideas for certain domain challenges. For instance, this taxonomy system has the potential to provide solutions to the following issues: (1) Which characteristics best characterise the various types of attacks? (2) Which categories of data are best suited for identifying specific types of cyberattacks? (3) Which categories of machine learning algorithms are the most effective matches for the various types of data? (4) How might methods of machine learning enhance intrusion detection systems in a variety of different ways? Researchers in the field of cyber security are interested in these concerns. In conclusion, a summary of recent representative research is used to explain the difficulties that will need to be overcome in order to continue the development of machine learning techniques for IDS.

Design and Implementation Method of a Rural Social Security System Based on Deep Learning

Rural Social Security

Agricultural social security refers to a system in which the state and other social organisations, in compliance with the law, give monetary and material aid to any and all farmers. Its goals are to reduce the income gap between the wealthy and the rest of society's members, to gradually improve the material lives of farmers, and to ensure that everyone has access to social security. Fair and stable, achieving social stability and economic growth in rural regions, providing a suitable environment for rural development, promoting healthy and sustainable development in rural areas, and accelerating agricultural modernization are all goals that need to be accomplished. Rural social security, rural social welfare, rural social aid, and rural preferential treatment are some of the components that are included in my nation's rural social security system. Insurance for family planning, insurance for occupational injuries, insurance for medical care, and insurance for retirement are only few of the areas that fall under the umbrella of agricultural social insurance. However, the ageing of the rural population in our nation is a very severe problem. The population is rather dense, and many farmers are unable to carry out the activities of their daily life because they are undergoing medical treatment. This places an increased load on farmers. As a result, the key components of the agricultural social security system that currently exists in my nation are care for the elderly and medical treatment, with the primary emphasis being placed on the establishment of a rural social pension and cooperative medical system. The payment of pensions to farmers who have reached the age of retirement in line with the applicable laws and regulations of our nation is what is meant by the term "Agricultural Cultural Relics Insurance." The objective is to provide a stable income for retiring farmers as a minimum standard of living. The state, businesses, and individual contributors all chip in to help build and support the pension system from the beginning. The rural cooperative medical care system is a participatory health insurance programme that receives financial backing from the government. Rural economic organisations and rural groups are contributing to its funding in order to minimise the rural poverty that is caused by illnesses and to preserve the health of individuals living in rural areas.

The term "rural social assistance" refers to a system in which the state and various social groups offer material support to rural farmers who are unable to guarantee their day-to-day life for various reasons. The purpose of the system is to ensure that farmers continue to suffer revenue loss or get income that is insufficient to fulfil their basic requirements for subsistence. At the moment, the primary emphasis of my nation's rural social aid is on disaster relief as well as rural livelihood systems. Farmers who have suffered losses as a result of natural disasters are the primary beneficiaries of disaster assistance, whereas less prosperous farmers who do not yet have adequate solutions to their basic problems are the primary beneficiaries of the minimum agricultural security system. A public welfare activity, the prosperity of rural society is a guarantee granted to certain special farmer groups, such as the elderly and the disabled, as well as vulnerable groups in rural regions. These special farmer groups include the elderly and the disabled. Its primary objective is to offer financial and material aid to senior people in rural regions who are unable to take care of themselves and elderly people who do not have children, with the goal of ensuring that they maintain a minimum quality of subsistence. In addition to this, they offer emotional and physical assistance to the elderly, widowed, and disabled people who live in rural regions. Contribute to an increase in the quality of life enjoyed by people of rural areas. The income of Chinese farmers on a per capita basis as well as their overall consumption levels have seen earth-shattering shifts in the past few years. In the same vein, the initial level of social assistance has shown to be insufficient in meeting their present-day requirements. The living standards of those who used to farm are more important to them, thus they pay greater attention to things like food, clothes, shelter, and transportation. They have just started paying attention to the requirements that their spiritual consumption has. However, in order to ensure rural social welfare stability, a bigger capital investment from the state is required. This is something that is exceedingly challenging for a growing nation with a huge population, which is why social welfare in rural regions cannot be realised in the near term.

