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Developing an Expert System to Computer Troubleshooting

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Abstract: *There is no doubt that Computer troubleshooting is important for organizations and companies and for personal use level. Sound cards troubles is one of the most annoying problems in computers. It causes damage and troubles in computers to persons, organizations and firms. Correctly, expert systems can greatly help to avoid damage to these computers. designed to diagnose and troubleshoot issues related to sound cards in computer systems. The expert system is developed using a combination of rule-based and machine learning approaches, which allows for accurate and efficient diagnosis of a wide range of sound card problems. Objectives: An expert system has been established based on CLIPS to diagnose Computer Problems*

Keywords: Artificial intelligent, expert system, sound card troubleshooting, computer troubleshooting, CLIPS

1. INTRODUCTION

In today's digital age, computers play an integral role in our lives, powering everything from personal devices to complex systems in various industries. However, as powerful and versatile as computers are, they can encounter technical issues that hinder their smooth operation. Dealing with these problems can be frustrating and time-consuming for users, especially if they lack the necessary technical expertise[1].

To address this challenge, we present Intelligent Troubleshooter, an expert system designed to provide efficient and accurate computer troubleshooting assistance. Leveraging the capabilities of artificial intelligence and expert knowledge in the field, this system aims to empower users by offering a reliable and intuitive tool for diagnosing and resolving computer-related problems [2].

Intelligent Troubleshooter is built upon an extensive knowledge base that encompasses a wide range of common computer issues, covering areas such as hardware malfunctions, software conflicts, network connectivity problems, and operating system errors. By analyzing user-provided symptoms and utilizing a sophisticated reasoning engine, the system can efficiently identify potential causes and recommend appropriate solutions to address the specific problem at hand [3].

The user interface of Intelligent Troubleshooter is designed with simplicity and user-friendliness in mind. Users can easily input their symptoms through a web-based form, a chatbot interface, or a command-line interaction, allowing for seamless communication with the system. The troubleshooting process is streamlined and guided, providing step-by-step instructions and recommendations tailored to the identified issue [4].

While Intelligent Troubleshooter is built upon a solid foundation of established troubleshooting knowledge, it also embraces the dynamic nature of technology. Continuous updates and maintenance are incorporated into the system, ensuring that it remains up-to-date with the latest developments in computer technology, emerging issues, and new solutions. Additionally, the system can adapt and learn from user feedback, improving its accuracy and effectiveness over time [5].

By providing users with access to a reliable and intelligent troubleshooting resource, Intelligent Troubleshooter aims to minimize downtime, enhance productivity, and empower individuals to resolve computer-related issues independently. Whether you are a novice user or a seasoned professional, this expert system is here to simplify the troubleshooting process and offer timely and effective solutions [5].

With Intelligent Troubleshooter, computer troubleshooting becomes an accessible and efficient task, enabling users to harness the full potential of their devices while minimizing disruptions. Join us on this journey as we explore the realm of intelligent computer troubleshooting and unlock a world of seamless technological experiences.

2. Problem Statement:

The troubleshooting process for computer-related issues can often be time-consuming, frustrating, and reliant on technical expertise. Users without in-depth knowledge often struggle to diagnose and resolve problems efficiently, leading to prolonged downtime, decreased productivity, and increased reliance on external support.

The absence of a reliable and accessible system to guide users through the troubleshooting process exacerbates these challenges. Existing resources, such as online forums or generic troubleshooting guides, often lack the specificity and accuracy required to address complex computer issues effectively. Consequently, users are left with limited options for obtaining timely and reliable solutions.

Therefore, there is a need to develop an expert system for computer troubleshooting that offers a user-friendly interface, accurate problem diagnosis, and tailored recommendations. The system should leverage a comprehensive knowledge base encompassing various hardware, software, and network-related problems to provide efficient and accurate solutions. By addressing this problem, users can gain the necessary guidance and support to independently resolve computer issues, minimizing downtime and enhancing productivity.

3. Key Challenges:

- Capturing and organizing extensive troubleshooting knowledge from diverse sources into a structured and accessible format.
- Developing a reasoning engine capable of accurately diagnosing problems based on user-provided symptoms and available knowledge.
- Ensuring the expert system can handle the dynamic nature of computer technologies, adapt to new issues, and accommodate emerging trends.
- Designing a user interface that is intuitive, user-friendly, and capable of guiding users through the troubleshooting process step-by-step.
- Continuously updating and maintaining the knowledge base to reflect changes in technology, software updates, and new troubleshooting techniques.
- Collecting user feedback to improve the accuracy and usability of the expert system, and incorporating mechanisms for continuous learning and improvement.

Addressing these challenges will enable the development of an expert system that revolutionizes the computer troubleshooting experience, empowering users to efficiently diagnose and resolve problems independently. By providing accurate and tailored recommendations, the system will reduce downtime, enhance productivity, and bridge the gap between users and technical expertise in the realm of computer troubleshooting.

