ISSN: 2182-2069 / E-ISSN: 2182-2077

Incorporating Computer Networks and Machine Learning for AI-Driven Network Operators

Yousra Atalla Turky[1*], Israa Zamil Chyad Alrikabi[2], Shaimaa Hadi Mohammad[3], and Zaid Hamid Alkhairullah[4]

[1*]Ministry of Education, General Directorate of Education, Anbar, Iraq. youssraalani0@gmail.com, https://orcid.org/0009-0002-7911-7318

[2]Ministry of Education, University of Sumer, Dhi-Qar, Iraq. asraaadnan74@gmail.com, https://orcid.org/0009-0003-6541-9726

[3]Ministry of Education, Department of Communications Engineering, College of Engineering, University of Sumer, Dhi-Qar, Iraq. shma1910@gmail.com, https://orcid.org/0000-0001-7922-619X

[4]Ministry of Education, General Directorate of Vocational Education, Department of Vocational Education in Thi Qar, Iraq. zaid.sw82@gmail.com, https://orcid.org/0009-0005-1363-8489

Received: February 03, 2025; Revised: March 17, 2025; Accepted: April 25, 2025; Published: May 30, 2025

Abstract

An intelligent network operator (INO), working as an artificial entity intelligence (AI) model, has been detailed and analyzed in this paper and involves an innovative approach, which is merging computer networks and artificial neural networks (ANNs). The operator first scans the network's state information into embedding vectors for matching embedding vectors of different types of information at each point of the network's operation. The fact that the operator has successfully cleared all testing phases with a 100% accuracy rate is mitigating the risks during the operation. Furthermore, extending the identification and resolution of major training losses is also introduced as a novel technique to maximize the overall efficiency of the operator's training process. A specific sealed computer network simulator has been designed to facilitate a teaching and testing environment. It also serves as a simulator that allows data collection, training, and testing procedures to be automated. This essay outlines succinctly the principal advancements used in this study through the use of the novel methodologies employed in the design, development and testing of the AI-based network operator. Both of these contributions are very important for the area and indicate that there exists the potential to improve network operations and training and testing frameworks through the application of AI.

Keywords: Artificial Intelligence-based Network Operator, Computer Network and Artificial Intelligence Integration, Neural Networks, Computer Embedded Vector Graphics, Auto Training and Evaluation, Neighboring.

1 Introduction

The traditional company network infrastructure is faced with a number of such obstacles during the digital transformation. Despite this, there is no doubt that the computer network system is a fundamental

Journal of Internet Services and Information Security (JISIS), volume: 15, number: 2 (May), pp. 336-350.
DOI: *10.58346/JISIS.2025.I2.024*

*Corresponding author: Ministry of Education, General Directorate of Education, Anbar, Iraq.

part of the IT infrastructure of an organization that is experiencing further changes in design and architecture (Garrahan et al., 2002). This is an environment shift from symbolic and constructed networks to application networks directed toward businesses and the need for applications (Song et al., 2024). Modernization of the corporate network is an essential part of the corporate network digital transformation initiative as a whole (Shetty & Nair, 2024).

There are several constraints in existing network infrastructures. Generally, businesses don't need the flexibility of their physical infrastructure to complement changing operational needs (Che et al., 2023). In addition, these networks remain unautomated and unintelligent, making consistently efficient operation very difficult. But network administration has gotten to be such muddles for some time now (Ravshanova et al., 2024). These are important causes as many of them frequently hinder the achievement of business continuity criteria codified in the Service Level Agreements (SLAs) or else result in remarkable network operational expenses.

Therefore, the purpose of this document is to address those challenges and to do so; this enacts an intelligent network operator. It is a system that calculates the present network parameter status, checks whether there are any problems or defects in the parameters and then suggests the least possible error to resolve the problem (Jelena & Srđan, 2023). The intelligent operator enhances network resilience by providing another way of operation management of these network operations. Furthermore, it also facilitates better performance of the network application and makes sure the network transformation requirements are met for the enterprise networks in an ever-changing digital environment (Narayanan & Rajan, 2024).

2 Related Work

Intelligence of Computer Network System

The network system is broadly used to connect computers, terminals and the external environment with various network technologies. The resources can then be shared and transmitted over the network devices and communication lines amongst the mentioned devices, servers and other hardware distributed over different locations (Zhou et al., 2024). The focus of the subject-matter areas of interest is on network communication protocols and network operating systems. The information networks are set up by means of connectivity mediums such as twisted pair cables and optical fibres. With these media, we can perform communication and data transfer from one point to the other through the network infrastructure.

The design of computer network systems should follow that in which current data transmission requirements are met and in which future trends are included. The network systems should be adaptable for upgrades and for scalability to support future requirements. When looking into the security and stability of a network, one must have multiple network safeguards and reliability assurance. The reliability of such smooth operation of both information and intelligent systems is to the stability and reliability of the system (Praveenraj et al., 2024; Zhang et al., 2024).

According to network structure, the computer network subsystem of an intelligent building should use probabilistically the star topology. Public, private companies and intelligent networks are three kinds of networks that are commonly classified according to particular service type. It is used to isolate the company network and the internet (external) network for their security. In this case, it is simply all about making the work, servicing, and programming of the network security devices and the primary node switch all the live without confusing the entire network status and effectiveness (Patil & Iqbal, 2024).