Convolutional Neural Network

In the field of deep learning, the convergent neural network, which is also known as a convergent network, is the neural network that is used the most frequently. It is a neural network that was developed expressly to handle data with a similar grid pattern. It has been shown that compact neural networks perform very well in a variety of application domains, including those dealing with picture data (which can be seen as a two-dimensional grid of pixels) and time series data (which can be thought of as a one-dimensional grid created consistently over time). The structure of a trainable multilayer network is made up of numerous single-layer convolutional neural networks. The first convergence parameter is typically referred to as the input (that is, the data that will be processed), the second convergence parameter is termed the kernel function (which may be viewed as the processing function), and the output is called the feature map. This terminology is used in the context of convergent networks. The output of a neuron is connected to the weight of the input node and its connection in a standard neural network; however, the weight will not be reused in accordance with the calculation rules of the calculation type; that is, when multiplied by an element, the input will not be used again. Sharing of parameters is possible inside the feature map. Every feature map on level 2 will be able to identify each and every feature map on level 1. A network with bound weights (sometimes referred to as weight distribution) is another representation of the same principle. Figure 1 presents the detailed breakdown of the weight distribution.

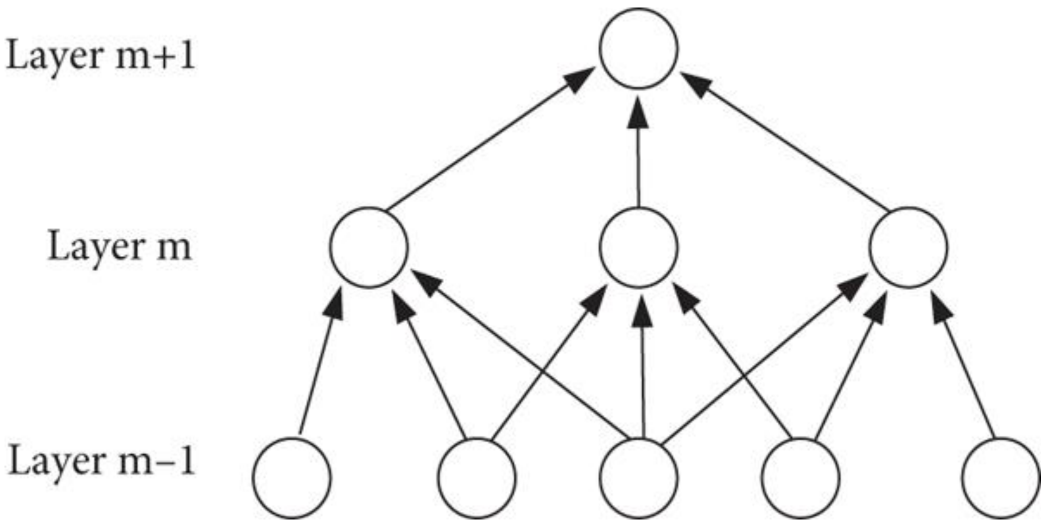

Figure 1 Weight sharing.

In a typical convergent neural network, each plane is comprised of three distinct phases. To begin, the layer will compute numerous convergences in parallel in order to provide a collection of linear activation responses for the next step. During the second step, each linear activation response is going to be routed via a nonlinear activation function. This phase is also known as the detection phase in some circles. In the third step, an attempt is made to maximise the output of the cohesive neural network by once more making advantage of the focused function it provides. It is the responsibility of the centralised function to process the output of the element coming from the adhesive layer in order to replace the output coming from the network at this point. It is possible that the usage of centralised functions can be deemed a sufficiently powerful extra function before: the functions gained via this degree of learning need to have just a minimal quantity of variable translation needs. When it turns out that this assumption is correct, the statistical performance of the network can be considerably improved by concentration.

Types of Machine Learning Techniques

As can be seen in Figure 2, the algorithms for machine learning may be broadly categorised as falling into one of four groups: supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning. In what follows, we will have a brief discussion of the many types of learning techniques and the extent to which they may be used to the solution of real-world situations.