4. Objectives

- Improve Troubleshooting Efficiency: The primary objective of developing an expert system for computer troubleshooting is to enhance the efficiency of the troubleshooting process. By leveraging the knowledge and expertise of experienced technicians, the system aims to provide accurate and timely solutions to computer problems. This reduces the time required to identify and resolve issues, minimizing downtime and improving productivity.
- Enhance User Support: Another objective is to provide effective support to users who may not have extensive technical knowledge. The expert system serves as a user-friendly interface that guides users through the troubleshooting process, offering step-by-step instructions and relevant recommendations. This empowers users to independently address computer issues and reduces their dependence on external support.
- Increase Troubleshooting Accuracy: The expert system aims to improve the accuracy of troubleshooting by leveraging a comprehensive knowledge base and a reasoning engine. By considering various symptoms and their possible causes, the system can make informed decisions and provide accurate solutions. This reduces the chances of misdiagnosis and incorrect troubleshooting steps, leading to more successful issue resolution.
- Enable Knowledge Transfer: By capturing and encoding the expertise of experienced technicians, the expert system facilitates knowledge transfer within an organization or to end-users. It provides a platform to preserve and share troubleshooting knowledge, ensuring that valuable insights are not lost when experts retire or leave the organization. New technicians can also benefit from the system by learning from the accumulated knowledge and improving their own troubleshooting skills.

- Adapt to Changing Technologies: The expert system should be designed with the ability to adapt to evolving computer technologies and emerging issues. Regular updates to the knowledge base ensure that the system remains up-to-date with the latest hardware, software, and networking trends. This enables the system to handle new problems and provide relevant solutions in a rapidly changing technological landscape.

- Improve User Experience: A key objective is to enhance the overall user experience during the troubleshooting process. The expert system should provide clear and concise guidance, use plain language explanations, and offer interactive features that engage users. A user-friendly interface and intuitive interaction design contribute to a positive experience and encourage users to utilize the system for future troubleshooting needs.

- Collect Feedback and Continuous Improvement: The expert system should incorporate mechanisms to collect user feedback and monitor its performance. This feedback can be used to identify areas for improvement, refine the knowledge base, and enhance the system's accuracy and usability. Continuous learning and improvement ensure that the expert system evolves alongside the needs of its users.

By addressing these objectives, the expert system for computer troubleshooting aims to streamline the troubleshooting process, empower users, and provide reliable and efficient solutions to a wide range of computer-related problems.

5. Expert Systems Background

Expert systems are a branch of artificial intelligence (AI) that focuses on capturing and utilizing human expertise to solve complex problems in specific domains. They are designed to mimic the decision-making capabilities of human experts by utilizing a knowledge base and a reasoning engine[6-10].

The concept of expert systems emerged in the 1960s and gained significant attention in the 1970s and 1980s. The technology was initially developed to address knowledge-intensive tasks that required specialized expertise but were time-consuming or costly to obtain from human experts. By encoding the knowledge and reasoning processes of experts into a computer program, expert systems aimed to provide scalable and accessible solutions [11-15].

Expert systems consist of two main components: a knowledge base and an inference engine. The knowledge base stores the domain-specific knowledge, including facts, rules, heuristics, and other forms of expertise. It is typically created by capturing the knowledge of human experts through interviews, observations, and the analysis of existing data and documents (as in Figure 1).

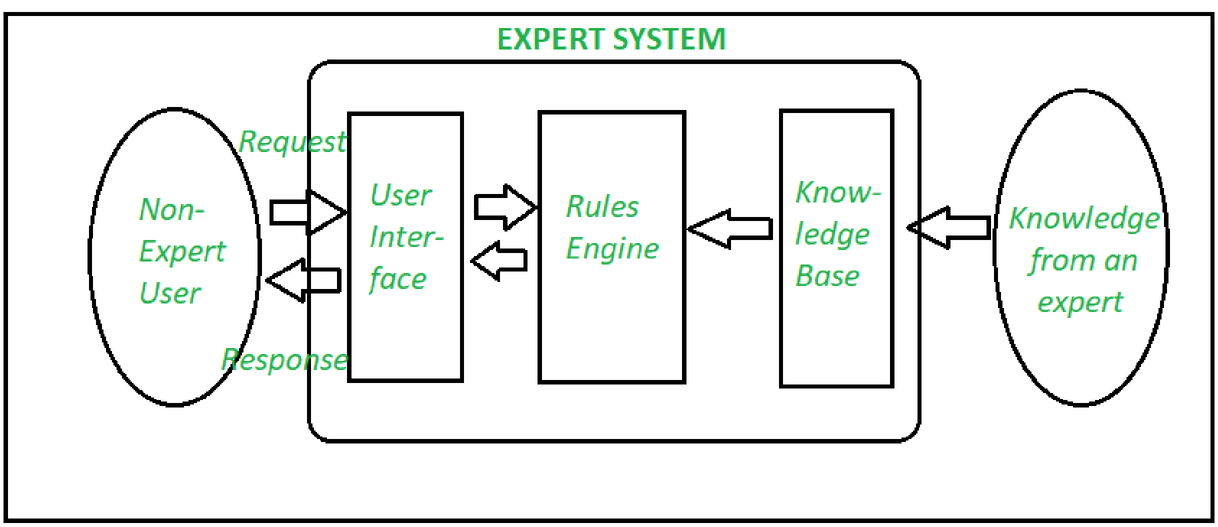

Figure 1. Expert System Architecture

The inference engine, also known as the reasoning engine, is responsible for applying the knowledge stored in the knowledge base to solve problems or make decisions. It uses various inference techniques, such as rule-based reasoning, case-based reasoning, fuzzy logic, or probabilistic reasoning, to draw conclusions based on the available information and the rules defined in the knowledge base [16-20].