The main objective of the introduction of a computer network is to share computer resources. The application program and an information database are the typical resources which are generally computer equipment itself. A computer network platform's dependability is important in relation to the degree of computerization and information processing in urban libraries, archives and construction sites (Fei et al., 2020). These operation's success is based upon the network's performance and stabilities in urban setups in which it is possible to attain necessary information with great reliability. Hence, key network components need to be so designed to efficiently support these functions (Xu et al., 2024).

It was a part of the project, which included constructing both external and internal networks for urban libraries and their archives, deployment of an intelligent network, and provision of all the resources available. First of all, as described, the external network, as a rule, offers access to the Internet plus the internal local area network (LAN). Wireless networks are also optimized and coverage is also ensured through the external network (Wu et al., 2024). The internal application services and links to the higher intranet level are available on the intranet. As a result, a fundamental part of the improvement in security measures and internal processes and operations is to adopt an intelligent network.

The segmentation of the security system is based on the required protection of businesses and offices, policy level, and the current state of networks and applications. This instigates the creation of unique security zones (Gong et al., 2024). This is necessary for all networks to ensure the reliability of the network infrastructures, and all the core switches, access switches, and wireless devices of the networks must have been produced by the same company to check this reliability (Zhang et al., 2024).

System Architecture

The minicomputer network case study of how an intelligent operator makes the operating system process is given as an example. This is a model where the simulator randomizes many sorts of computer networks and generates a variety of networks. This provides the intelligent operator or controller with assistance by judging and performing well in different conditions for being adaptive to different network environments. We then give a first outline of the simple structure of a network that uses minicomputers. The network has computer nodes, routers and switches, and other such devices. These devices are placed as a network of very complex and detailed network systems which are connected by cables or wireless. In addition, the custom network is supervised by professionals and skill training very well in the supervision of system operation operators. These operators are involved with a wide range of things depending on the tasks you are required to do with respect to network management duties such as traffic monitoring, packet analysis, and so on. It's a critical role for the network as they are monitoring the real-time operations, detecting any potential issue and taking action when it's required to fix it. Such a level of oversight can help the network run smoothly and can resist disruptions even in situations different from those. The performance and stability of the network are dependent on intelligent operators and simulators. Pre-set guidelines and algorithms are followed by them to perform various tasks such as:

- Defect detection and network monitoring: If we neglect operators, we risk forking out terrible pains. Operators monitor traffic patterns, monitor the status of the operation and equipment, and detect anomalous activity like congestion and equipment failure.
- This includes changing the network in real-time, with the amount of traffic coming in, and adjusting the transport of the data so the network works as designed.
- The use of intelligent operators who constantly check for attacks or vulnerabilities provides security on the networks. They counter this automatically with the aid of threat mechanisms, such as intrusion detection and firewall configurations.

- Back-up procedures, for example, if they are repetitive tasks, can be part of these activities—software updates and patch management down the line, as well as configurations of the network device. Reducing the workload the administration is responsible for goes a long way.
- Intelligent operators are used to monitor and supervise the usage of a network and its other performance strategies for a general enhancement of performance and network stability (Ni et al., 2024; Zhang et al., 2024).

These features make it easy for the experts responsible for this compact computer network to manage and monitor it and increase its reliability, safety, and efficiency. As such, users can get on with their networks, and the administrators are free from burdensome network management easily and efficiently.

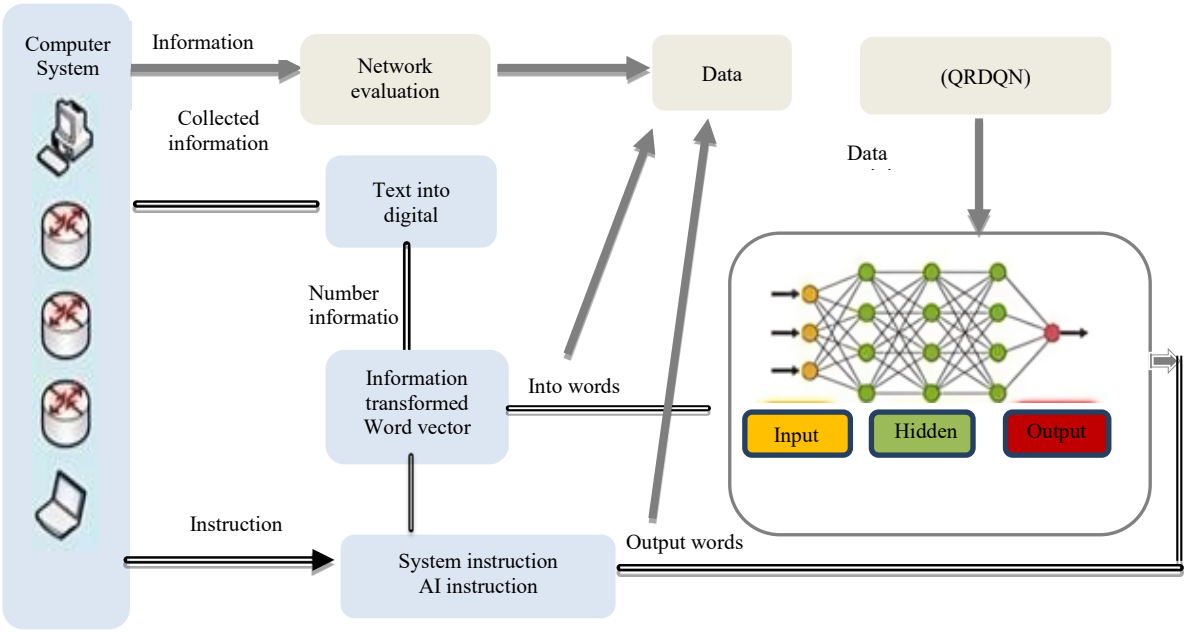

Figure 1: Architecture and Data Flow Diagram

Each component is described concisely in Figure 1. A system of computers involved in communication and the sharing of information is referred to as a network of computers. It is either the condition of the system normal or malfunctioning and, in textual style, conveys this information. In addition, it is capable of autonomously changing the status information that it communicates on behalf of network devices on the basis of received directives.