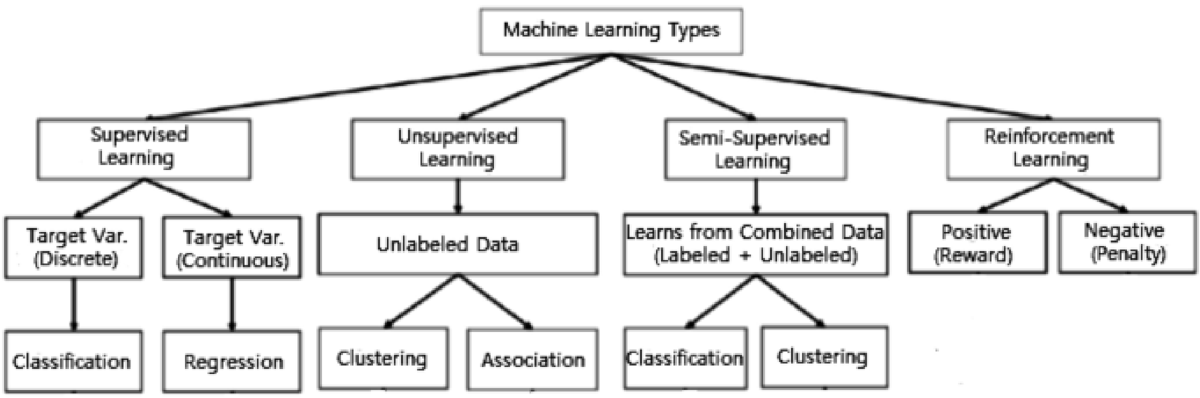

Fig. 2 Various types of machine learning techniques

Supervised: The goal of supervised learning in machine learning is normally to train a function that translates an input to an output based on sample pairs of inputs and outputs. This job is known as "supervised learning." For the purpose of deducing a function, it employs labelled training data in conjunction with a set of training samples. To put it another way, supervised learning is carried out when a task-driven approach is taken, which means that specific goals are recognised as being to be fulfilled from a given set of inputs. "Classification," which involves separating the data, and "regression," which involves fitting the data, are the most prevalent types of supervised jobs. One type of learning known as supervised learning involves making predictions about the category label or sentiment of a piece of text, such as a tweet or a review of a product. This is referred to as text categorization.

Unsupervised: An example of a data-driven process is unsupervised learning, which is the process of analysing unlabeled datasets without the need for human intervention. This is used extensively for a variety of objectives, including the extraction of generative characteristics, the identification of relevant patterns and structures, the grouping of data, and exploratory purposes. Clustering, density estimation, feature learning, dimensionality reduction, identifying association rules, anomaly detection, and other similar activities are some of the most prevalent types of unsupervised learning tasks.

Semi-supervised: Because it uses both labelled and unlabeled data in its analysis, semi-supervised learning may be thought of as a hybridization of the supervised and unsupervised learning approaches that have been discussed thus far. As a result, it lies somewhere in the middle between learning "without supervision" and learning "with supervision." In the actual world, labelled data may be few in a variety of settings, but unlabeled data are abundant. This presents an opportunity for semi-supervised learning, which can be beneficial. When it comes to prediction, the end aim of a semi-supervised learning model is to deliver an output that is superior to the one provided by the model when utilising the labelled data from the model on its own. Machine translation, fraud detection, data labelling, and text categorization are just few of the application domains that make use of semi-supervised learning.

Reinforcement: It is a sort of machine learning technique known as reinforcement learning. It enables software agents and machines to automatically analyse the best behaviour in a given context or environment in order to increase its efficiency. This is known as an environment-driven method. This form of learning is based on receiving a reward or being subjected to a penalty, and its ultimate objective is to utilise the insights received from environmental activists to take action that will either raise the benefit or decrease the danger. It is not recommended to use it for the purpose of resolving simple or uncomplicated issues because it is a powerful tool for training AI models that can help increase automation or optimise the operational efficiency of sophisticated systems such as robotics, autonomous driving tasks, manufacturing, and supply chain logistics. However, it can help increase automation or optimise the operational efficiency of these systems.