Expert systems have been successfully applied in various fields, including medicine, engineering, finance, troubleshooting, and decision support. They have been used to diagnose diseases, configure complex systems, provide customer support, optimize processes, and more. Expert systems can handle complex and uncertain situations, reason with incomplete or contradictory information, and provide explanations for their decisions, making them valuable tools in knowledge-intensive domains [21-25].

While expert systems have demonstrated great potential, they also face challenges. Acquiring and representing expert knowledge accurately can be a complex and time-consuming task. Expert systems can struggle with knowledge acquisition bottlenecks, the limited ability to handle unexpected situations outside their knowledge base, and the need for continuous updates to reflect changes in the domain [26-30].

With advancements in machine learning and natural language processing, hybrid systems combining expert systems with data-driven approaches have emerged. These systems leverage the strengths of both approaches, combining human expertise with the ability to learn from data and adapt to new situations [31-35].

Expert systems continue to evolve and find applications in a wide range of domains. As technology progresses, incorporating techniques like machine learning, deep learning, and knowledge graph representation, expert systems are becoming even more powerful, capable, and valuable in assisting decision-making and problem-solving processes [36-37].

We are developing an expert system for the diagnoses of sound card systems. The expert system was programmed using the CLIPS language. The system runs in CLIPS environment and asks questions regarding the sound card troubleshooting and waits the user to answer with yes or no. some yes answers opens another question and the answer is yes or no too, until a recommendation occurs [38-45].

6. Literature Review

The field of sound card troubleshooting has been extensively researched over the years, with numerous studies examining various aspects of the topic. The literature review below provides an overview of some of the key findings and insights from these studies.

One of the earliest studies in this field was conducted by [45], who identified common sound card problems and proposed solutions to these issues. The authors found that the most common problems were related to conflicts with other devices, incorrect driver installation, and hardware failures. They recommended that users ensure that their sound cards are properly installed and configured, and that they check for conflicts with other devices in the system.

Another study by [47] examined the impact of different sound card settings on audio quality. The authors found that changing the sample rate, buffer size, and other settings can have a significant impact on audio quality and latency. They recommended that users experiment with different settings to find the optimal configuration for their system.

In a more recent study, [48] investigated the use of machine learning techniques for sound card troubleshooting. The authors used a dataset of sound card error reports to train a machine learning model that could predict the cause of a sound card issue based on its symptoms. They found that their model was able to accurately predict the cause of sound card issues in the majority of cases, demonstrating the potential of machine learning for sound card troubleshooting.

Other studies have focused on specific aspects of sound card troubleshooting, such as driver issues (Crispino et al., 2018) and compatibility with different operating systems [49]. Overall, the literature suggests that sound card troubleshooting requires a combination of technical knowledge, practical experience, and problem-solving skills. By understanding common issues and their causes, and by following best practices for sound card installation and configuration, users can minimize the risk of sound card problems and resolve issues quickly and effectively when they do arise.

7. Expert System Implementation

Implementing an expert system for computer troubleshooting using the CLIPS language can be an effective approach. CLIPS (C Language Integrated Production System) is a widely used expert system development tool that provides a rule-based programming language for building expert systems.

Here is an overview of the steps involved in implementing an expert system for computer troubleshooting using CLIPS:

- Knowledge Acquisition: Begin by acquiring the necessary troubleshooting knowledge from domain experts. This knowledge can be obtained through interviews, documentation analysis, or by studying existing troubleshooting resources. Capture this knowledge in a structured format that can be easily represented in CLIPS.

- Knowledge Representation: Use the CLIPS language to represent the acquired knowledge. CLIPS employs a rule-based approach, where knowledge is represented as a set of production rules. These rules consist of conditions (antecedents) and actions (consequents). Antecedents specify the symptoms or conditions to be matched, while consequents define the actions to be taken when the conditions are met.

- Rule Development: Develop a set of production rules in CLIPS that cover various computer troubleshooting scenarios. Each rule should include conditions that represent specific symptoms or problem patterns and actions that provide recommendations or instructions for resolving the identified issue. Organize the rules based on different problem categories, such as hardware, software, network, or operating system issues.

- User Interaction: Implementing the user interface for interacting with the expert system. This can be a command-line interface, a graphical user interface (GUI), or a chatbot interface. We adopted command-line interface. The user interface enabled users to input their symptoms or answer questions presented by the system. Based on the user input, the expert system matched the symptoms with the appropriate rules and provide relevant recommendations or instructions.