To begin with, network information on a computer network means information about the workings and performance of a computer network. Specifically, network information observations: (Wang et al., 2024) the subset of network data that is preprocessed and fed to a neural network for analysis. An encoder is an algorithm that converts textual data into numerical numbers. To perform this, information is converted into textual representation using a pre-established mapping table. Data in a digital format. Digital (observation):

Information of the same kind as that which is desired to be represented is converted into a digital representation that accurately reproduces the original observed information. Network data (observation).

He helps track what is going on for the encoding of information from integers into embedding vectors. It changes the text to embedding vectors, which are numbers in the form of floating points. Before the process begins, he employs conventions of transformation.

The word embedding vector simply means a list (or a set) of floating point integers called vectors, with which you can build representation to observations. Converts the identical data (observations) into a numeric form (Online Artificial Neural Network Model). Intelligent Operator: The final output or instruction is numerical, at the end of which the present observations or embedded vectors can be computed by the AI. It is a neural network model that is randomly initialized and further trained to become what constitutes an intelligent operator capable of analyzing and rectifying faults in embedded vectors (observations).

In this control format, the command includes numeric symbols which are called digits (AI output command). Network Device Instructions and AI Output Instructions Encoding algorithm: In this process, instructions generated by AI are digitalized, and then AI output instructions are digitalized again, which is the encoding algorithm. Conversion is based on an existing mapping table.

This paper also offers some network device instructions to rectify errors or problems. With observational data, the embedded vector is without inaccuracies. This paper is a theoretical model of measuring network performance by examining the influence of the computer network device command on the computer network, leading to a measurable number. It depends on the target readership of the magazine—it is the monetary value of the reward points.

Number (reward points): A number that indicates how much a change impacts if higher contributes towards change and lower indicates a negative impact towards change. Dataset: Log of all details accumulated when each observation was taken as well as all output commands entered during each iteration. The observation done at the current time is present observation, current action instruction is the thing the subject has to do in the near future, and current reward is the thing the subject got in the current time; the next information is what the subject is to get at the next one, five or ten determinations.

As mentioned in the reference (Vasquez & Mendoza, 2024), QRDQN is a reinforcement learning algorithm. It can provide guidance when the operator should use a particular algorithm and dataset. In this article, we use QRDQN in combination with the critical loss technique.

Intelligent Operator

To train an intelligent operator neural network model, one needs a large volume of real-time data, and computer networks give almost instant feedback. Computer networks and neural networks are prerequisites to attaining the goal of automatically recording data and training the operator.

Maximize the vocabulary from the field of network operations through the examination of a real-life scenario from the field of network traffic management. In this situation, the knowledgeable operator needs to be on duty to observe the flow of data in a network, identify and investigate various types of data packets, and then make prompt adaptations regarding an enhanced utilization of the network based on the amount of transmitting data. To achieve this, we can create a neural network over the computer networks by using these steps:

Data pre- and collection: For the first time, one needs data collectors in all of the networks that will be assigned after our proposal. Provides information regarding the traffic patterns in the interested network. The actual dataset is, in fact, information about maybe both the incoming and outgoing packets. In addition, traffic load and network latency are also additional types of interferences that may exist in a network affecting the performance of the network. The unprocessed data needs to be preprocessed (no errors or inconsistencies) prior to analysis. Optimization of the data processing in neural network models and other similar approaches is obtained by means of feature extraction.

Network traffic management: Now, we are going to develop a neural network model that is good for network traffic management. The efficient strategy of network traffic management can indeed be learnt by a deep reinforcement learning algorithm, such as a comparison of the Deep Q Network (DQN) algorithm and policy gradient (Choudhary & Verma, 2025). It is a model which accepts statistical data of the network traffic in preprocessed form as the inputs it takes and provides the management decision for updating the routes through which the data needs to be transmitted or prevented from some of the types of traffic.

Integration and training: The structure of the computer network should contain the intelligent operator, which is one of the modules of the established neural network model of the computer network. Furthermore, the neural network model is trained using the Deep Q Network experience-based regeneration technique with real-time data that is collected. The neural network is always active in the training phase with the network; NN learns the network and modifies the pattern and behaviour learning in response to the current network and the received feedback signal to enhance the performance of NN for network traffic.

Finally, the model composed of the neural network is used on the internet, but it is fine-tuned within the network once it is implemented within the environment. Traffic flow in the network is analyzed in real-time by smart operators, therefore deciding on its operations based on the results from the neural network model. Additionally, data can be collected in the field for systematization in order to modify the neural network model and fit the condition of the existing stencil and the needs of the network (Xu et al., 2024; Fadlullah et al., 2017).

For this reason, as well as the advantages listed above, we have the fusion of computer networks and brain systems by using this integrated method. Networks. The return that this technology could bring in it's worth it since intelligent operators can be able to pull up real-time data of the network in order to augment their network management and optimization skills, a goal that can be accomplished in the long run. The integrated method improves the network management level as it also makes network management better. Efficient management and maintenance of the network for the enhancement of its functionality and reliability.