Therefore, in order to develop successful models in a variety of application areas, several types of machine learning approaches can play a vital role according to their respective learning capacities, based on the nature of the data, as was stated previously, as well as the output that is desired. In Table 1, we provide a concise overview of the many different types of machine learning techniques along with some examples. A data-driven application's intelligence and skills may be significantly improved by implementing certain machine learning methods, which will be covered in detail in the next section of this article.

Experimentation with the Design and Implementation of a Deep Learning-Focused Method for a Rural Social Security System

System Requirement Analysis

Functional Requirement Analysis

The primary purpose of this research system is to finish storing revenue and spending data, to conduct business transactions, and to generate different files for the municipal, county, district, and township and rural social endowment insurance funds. (One is the socioeconomic position of farmers, which is examined from the point of view of the amount of arable land owned by farmers, the sources of income they have, the primary expenses they have, and the challenges they confront in both production and daily living. The second objective is to evaluate the state of the implementation of the rural social insurance system from the point of view of farmers' involvement in the new rural social pension insurance and new rural cooperative medical insurance, as well as levels of payment and satisfaction with the policies. Third, the assessment of the implementation impact of the rural minimum living security system is carried out from the perspectives of the minimum living security standard, the effect of poverty reduction, and the level of farmers' satisfaction with the system. A centralised database is built with municipal administration at its core in order to facilitate the supervision, management, and analysis of data. Consider the management of the county to be the primary body of management, and the management of the numerous enterprises and townships to be auxiliary management. When the conditions are favourable, the vast majority of company operations can be carried out.

The township (village) management, personnel participation management, insurance relationship change management, payment management, account management, benefit distribution management, system connection management, financial management, financial subsidy management, and comprehensive query management are some of the business module designs that are primarily finished off by the city bureau network version of this system. Other business module designs include information publicity, statistical reports, and system maintenance. The previously mentioned Windows 7 operating system can be used by the outlets regardless of the type of software that is powering the server. The city level has the capability to operate the city's data. The data belonging to that particular county and city are the only ones that may be used and operated. Each town is only permitted to use and run the databases of the county and city, but they are free to use and operate the databases of the township.

Analysis of Nonfunctional Requirements

Since the proposal and final application of this topic provide a usable army equipment management system for specific units, it is necessary to consider how to build a stable, easy-to-maintain, expandable, and highly supportive system based on actual usage (concurrent number of troops of the equipment management system). This is necessary because it is necessary to provide a usable army equipment management system for specific units.

One of the aspects of study that will be covered by this topic is the building of the environment that runs on the server. The computer is necessary to have sufficient loads for numerous users to access the appropriate hardware configuration at the same time in order for it to function as a server. Additionally, the machine is required to have sufficient hard disc space in order to store data, and it is required to be equipped with the software interface system that is required by the operating system. In addition, it is necessary to combine the existing network conditions of the internal network, take into account all relevant aspects such as stability, concurrency, security, and ease of use, and make a reasonable selection, configuration, testing, evaluation, and evaluation of web services, databases, and operating systems. All of these steps are necessary. The trial deployment receives an operating environment construction plan that is robust and steady in terms of performance.

The Experimental Results of the Design and Implementation of the Deep Learning-Based Rural Social Security System

Survey Content and Sample Analysis

The survey uses a sample method called random sampling. The content of the survey focuses mostly on these three factors. First, the production and living circumstances of farmers, specifically with regard to the amount of farmland available, the sources of revenue, the primary expenditures, and the challenges that farmers confront in both production and life. The second objective is to study the implementation status of the rural social insurance system. This will be done from the viewpoints of farmers' involvement in the new rural social endowment insurance and new rural cooperative medical insurance, as well as payment levels and policy satisfaction. Third, the assessment of the implementation impact of the rural minimum living security system is carried out from the perspectives of the minimum living security standard, the effect of poverty reduction, and the level of farmers' satisfaction with the system. Two counties and cities, seven towns, and seventeen villages contributed to the collection of samples, which resulted in 192 valid samples in total. Table 1 presents the sample distribution for your perusal.