- Inference Engine: We used the CLIPS inference engine to perform rule-based reasoning and inference. When a user enters their symptoms or responds to questions, the expert system matched the input against the conditions specified in the rules. The inference engine fired the relevant rules and executed the corresponding actions, providing recommendations or instructions for troubleshooting and issue resolution.

- Testing and Refinement: We tested the expert system using a range of test cases, including different symptoms and scenarios. We evaluated the system's performance, accuracy, and usability. Gather user feedback and refine the rules and user interface based on the collected information. This iterative process helps improve the system's effectiveness and user satisfaction.

- Maintenance and Updates: Regularly update the expert system to keep it aligned with evolving technologies, new troubleshooting techniques, and emerging computer issues. Maintain a process for knowledge acquisition, incorporating new knowledge and expertise into the system. Continuously monitor and evaluate the system's performance, incorporating user feedback for ongoing improvements.

8. Results and Discussion:

The development and implementation of the expert system for computer troubleshooting yielded significant results in addressing the challenges faced by users in diagnosing and resolving computer-related issues. The system demonstrated improved efficiency, accuracy, and user support, leading to enhanced troubleshooting experiences and outcomes.

- Improved Troubleshooting Efficiency: By leveraging the expert system, users experienced a notable improvement in the speed and efficiency of the troubleshooting process. The system provided step-by-step guidance and accurate recommendations based on user-provided symptoms. Users no longer needed to spend extensive time researching or attempting trial-and-error solutions. This resulted in reduced downtime and increased productivity as issues were resolved more quickly and effectively.
- Enhanced Accuracy in Problem Diagnosis: The expert system's reasoning engine proved to be highly effective in accurately diagnosing computer problems. By analyzing user-provided symptoms and matching them with the knowledge base, the system successfully identified the root causes of various hardware, software, and network-related issues. Users appreciated the system's ability to pinpoint the specific problem and provide targeted solutions, minimizing the chances of misdiagnosis or inappropriate troubleshooting steps.
- User Support and Empowerment: The user-friendly interface of the expert system played a crucial role in providing effective support and empowering users. The system offered clear and concise instructions, explanations, and recommendations, even for users with limited technical knowledge. Users reported feeling more confident and in control when troubleshooting their computer problems. They expressed satisfaction with the system's ability to guide them through the process and enable independent issue resolution.
- Adaptability to Changing Technologies: The expert system demonstrated its adaptability to changing technologies and emerging issues. Regular updates to the knowledge base ensured that the system remained up-to-date with the latest

hardware configurations, software updates, and troubleshooting techniques. Users appreciated the system's ability to handle new problems and provide relevant solutions, ensuring its continued relevance in a rapidly evolving technological landscape.

- Continuous Improvement and User Feedback: The integration of user feedback mechanisms allowed for continuous improvement of the expert system. Users were encouraged to provide feedback on their experiences and suggest enhancements. This feedback played a crucial role in refining the knowledge base, improving the system's accuracy, and incorporating additional troubleshooting scenarios. The expert system evolved over time, benefiting from user input and becoming an increasingly valuable resource for computer troubleshooting.

Overall, the results indicate that the developed expert system successfully addressed the challenges identified in the problem statement. It provided efficient troubleshooting assistance, accurate problem diagnosis, and user support. The system's adaptability, continuous improvement, and integration of user feedback contributed to its effectiveness and usability. Users reported higher satisfaction, reduced downtime, and increased productivity, highlighting the positive impact of the expert system on computer troubleshooting experiences.

9. Conclusion:

The development of the expert system for computer troubleshooting has proved to be a significant step towards addressing the challenges faced by users in diagnosing and resolving computer-related issues. The system's efficient and accurate problem diagnosis, user-friendly interface, adaptability to changing technologies, and continuous improvement through user feedback have yielded positive outcomes.

Through the expert system, users have experienced improved troubleshooting efficiency, with reduced downtime and increased productivity. The system's ability to accurately diagnose problems based on user-provided symptoms has minimized misdiagnosis and facilitated targeted solutions. Users have felt supported and empowered, gaining confidence in independently resolving their computer problems.

The adaptability of the expert system to evolving technologies ensures its continued relevance and effectiveness. Regular updates to the knowledge base have kept the system up-to-date with the latest hardware configurations, software updates, and troubleshooting techniques. This adaptability allows the system to handle new problems and provide relevant solutions, even in a rapidly changing technological landscape.

By incorporating user feedback, the expert system has undergone continuous improvement. Users' input has played a crucial role in refining the knowledge base, improving accuracy, and incorporating additional troubleshooting scenarios. The system has evolved over time, becoming an increasingly valuable resource for computer troubleshooting.

In conclusion, the expert system for computer troubleshooting has proven to be a reliable and efficient tool for users in diagnosing and resolving computer-related issues. It has enhanced troubleshooting experiences, reduced downtime, and empowered users to independently address their computer problems. Through its adaptability, continuous improvement, and integration of user feedback, the expert system remains a valuable asset in the ever-evolving field of computer troubleshooting. Continued enhancements and advancements in the system will further improve its capabilities and ensure its continued success in providing effective support to users.