Work Overview

The purpose of this project is to develop an overall high-level network operator to perform normal computer network analysis activities and solve the problems that arise within the network. So, we proceeded to do the following: We described the principles of effective joining of computer and neural networks. In this architecture, computer networks' awareness is merged along with the intellectual Otis of neural networks. This makes it easy for the intelligent network operator to control and evaluate the tasks in the network.

Finally we then carry out the foregoing design architecture and train an intelligent operator successfully. Thus, we were able to design an intelligent operator with the help of a large training sample and sophisticated algorithms used. At the index level, very good levels of analysis and accuracy are attained. In addition, people are also allowed the source code of the project. Our research results are made available to others to be extended and put into practice. Finally, we discuss the strategy that intelligent operators should adopt to achieve 100% accuracy. To achieve. Thus, one can see that the intelligent performance of the operator in network analysis activities can be improved by means of both optimizing the loss function as well as altering it. The improvement provides for trustworthy support and assurance in fixing the actual network problem.

Essentially; computation networks and neural networks combined allow for training and deploying intelligent constrains to drive the automation and network management. The operation of such a system by skilled operators enables them to actively observe network traffic, scrutinize data packets and apply pre established neural network models to guide informed judgments that improves network performance and efficiency of network management. That is why, in addition to improving the cognitive ability of managing a network, network operations and maintenance dependability and effectiveness are also ensured.

Thus, in the following phase, it is possible to refine the model of the neural network by introducing new nodes and modifying the existing nodes in response to the new dynamic network environment and specification. However, other aspects of network management and other conditions can be added and explored to enhance the capabilities and effectiveness of intelligent operators: protection from threats and resource efficiency. We will continuously study the problems and actual applications, and we will use the technologies of Network Management to encourage its development and to improve the assistance, the technology and the solutions for the detailed management of a network with high productivity.

3 Methodology

In general, the proposed architecture can be made from four main modules, for instance, a computer network simulator, parts of the computer network environment, a trainer and a tester. The key role of a computer network simulator is to introduce the simulated system and to extend data types by introducing a random construction in the computer networks. This results in the creation of a complete dataset upon which the intelligent operators can train to better control and optimize network operation. The components of the computer network environment are the simulator and the intelligent operator, which is a combination of the two. They basically comprise the process of gathering real-time data from the network and transferring them for making decisions and processing.

Data is transferred to the operator where the operations have not been able to give a full degree of accomplishing objectives, and it is processed and acted upon. Such collaboration ensures that the system can handle network challenges. Second, it uses a learning module: the data collected from the system and the first neural network so that the intelligent operator gets feedback, i.e., a training module. A feedback loop of the feedback is back for the operator to use continuously improving in order to improve strategies and actions for the network improvement and adaptation. The trainer thus provides the operator with his support to continually improve his decision-making process in order to retain its effectiveness. Finally, the tester module is developed and evolves to evaluate the performance of trained and intelligent operators in a live or preferably realistic network environment. This module proves that under given different conditions and scenarios, the operator is capable of achieving an optimal level of results. The four modules are merged into one Intelligent Operator System. It has an important role in intelligent network management and intelligent computer networks.

Computer Network Simulator

The Another advantage of the system is the flexibility the simulator is able to offer since it is able to randomly and freely create computer networks and so users can design networks with different structures; (Figure 2).

The state of the network that include node connections, work device state and a load on a network can be changed by users as required.

Moreover, the simulator offers many more additional features, such that it can monitor it, display the live state of the network, can simulate the network problems and the problems of cyberattacks to evaluate network security. These functions let the users find evaluation behaviour in the simulated network, learn the general and the specific principles and properties of the network and increase their knowledge about computer networks.

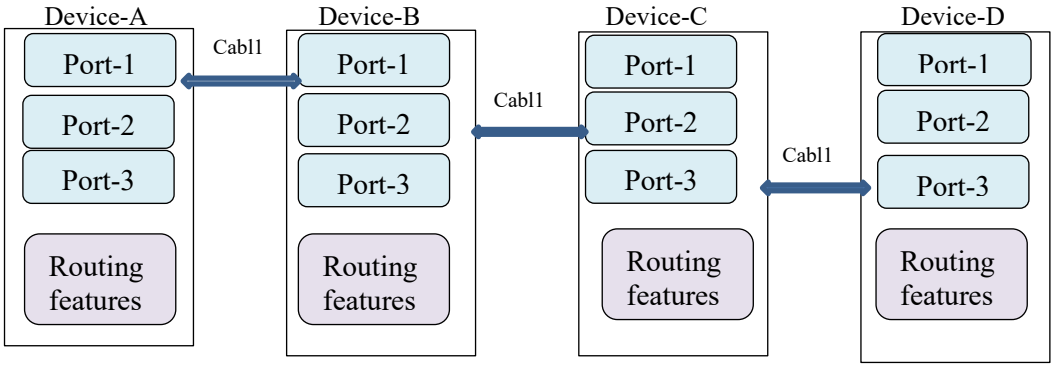

Figure 2: Computer Network Diagram

The computer network built by the emulator represented in Figure 2 has the following characteristics:

- The devices number from 4 to 10.
- The devices are connected via a tree connection.
- Internet Protocol Subnet Choose one subnet from thirty two subnets available. For ease of convenience let the subnets be called as IP Subnet-1 to IP Subnet-32. Subnet mask has 24 bits which is 255, 255 and 255 with zero's at end.
- Select one IP address from a pool of 63 addresses assigned to each subnet. For convenience, let‟s name the IP addresses ip-address -1, ip- address -2,…, ip-address -63 An IP address will be referred to as "IP address -x in IP-subnet-y where x and y are numbers. In this article, the only way used to define the IP address is "IP-address -x". This statement is true even to this day and UN complex since the IP subnet part of an IP address cannot be changed.