Table 1 Survey sample distribution table.

	Town	Village	Residents
County seat A	a	1	11
	b	2	28
	c	2	25
	d	2	23
	e	2	24
County seat B	a	4	38
	b	4	43

In the survey sample, males made up 61.4% of the population, while females made up 38.6% of the population. There were 16.6% of the population that was illiterate (there were more elderly people left behind in the survey area), 41.5% of the population only had elementary school education, 31.1% of the population only had junior high school education, and the education level was high school (middle school). Those with a college degree or above accounted for 6.2% of the population; those with a college degree or above accounted for 4.1% of the population; those aged 18-29 accounted for 5.2% of the population; those aged 30-44 accounted for 24.0% of the population; those aged 45-59 accounted for 38.0% of the population; those aged 60-74 accounted for 28.1% of the population; and those aged 75 or above accounted for 4.7% of the population. 18.8 percent of households Those who did not go out to work made up 51.0% of the population, which accounted for 49.0% of the total. 3.3% of the cultivated land area was less than 1 mu, while 11.5% of it was comprised of 1-2 acres (including 1, less than 2) and 2-3 acres (containing 2, less than 3). 3-4 acres (including 3, less than 4) accounted for 23.0% of the total, 4-5 acres (including 3, less than 5) accounted for 14.8% of the total, and 5 acres and above accounted for 24.6% of the total.

The breakdown of the many revenue streams that statistical farmers rely on is presented in Table 2, which is one of these.

Table 2 The composition of income sources of survey sample farmers.

Income type	The proportion (%)
Agricultural income	23.23
Self-employed income	2.94
Income from migrant workers	58.07
Transfer income	4.76
Other income	13.00

There are various life pressures that people face due to the fragility features of farmers. These life pressures include irresistible natural dangers, a shortage of production materials and technical constraints, people's livelihood difficulties that are strongly tied to life, and systemic risks that result from changes in national policy. Farmers face all of these life pressures on a daily basis. The stress that farmers face in their daily lives and in their professional endeavors is illustrated in Figure 5.