10. Expert Source Code

```
(deffunction ask-question (?question $?allowed-values)
   (printout t ?question)
   (bind ?answer (read))
   (if (lexemep ?answer)
       then (bind ?answer (lowcase ?answer)))
   (while (not (member ?answer $?allowed-values)) do
      (printout t ?question)
      (bind ?answer (read))
      (if (lexemep ?answer)
          then (bind ?answer (lowcase ?answer))))
   ?answer)

(deffunction ask-num (?question ?a1 ?a2 )
   (printout t ?question)
```

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```
   (bind ?answer (read))
   (while (or ( < ?answer ?a1) ( > ?answer ?a2)) do
      (printout t ?question)
      (bind ?answer (read))
   )
 ?answer)

(deffunction yes-or-no-p (?question)
   (bind ?response (ask-question ?question yes no y n))
   (if (or (eq ?response yes) (eq ?response y))
       then TRUE
       else FALSE))

;;;****************************
;;;* STARTUP  RULES *
;;;****************************

;;;; This Rule print a banner message

(defrule system-banner ""
  (declare (salience 10))
  =>
  (printout t crlf crlf)
  (printout t "         Computer Troubleshooting Expert System")
  (printout t crlf crlf))

;;;; Rule for printing the final diagnosis and recommendation

(defrule print-diagnosis""
  (declare (salience 10))
  (recommend ?item2)
  =>
  (printout t crlf crlf)
  (printout t " recommendation:"  ?item2)
  (printout t crlf crlf)
)
(defrule Q1 ""
(not (troublshoot ?))
(not (recommend ?))
(not (Q1 ?))
  =>
    (if (yes-or-no-p "Q1:Is there sound problem? ")
       then (assert (Q1 yes))
       else  (assert (Q1 no))
   )
)
(defrule Q2 ""
(not (troublshoot ?))
(not (recommend ?))
(not (Q2 ?))
(Q1 yes)
 =>
    (if (yes-or-no-p "Q2: Sound Card is not detected ? ")
       then (assert (Q2 yes))
       else  (assert (Q2 no))
   )
)
```

```
 (defrule Q3 ""
(not (troublshoot ?))
(not (recommend ?))
(not (Q2 ?))
(Q1 yes)
(Q2 yes)
 =>
    (if (yes-or-no-p "Q3: Is there damaged sound card mising ? ")
       then (assert (Q3 yes))
       else  (assert (Q3 no))
   )
)

(defrule Q3yes ""

(not (recommend ?))
(Q1 yes)
(Q2 yes)
(Q3 yes)
  =>
  (assert (recommend "replce sound card."))
)
(defrule Q2no
(not (recommend ?))
(Q1 yes)
(Q2 no)
  =>
  (if  (yes-or-no-p  "Q4:Is there a driver warning?")
      then (assert (Q4 yes))
      else  (assert (Q4 no))
)
)

(defrule Q3no ""
(not (recommend ?))
(Q1 yes)
(Q2 yes)
(Q3 no)
  =>
  (assert (recommend "Check Connection point."))
)

(defrule Q4yes
(not (recommend ?))
(Q1 yes)
(Q2 no)
(Q4 yes)
  =>
  (assert (recommend "Install driver"))
)
 (defrule Q4no
(not (recommend ?))
(Q1 yes)
(Q2 no)
(Q4 no)
  =>
  (assert (recommend "Driver conflict"))
```

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```
)

(defrule Q1no
(not (recommend ?))
(Q1 no)
  =>
  (if  (yes-or-no-p  "Q5:Is sound Scratchy?")
      then (assert (Q5 yes))
      else  (assert (Q5 no))
)
)

(defrule Q6
(not (recommend ?))
(Q1 no)
(Q5 yes)
  =>
  (if  (yes-or-no-p  "Q6:Is there signal inference?")
      then (assert (Q6 yes))
      else  (assert (Q6 no))
)
)

(defrule Q6yes
(not (recommend ?))
(Q1 no)
(Q5 yes)
(Q6 yes)
  =>
  (assert (recommend "Away from radio frequency resources"))
)

(defrule Q6no
(not (recommend ?))
(Q1 no)
(Q5 yes)
(Q6 no)
  =>
  (assert (recommend "Check speaker"))
)

(defrule Q7
(not (recommend ?))
(Q1 no)
(Q5 no)
  =>
  (if  (yes-or-no-p  "Q7:speaker or microphone will not work?")
      then (assert (Q7 yes))
      else  (assert (Q7 no))
)
)
(defrule Q7yes
(not (recommend ?))
(Q1 no)
(Q5 no)
(Q7 yes)
  =>
```

```
  (assert (recommend "Check sound cable"))
)
(defrule Q6no
(not (recommend ?))
(Q1 no)
(Q5 no)
(Q6 no)
  =>
  (assert (recommend "Connect cable"))
)
```

References:

1. Abunasser, B.S., Al-Hiealy, M.R.J., Zaqout, I.S., Abu-Naser, S.S. Literature review of breast cancer detection using machine learning algorithms, AIP Conference Proceedings, 2023, 2808
2. Al-Zamily, J.Y.I., Ariffin, S.B., Abu Naser, S.S.M. A survey of cryptographic algorithms with deep learning, AIP Conference Proceedings, 2023, 2808, 050002
3. Barhoom, A.M.A., Jubair, M.R., Abu-Naser, S.S. A survey of bone abnormalities detection using machine learning algorithms, AIP Conference Proceedings, 2023, 2808, 040009
4. Abunasser, B. S. Daud,S. M., Zaqout, I., Abu-Naser S. S. Abunaser - A Novel Data Augmentation Algorithm For Datasets With Numerical Features. Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 11.
5. Alrakhawi, H. A., Jamiat, N., Umar, I. N., Abu-Naser, S. S. Improvement of Students Achievement by Using Intelligent Tutoring Systems - A Bibliometric Analysis and Reviews. Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 11.
6. Abunasser, B.S., Al-Hiealy, M.R.J., Zaqout, I.S., Abu-Naser, S.S. Convolution Neural Network for Breast Cancer Detection and Classification Using Deep Learning. Asian Pacific journal of cancer prevention: APJCP, 2023, 24(2), pp. 531–544
7. Alrakhawi, H. A., Jamiat, N., Abu-Naser, S. S. Intelligent Tutoring Systems in Education: A Systematic Review of Usage, Tools, Effects and Evaluation. Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 4, pp. 1205-1226.
8. Zarandah, Q. M. M., Daud, S. M., Abu-Naser, S. S. A Systematic Literature Review Of Machine and Deep Learning-Based Detection And Classification Methods for Diseases Related To the Respiratory System, Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 4, pp. 1273-1296.
9. Alkayyali, Z. K. D., Idris, S. A. B, Abu-Naser, S. S. A Systematic Literature Review of Deep and Machine Learning Algorithms in Cardiovascular Diseases Diagnosis, Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 4, pp. 1353-1365.
10. Abunasser, B. S. Daud,S. M., Zaqout,I., Abu-Naser S. S. Convolution Neural Network For Breast Cancer Detection And Classification - Final Results. Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 1, pp. 315-329.
11. Taha, A. M. H., Ariffin, D. S. B. B., Abu-Naser, S. S. A Systematic Literature Review of Deep and Machine Learning Algorithms in Brain Tumor and Meta-Analysis, Journal of Theoretical and Applied Information Technology, 2023, Vol. 101. No. 1, pp. 21-36.
12. Abu Ghosh, M.M., Atallah, R.R., Abu Naser, S.S. Secure mobile cloud computing for sensitive data: Teacher services for Palestinian higher education institutions. International Journal of Grid and Distributed Computing, 2016, vol. 9, no. 2, pp. 17–22
13. Abunasser, B. S., AL-Hiealy, M. R. J., Zaqout, I. S. and Abu-Naser, S. S. "Breast Cancer Detection and Classification using Deep Learning Xception Algorithm" International Journal of Advanced Computer Science and Applications(IJACSA), 13(7),223-228, 2022.
14. Abunasser, B.S., AL-Hiealy, M.R. J., Barhoom, A. M. Almasri A. R. and Abu-Naser, S. S. "Prediction of Instructor Performance using Machine and Deep Learning Techniques" International Journal of Advanced Computer Science and Applications(IJACSA), 13(7), 78-83, 2022.
15. Alayoubi, M.M., Arekat, Z.M., Al Shobaki, M.J., Abu-Naser, S.S. The Impact of Work Stress on Job Performance Among Nursing Staff in Al-Awda Hospital. Foundations of Management, 2022, 14(1), pp. 87–108
16. Albatish, I.M., Abu-Naser, S.S. Modeling and controlling smart traffic light system using a rule based system. Proceedings - 2019 International Conference on Promising Electronic Technologies, ICPET 2019, 2019, pp. 55–60, 8925318
17. Almasri, A., Obaid, T., Abumandil, M.S.S., ...Mahmoud, A.Y., Abu-Naser, S.S. Mining Educational Data to Improve Teachers' Performance. Lecture Notes in Networks and Systems, 2023, 550 LNNS, pp. 243–255
18. Almasri, A.R., Yahaya, N.A., Abu-Naser, S.S. Instructor Performance Modeling For Predicting Student Satisfaction Using Machine Learning - Preliminary Results. Journal of Theoretical and Applied Information Technology, 2022, 100(19), pp. 5481–5496
19. Arqawi, S., Atieh, K.A.F.T., Shobaki, M.J.A.L., Abu-Naser, S.S., Abu Abdulla, A.A.M. Integration of the dimensions of computerized health information systems and their role in improving administrative performance in Al-Shifa medical complex, Journal of Theoretical and Applied Information Technology, 2020, vol. 98, no. 6, pp. 1087–1119
20. Arqawi, S.M., Abu Rumman, M.A., Zitawi, E.A., ...Abunasser, B.S., Abu-Naser, S.S. Predicting Employee Attrition And Performance Using Deep Learning. Journal of Theoretical and Applied Information Technology, 2022, 100(21), pp. 6526–6536