Here you should choose RIP version 2, EIGRP AS 1 and OSPF process id 1. Automated. They have switched off the RIP and EIGRP aggregation features. Values of 224 for OSPF subnets put them in the range 0of.

The faulty example in this network employs the random generation of six types of faults where random errors are dropped in the network stream.

Table 1 shows the current status of the device, and below the table is a list of possible reasons for any problem.

Table 1: Shows the Current Device Status and Possible Causes of Problems

Status	**Possible Reasons**
Port Closed	1. Port misconfiguration or not properly enabled.
	2. Port not specified in device configuration.
	3. Hardware faults or connectivity issues.
Incorrect IP Address	1. Static IP address misconfigured.
	2. Dynamic IP address allocation failure or misconfiguration.
	3. Subnet mask misconfigured.

Incorrect IP Subnet	1. Subnet mask misconfigured.
	2. IP address not matching the network of the device.
	3. Subnet mask not matching the network of the device.
Missing IP Subnet	1. The device is not configured with an IP address.
	2. Device not joined to any network.
	3. Non-existent network or connectivity issues.
Automatic Summary Routing	1. Automatic summary function misconfigured.
	2. Router not enabled with automatic summary function.
	3. Erroneous summary routes in the static routing table.
Routing Protocol Version	1. Routing protocol misconfiguration.
	2. Protocol version mismatch between the router and neighbouring devices
	3. Router not enabled with any routing protocol.

The aforementioned features are crucial for any computer network, and potential enhancements may include security features, quality of service features, traffic engineering features, and so on.

Computer Network Environment Components

Environmental component contains all the things relating to the functionalities of the simulator and has two more parts to it, which are an Observation encoder (Obs Encoder) that enables one to change the string of above mentioned observations into numerical representation and an observation embedder (Obs Embedder) which helps us to embed the observation.

Observe that the Embedder maps the observation to the embedding vector (vectors) of floating-point details. This is because this relationship in terms of environment components is simple comparatively, and using integers from 0 to 1 makes the purpose of this article easy to understand and more attractive. In other words, the goal is to push vectors with close numerical information apart in space and vectors with different classes together. It helps in maintaining the co-referencing of neighbouring numbers for signalling so as to emit a similar attribute or meaning. To categorize it as category 1, it operates with IP addresses, which is an attribute an operator can obtain through training.

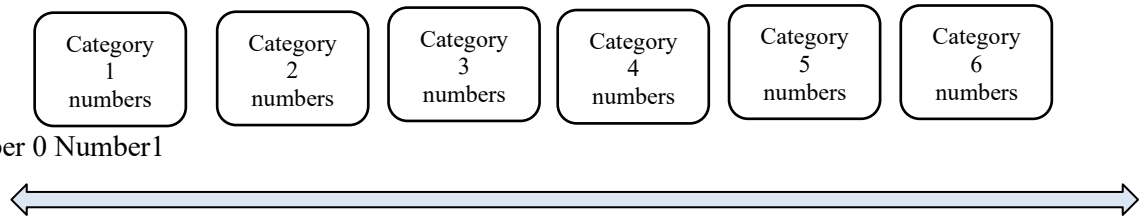

Figure 3: Concept of Embedding Vectors

The environmental component at each stage uses computer network data specified by the original and current network information dictionaries as observational data. More potent verbs and adjectives should be used. This data encompasses either the port connection status or the port IP address. The application systematically inquires through all network information until all undesirable have been picked up or the designer reaches the maximum allowable iterations.

The steps you need to create such tedious instructions are broken to smaller parts manageable for the environment component to work with. For example, in the case of the process of making a correct IP address, it has 3 substrates.

- The subsequent directive is There is an issue with the port based on the observations computed by

the operator:

- The observations are computed by the operator, and the accurate command is given to it.
- Give instructions in the command that are clearly specified.
- The observations are calculated by the operator, and commands are issued.
- Refers to any of the variables or values of the characteristics or conditions of the instruction. The environment is to support subsequent processing.

These three sub instructions are then combined to make up an all around network light instruction which constitute one component.

Practical Application

When the simulator is applied in practical implementation on real work, for example, a computer network is chosen and randomly built according to the structured process. In the first, we randomly generate the number of devices from 4 to 10 and give them all unique names. A chance is then made on one of these devices to be the master and connected via cable 1. Second, all other devices are then wired onto the network wire in a cascading fashion until all devices are via a wired signal on the network or the PNA is removed. After a given physical structure of the network has been defined, the simulator randomly chooses one of the available routing protocols: Goodbye, EIGRP, or OSPF. After that, the preconfigured available data pool is randomly extracted for the IP addresses and subnets in order to assign a device with a specific network configuration.

At this time, the simulator generates the first network data, that is first network topology description and an information dictionary for creating a stable and error-free network. Then, it randomly chooses a set of faults and injects them systematically into the network. Additionally, a dictionary is saved to see whether the network is correct in its current state. An integrated network estimator is also given as part of the simulator, which is required for network performance evaluation and validity of the correctness of operator intervention. This estimator verifies if an instruction set as defined by the operator's instructions matches the set of instructions provided in advance.