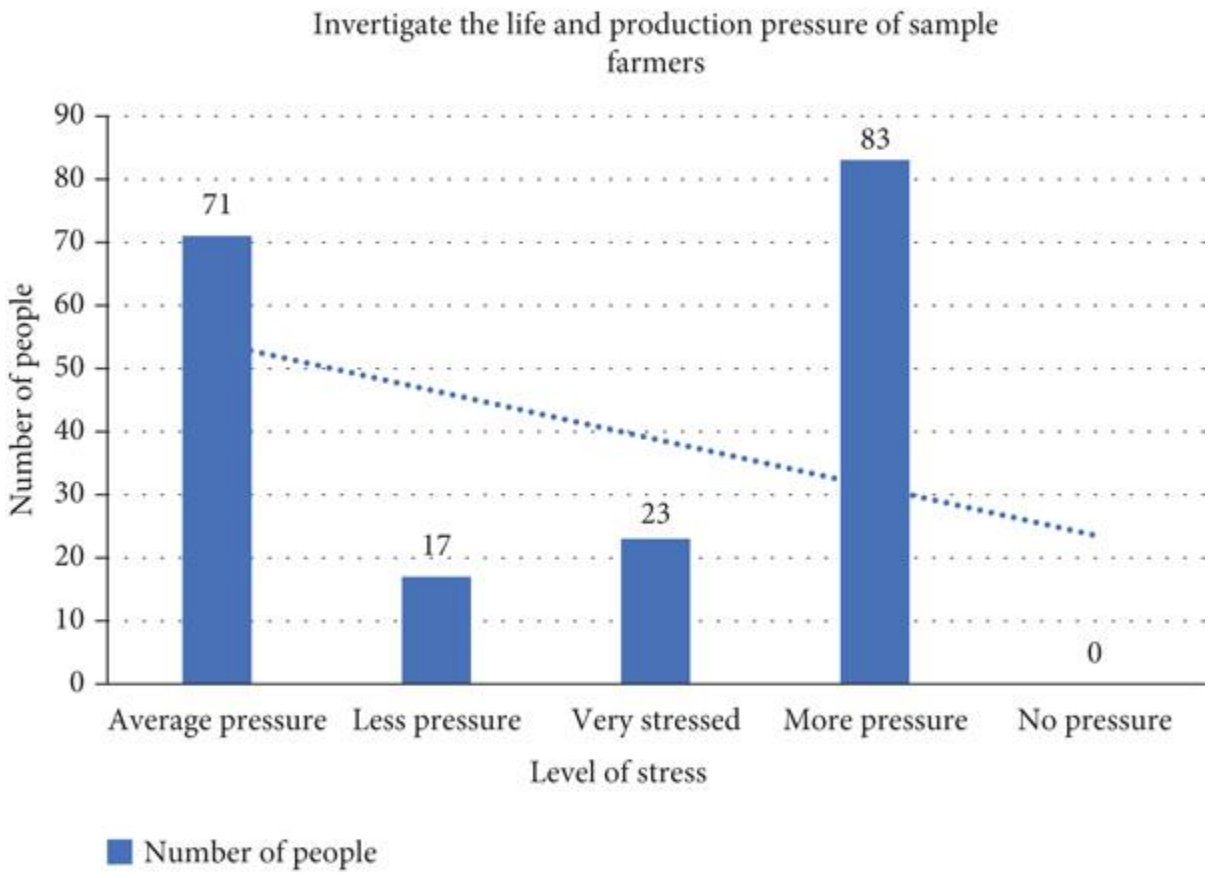

Figure 3Examine the stresses of daily life as well as productivity that sample farmers face.

According to the specific survey data, among the sample population of farmers, 12.26% of the farmers believe that the pressure on production and life is very high, 40.47 % of the farmers believe that the pressure on production and life is relatively high, 37.48% of the farmers believe that the pressure on production and life is average, 8.97 % of the farmers believe that the pressure on production and life is very small, and the number of farmers who choose not to be pressured is 0. It is clear that the farmers in the survey region have a strong perception that there is a significant amount of stress placed on both productivity and living, and the relatively big samples make up 51.76% of the overall sample.

Conclusions

The research design demonstrates that the design of the rural social security system based on deep learning that is presented in this article is superior to other existing rural social security systems in terms of the power of the statistical data, the quality of the data retention, and the timeliness of the response to the system. In addition to this, the statistical capability is significantly improved. This article employs the method of sample collecting as well as the method of statistical analysis. It also streamlines the algorithm and creates a new rural social security system. According to the information that was gathered by the system, the percentage of farmers who are very satisfied, satisfied, average, unhappy, and extremely dissatisfied with the new rural insurance is 8.94%, 45.533%, 34.96%, 8.13%, and 2.44%, respectively. It is clear that the proportion of farmers who select "satisfied" as their preferred state is the biggest, while more than 10.0% of farmers select "dissatisfied" or "very dissatisfied" as their preferred state. Investigate the elements that farmers are concerned about in relation to taking part in the new rural insurance, and the options for the questionnaire may also be set to include multiple choice questions. The results of the survey indicate that 29.27% of farmers believe that the individual payment for participating in the new rural insurance is higher; 26.02% of farmers believe that they do not understand the new rural insurance system; 9.76% of farmers believe that it is unnecessary to pay for the new rural insurance; 22.76% of farmers choose to rely on either themselves or their children in the future; and 27.64% of farmers believe that the system is unstable. The data that is collected by the system that was built in this work has a high degree of accuracy, the sample size is sufficient, and the system's automatic analysis is carried out in a very short amount of time.

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