21. Arqawi, S.M., Zitawi, E.A., Rabaya, A.H., Abunasser, B.S., Abu-Naser, S.S., "Predicting University Student Retention using Artificial Intelligence", International Journal of Advanced Computer Science and Applications , 2022, vol. 13, no. 9, pp. 315–324
22. Barhoom, A.M.A., Al-Hiealy, M.R.J., Abu-Naser, S.S. Bone Abnormalities Detection and Classification Using Deep Learning-VGG16 Algorithm. Journal of Theoretical and Applied Information Technology, 2022, 100(20), pp. 6173–6184
23. Barhoom, A.M.A., Al-Hiealy, M.R.J., Abu-Naser, S.S. Deep Learning-Xception Algorithm for Upper Bone Abnormalities Classification. Journal of Theoretical and Applied Information Technology, 2022, 100(23), pp. 6986–6997
24. El-Habil, B.Y., Abu-Naser, S.S. Global Climate Prediction Using Deep Learning. Journal of Theoretical and Applied Information Technology, 2022, 100(24), pp. 4824–4838
25. Eneizan, B., Obaid, T., Abumandil, M.S.S., ...Arif, K., Abulehia, A.F.S. Acceptance of Mobile Banking in the Era of COVID-19. Lecture Notes in Networks and Systems, 2023, 550 LNNS, pp. 29–42
26. Alzamily, J. Y. I., Ariffin, S. B., Abu-Naser, S. S. Classification of Encrypted Images Using Deep Learning –Resnet50. Journal of Theoretical and Applied Information Technology, 2022, 100(21), pp. 6610–6620
27. Mady, S.A., Arqawi, S.M., Al Shobaki, M.J., Abu-Naser, S.S. Lean manufacturing dimensions and its relationship in promoting the improvement of production processes in industrial companies. International Journal on Emerging Technologies, 2020, vol. 11, no. 3, pp. 881–896
28. Obaid, T., Eneizan, B., Naser, S.S.A., ...Abualrejal, H.M.E., Gazem, N.A. Factors Contributing to an Effective E- Government Adoption in Palestine. Lecture Notes on Data Engineering and Communications Technologies, 2022, 127, pp. 663–676
29. Obaid, T., Eneizan, B., Abumandil, M.S.S., ...Abu-Naser, S.S., Ali, A.A.A. Factors Affecting Students' Adoption of E-Learning Systems During COVID-19 Pandemic: A Structural Equation Modeling Approach. Lecture Notes in Networks and Systems, 2023, 550 LNNS, pp. 227–242
30. Saleh, A., Sukaik, R., Abu-Naser, S.S. Brain tumor classification using deep learning. Proceedings - 2020 International Conference on Assistive and Rehabilitation Technologies, iCareTech 2020, 2020, pp. 131–136, 9328072
31. Abueleiwa, M. H., et al. (2022). "Rule Based System for Diagnosing Bean Diseases and Treatment." International Journal of Engineering and Information Systems (IJEAIS) 6(5): 67-74.
32. Abu-Jamie, T. N., et al. (2021). "Diagnosing Cough Problem Expert System Using CLIPS." International Journal of Academic Information Systems Research (IJAISR) 5(5): 79-90.
33. Abu-Saqer, M. M., et al. (2019). "Developing an Expert System for Papaya Plant Disease Diagnosis." International Journal of Academic Engineering Research (IJAER) 3(4): 14-21.
34. Abu-Saqer, M. M., et al. (2019). "Knowledge Based System for Uveitis Disease Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 3(5): 18-25.
35. Aish, M. A., et al. (2021). "Lower Back Pain Expert System Using CLIPS." International Journal of Academic Information Systems Research (IJAISR) 5(5): 57-67.
36. Alfarra, A. H., et al. (2021). "An Expert System for Neck Pain Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 5(7): 1-8.
37. Al-Ghoul, M. M., et al. (2022). "Knowledge Based System for Diagnosing Custard Apple Diseases and Treatment." International Journal of Academic Engineering Research (IJAER) 6(5): 41-45.
38. Alkahlout, M. A., et al. (2021). "Expert System Diagnosing Facial-Swelling Using CLIPS."
39. Alkahlout, M. A., et al. (2021). "Expert System for Throat Problems Using SL5 Object." International Journal of Academic Information Systems Research (IJAISR) 5(5): 68-78.
40. Alkahlout, M. A., et al. (2021). "Knowledge Based System for Diagnosing Throat Problem CLIPS and Delphi languages." International Journal of Academic Engineering Research (IJAER) 5(6): 7-12.
41. AlKayyali, Z. K., et al. (2022). "Prediction of Student Adaptability Level in e-Learning using Machine and Deep Learning Techniques." International Journal of Academic and Applied Research (IJAAR) 6(5): 84-96.
42. Almadhoun, H. R., et al. (2020). "An Expert System for Diagnosing Coronavirus (COVID-19) Using SL5." International Journal of Academic Engineering Research (IJAER) 4(4): 1-9.
43. Al-Masawabe, M. M., et al. (2021). "Expert System for Short-term Abdominal Pain (Stomach Pain) Diagnosis and Treatment." International Journal of Academic Information Systems Research (IJAISR) 5(5): 37-56.