The system rewards 1 from VBA if instruction is correct, and penalizes 1 from VBA in case the instruction is incomplete or incorrect. By implementing this extensive approach, we create a realistic and efficient computer network environment that can be dynamically built up, validated and evaluated.

4 Critical Loss Algorithm

Model Training

We construct an intelligent operator, a neural network model, and initialize it with random values, and later, it is only able to produce instructions randomly. The driver's progressively increasing knowledge of how to produce more accurate instructions on the incoming data (observations) depends on the training process. It is outlined in the following way:

a. One segment from the first given network information dictionary is obtained from the environment component. Below is also provided a dictionary which receives the current information of this network. The text observation contains an IP address of a port. Then it amplifies the observation and It transforms it by making it more loud to make it what is termed the current observation and delivers it into the operator.

b. The operator computes a value of the vector, and the current instruction is performed (this one).

c. The instructions are then converted to directives for the network device by the environment component. Then, it passes the instructions to the computer network, which then judges the data and gives a reward. An instruction is considered valid if its value is assigned 1 and is invalid if it has the value -1. The environmental component further generates the embedding vector for the following observation and, thus, similarly, afterwards.

d. As the current observation, current instruction, current reward and subsequent observation come in, they get added into the buffer.

e. Now, repeat the following above procedures to add a few samples in the said set of positive instances (accurate instructions [„on‟]) and negative instances (inaccurate instructions [„off‟]).

f. Use your algorithm and your data set to teach yourself and then your operator.

g. As stated before, with the above steps it is possible to perform minimization down to only one operator identifying 100% correctly objects.

Critical Loss Function

In this paper the enhanced critical loss algorithm is based on the QRDQN algorithm. Currently, one of most famous algorithms for reinforcement learning is QRDQN algorithm. Using that he computes the value of each combination of state and action as his action value function.

Obtains multiple evaluation outcomes. Ultimately, he chooses an action. Under the given conditions, the judges determine which instruction gives the highest average evaluation and output of that instruction. Accurate results of the generated instructions range around 80% showing that the instructions are initially wrong.

This can be attributed to two inherent characteristics of the neural network:

- It generates data that is statistically analyzed and the value represents the probability range of being accurate of the particular conclusion. The probability of getting a correct outcome increases keeping apace with the value.
- Among all the parameters that go into a calculation, these are tuned while one is in the process of optimizing the structures of a neural network. This, however, results in oscillator-like behaviour in the output values and thus sharply affects the accuracy of the network.

Solution

Set your output value that will produce the best results to bring your issue to an end. Consequently, the advantages of this undertaking call for the selection of two objective values, setting it apart from truth and untruth. For this case, we need to choose the value such that it will be inside the range of 0 and 1. As a result of data sensitivity, the interval for neural networks is between -1 and 1. It is prudent to choose two positive values, which will get us the required two goal values. However, it should also be noted that we cannot distinguish accurate from false instructions without a temporal interval, in particular, a large one. To avoid such problems, one should avoid using the numbers 0 and 1, in which meaningful numerical analytic techniques are necessary to treat them, and the precision tends to degrade at the boundaries. At 0.7 or 0. 3, the model is expected to provide accurate or incorrect assertions, n respectively, y, to identify the most suitable model for the mentioned data set.

Loss is made with the prediction value (prediction) of the neural network compared to the desired goal value (y) Specifically, the instruction optimization process can afford to sustain major loss, and among the items that can be lost is mistakes. Small incremental losses have little effect on how the process of instruction selection is decided and this is why they are also referred to as considered non-essential or insignificant losses.

To guide model training, extreme losses are given more importance in learning during neural network training because they are assigned higher importance when the total loss is being computed, which sometimes means throwing away an extreme loss is prioritized. This reduces the chance of critical loss without increasing the error in the optimization process.

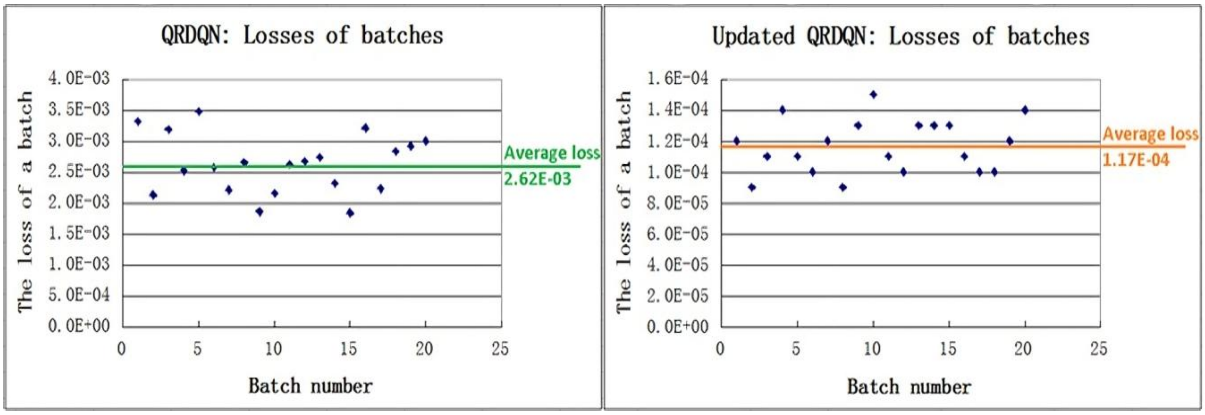

Figure 4: Ratio Before and After Critical Loss (Fadlullah et al., 2017)

In the algorithm optimization phase, the values of the seven instructions are set between 0 and 1 and the neural network is configured to come out with a set of seven values of 0 to 1, which are the assessment results of the 7 instructions. The training is judged by computing the average of these scores, with a higher average being better. Using this strategy makes network output variability less significant to the rate of accuracy. These evaluations give the most effective instructions selected. Put into effect, the optimal directives are then evaluated as to their effectiveness on the functioning of the computer network. On the basis of an output, the instructions are classified as correct or incorrect.

There are indeed four values that are factored into the critical loss assessment.

In the specified case, this threshold for precise instruction is set at 0.7. A non-critical loss is given by values higher than 0.7. The mean rating value for precise teaching is 0.56, which is the acceptable requirement. Readings over this level indicate that the loss is not substantial on average and hence constitutes average. The misdirection score target is 0.3 for the twenty-fourth figure. The loss is insignificant if the values are below 0.3. The rate of permissible mean misdirection is 0.44. Once this threshold is breached, Average Values become a strong indication that the loss has a minor degree. Other losses are losses that are not classified as material losses.

A neural network is improved by minimizing a critical loss function using the Adam optimization approach. The adjustment, therefore, produces an average loss reduction from $2.62E-03 to $1.17E-04. In other words, an impressive 95.5% off the average has been cut by this. As a result, the precision of the output instructions can be improved by a great deal to at least achieve 100% accuracy of the program (see Figure 4).

5 Conclusion

In Section 2.4, it is detailed how the effectiveness of the Intelligent Operator has been demonstrated through more than 12,000 randomly generated computer networks. We trained a model that accomplishes outstanding results, achieving 100% flawless accuracy over 237 operations per network for 28 tasks, using the Intelligent Operator, which uses a neural network model. Without a mistake, it entered almost 2,800,000 operations. The proficient operator is able to solve any problem inside the computer network within 1 to 5 seconds for all assessments and fixes. Having said that, methodological issue aside, it is interesting that so much responsibility is placed on the part of the operator early on in the study. The average time to perform the work is 10 seconds, and then an extra 10 seconds to print all the operation details which took place at each stage. 13 to 14 seconds. This can be interpreted in terms of whether this indicates youth deviance that is unpredictable or youth spontaneity. The AI-driven network operator presented here was effectively used in this study to demonstrate its ability to resolve various computer network problems as rapidly as possible and efficiently. Intelligent operators' integration into the computer and neural networks is a challenging problem and is expected to be a central issue in future computer and network management and optimization research and applications.

References

[1] Arfizurrahmanl, M., Ahmad, M. S. H., Hossain, M. S., Haque, M. A., & Andersson, K. (2021). Real-Time Non-Intrusive Driver Fatigue Detection System using Belief Rule-Based Expert System. *Journal of Internet Services and Information Security*, *11*(4), 44-60.

[2] Che, C., Lin, Q., Zhao, X., Huang, J., & Yu, L. (2023, September). Enhancing multimodal understanding with clip-based image-to-text transformation. In *Proceedings of the 2023 6th International Conference on Big Data Technologies* (pp. 414-418).

[3] Choudhary, N., & Verma, M. (2025). Artificial intelligence-enabled analytical framework for optimizing medical billing processes in healthcare applications. *Global Journal of Medical Terminology Research and Informatics*, *3*(1), 1-7.

[4] Fadlullah, Z. M., Tang, F., Mao, B., Kato, N., Akashi, O., Inoue, T., & Mizutani, K. (2017). State-of-the-art deep learning: Evolving machine intelligence toward tomorrow's intelligent network traffic control systems. *IEEE Communications Surveys & Tutorials*, *19*(4), 2432-2455.

[5] Fei, C. W., Li, H., Liu, H. T., Lu, C., An, L. Q., Han, L., & Zhao, Y. J. (2020). Enhanced network learning model with intelligent operator for the motion reliability evaluation of flexible mechanism. *Aerospace Science and Technology*, *107*, 106342.

[6] Garrahan, J. J., Russo, P. A., Kitami, K., & Kung, R. (2002). Intelligent network overview. *IEEE Communications magazine*, *31*(3), 30-36.

[7] Gong, Y., Huang, J., Liu, B., Xu, J., Wu, B., & Zhang, Y. (2024). Dynamic resource allocation for virtual machine migration optimization using machine learning.

[8] Jelena, T., & Srđan, K. (2023). Smart Mining: Joint Model for Parametrization of Coal Excavation Process Based on Artificial Neural Networks. *Arhiv za tehničke nauke*, *2*(29), 11-22. https://doi.org/10.59456/afts.2023.1529.011T

[9] Narayanan, L., & Rajan, A. (2024). Artificial Intelligence for Sustainable Agriculture: Balancing Efficiency and Equity. *International Journal of SDG's Prospects and Breakthroughs*, *2*(1), 4-6.

[10] Ni, C., Wu, J., Wang, H., Lu, W., & Zhang, C. (2024, June). Enhancing cloud-based large language model processing with elasticsearch and transformer models. In *International Conference on Image, Signal Processing, and Pattern Recognition (ISPP 2024)* (Vol. 13180, pp. 1648-1654). SPIE.