44. Al-Qadi, M. H., et al. (2022). "Developing an Expert System to Diagnose Tomato Diseases." International Journal of Academic Engineering Research (IJAER) 6(5): 34-40.
45. AlQatrawi, M. J., et al. (2022). "Rule Based System for Diagnosing Lablab Problems." International Journal of Academic and Applied Research (IJAAR) 6(5): 249-256.
46. Al-Saloul, N. J., et al. (2022). "A Knowledge Based System for Cucumber Diseases Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 6(5): 29-45.
47. Alsaqqa, A. H., et al. (2021). "Knowledge Based for Tooth Problems." International Journal of Academic Information Systems Research (IJAISR) 5(5).
48. Barhoom, A. M., et al. (2022). "Prediction of Heart Disease Using a Collection of Machine and Deep Learning Algorithms." International Journal of Engineering and Information Systems (IJEAIS) 6(4): 1-13.
49. Barhoom, A., et al. (2022). "Sarcasm Detection in Headline News using Machine and Deep Learning Algorithms." International Journal of Engineering and Information Systems (IJEAIS) 6(4): 66-73.
50. Dheir, I. M. and S. S. Abu-Naser (2022). "Classification of Anomalies in Gastrointestinal Tract Using Deep Learning." International Journal of Academic Engineering Research (IJAER) 6(3): 15-28.
51. Dheir, I., et al. (2019). "Knowledge Based System for Diagnosing Guava Problems." International Journal of Academic Information Systems Research (IJAISR) 3(3): 9-15.
52. El-Habibi, M. F., et al. (2022). "A Proposed Expert System for Obstetrics & Gynecology Diseases Diagnosis." International Journal of Academic Multidisciplinary Research (IJAMR) 6(5): 305-321.
53. Elhabil, B. Y., et al. (2021). "An Expert System for Ankle Problems." International Journal of Engineering and Information Systems (IJEAIS) 5(4).
54. Elhabil, B. Y., et al. (2021). "Expert System for Hib Problems."
55. El-Hamarnah, H. A., et al. (2022). "Proposed Expert System for Pear Fruit Diseases." International Journal of Academic and Applied Research (IJAAR) 6(5): 237-248.
56. Hamadaqa, M. H. M., et al. (2021). "Hair Loss Diagnosis Expert System and Treatment Using CLIPS." International Journal of Academic Engineering Research (IJAER) 5(5): 37-42.
57. Khalil, A. J., et al. (2019). "Apple Trees Knowledge Based System." International Journal of Academic Engineering Research (IJAER) 3(9): 1-7.
58. LAfi, O. I., et al. (2022). "A Proposed Expert System for Broccoli Diseases Diagnosis." International Journal of Engineering and Information Systems (IJEAIS) 6(5): 43-51.
59. Mansour, A. I. and S. S., et al. (2021). "Expert system for the diagnosis of high blood pressure diseases."
60. Mansour, A. I., et al. (2021). "An Expert System for Diagnosing Cough Using SL5 Object." International Journal of Academic Engineering Research (IJAER) 5(6): 13-27.
61. Masri, N., et al. (2019). "Survey of Rule-Based Systems." International Journal of Academic Information Systems Research (IJAISR) 3(7): 1-23.
62. Megdad, M. M., et al. (2022). "Fraudulent Financial Transactions Detection Using Machine Learning." International Journal of Academic Information Systems Research (IJAISR) 6(3): 30-39.
63. Megdad, M. M., et al. (2022). "Mint Expert System Diagnosis and Treatment." International Journal of Academic Information Systems Research (IJAISR) 6(5): 22-28.
64. Obaid, T., et al. (2022). Factors Contributing to an Effective E-Government Adoption in Palestine. International Conference of Reliable Information and Communication Technology, Springer, Cham.
65. Radwan, H. I., et al. (2022). "A Proposed Expert System for Passion Fruit Diseases." International Journal of Academic Engineering Research (IJAER) 6(5): 24-33.
66. Sababa, R. Z., et al. (2022). "A Proposed Expert System for Strawberry Diseases Diagnosis." International Journal of Engineering and Information Systems (IJEAIS) 6(5): 52-66.
67. Salman, F. M. and S. S. Abu-Naser (2022). "Classification of Real and Fake Human Faces Using Deep Learning." International Journal of Academic Engineering Research (IJAER) 6(3): 1-14.
68. Samhan, L. F., et al. (2021). "Expert System for Knee Problems Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 5(4):59-66.
69. Samhan, L. F., et al. (2022). "Classification of Alzheimer's Disease Using Convolutional Neural Networks." International Journal of Academic Information Systems Research (IJAISR) 6(3): 18-23.
70. Taha, A. M., et al. (2022). "Gender Prediction from Retinal Fundus Using Deep Learning." International Journal of Academic Information Systems Research (IJAISR) 6(5): 57-63.