[11] Patil, S., & Iqbal, B. (2024). Cranial Morphology and Migration Patterns in Prehistoric Populations. *Progression Journal of Human Demography and Anthropology, 2*(1), 9-12.

[12] Praveenraj, D. D. W., Prabha, T., Ram, M. K., Muthusundari, S., & Madeswaran, A. (2024). Management and Sales Forecasting of an E-commerce Information System Using Data Mining and Convolutional Neural Networks. *Indian Journal of Information Sources and Services*, *14*(2), 139-145.

[13] Ravshanova, A., Akramova, F., Saparov, K., Yorkulov, J., Akbarova, M., & Azimov, D. (2024). Ecological-Faunistic Analysis of Helminthes of Waterbirds of the Aidar-Arnasay System of Lakes in Uzbekistan. *Natural and Engineering Sciences, 9*(1), 10-25. https://doi.org/10.28978/nesciences.1471270

[14] Shetty, A., & Nair, K. (2024). Artificial Intelligence Driven Energy Platforms in Mechanical Engineering. *Association Journal of Interdisciplinary Technics in Engineering Mechanics, 2*(1), 23-30.

[15] Song, B., Wu, Y., & Xu, Y. (2024, March). ViTCN: Vision Transformer Contrastive Network For Reasoning. In *2024 5th International Seminar on Artificial Intelligence, Networking and Information Technology (AINIT)* (pp. 452-456). IEEE.

[16] Vasquez, E., & Mendoza, R. (2024). Membrane-Based Separation Methods for Effective Contaminant Removal in Wastewater and Water Systems. *Engineering Perspectives in Filtration and Separation*, 21-27.

[17] Wang, Y., Zhou, Y., Ji, H., He, Z., & Shen, X. (2024, March). Construction and application of artificial intelligence crowdsourcing map based on multi-track GPS data. In *2024 7th International Conference on Advanced Algorithms and Control Engineering (ICAACE)* (pp. 1425-1429). IEEE.

[18] Wu, B., Xu, J., Zhang, Y., Liu, B., Gong, Y., & Huang, J. (2024). Integration of computer networks and artificial neural networks for an AI-based network operator.

[19] Xu, X., Xu, Z., Ling, Z., Jin, Z., & Du, S. (2024, June). Comprehensive implementation of TextCNN for enhanced collaboration between natural language processing and system recommendation. In *International Conference on Image, Signal Processing, and Pattern Recognition (ISPP 2024)* (Vol. 13180, pp. 1527-1532). SPIE.

[20] Xu, Z., Gong, Y., Zhou, Y., Bao, Q., & Qian, W. (2024, October). Enhancing kubernetes automated scheduling with deep learning and reinforcement techniques for large-scale cloud computing optimization. In *Ninth International Symposium on Advances in Electrical, Electronics, and Computer Engineering (ISAEECE 2024)* (Vol. 13291, pp. 1595-1600). SPIE.

[21] Zhang, C., Lu, W., Ni, C., Wang, H., & Wu, J. (2024, June). Enhanced user interaction in operating systems through machine learning language models. In *International Conference on Image, Signal Processing, and Pattern Recognition (ISPP 2024), 13180,* 1623-1630). SPIE.

[22] Zhang, Y., Liu, B., Gong, Y., Huang, J., Xu, J., & Wan, W. (2024, April). Application of machine learning optimization in cloud computing resource scheduling and management. In *Proceedings of the 5th International Conference on Computer Information and Big Data Applications* (pp. 171-175).

[23] Zhou, Y., Tan, K., Shen, X., He, Z., & Zheng, H. (2024, March). A protein structure prediction approach leveraging transformer and CNN integration. In *2024 7th International Conference on Advanced Algorithms and Control Engineering (ICAACE)* (pp. 749-753). IEEE.

Authors Biography

Yousra Atalla received her B.Sc. in Information Systems from Al-Anbar University College, Iraq Al Anbar, in 2005. She obtained her M.Sc. in Computer science at Al-Anbar University, Al Anbar, Iraq in 2016. She currently holds the position of assistant lecturer in the General Directorate of Education in Anbar.

Israa Zamil Chyad Alrikabi was born in Thi-Qar city, Iraq, in 1987. She received the B.Cs degree from Thi-Qar University, in Computer Science, in 2008. She holds a M.Sc. degree in computer engineering from the University of Mazendran, Iran, in 2023. She currently works as an Information Technology Officer at Sumer University, Iraq. Her research interests are networks, network security, networks and artificial intelligence, deep learning networks, neural networks and wireless sensor networks.

Shaimaa Hadi Mohammad was born in Thi-Qar city, Iraq, in 1984. She received the B.Cs degree from Thi-Qar University, in Computer Science, in 2006. She holds a M.Sc. degree in computer engineering from the University of Thi-Qar, Iraq, in 2018. She is currently working lecturer in the Department of Communications Engineering, College of Engineering, Sumer University, Iraq. Her research interest is in Image Processing and Information Security, artificial intelligence, deep learning, cloud computing and Computer Security, Wireless sensor networks.

Zaid Hamid Alkhairullah was born in Thi-Qar, Iraq, in 1982. He received the B.Sc. degree from Al-Rafidain University College, Iraq, Baghdad, in Software Engineering, in 2005. He holds a M.Sc. degree in computer engineering from the University of Mazandaran, Iran, in 2023. His research interest is in Image Processing and Information Security, artificial intelligence, deep learning, cloud computing and Computer Security, Advanced networks.