Design and Development of Human Computer Interface using Virtual Reality Techniques

Zarqa Iqbal[1], Muhammad Akram[2], Momina Iftikhar[2], Kingsley Erhons ENERIJIOFI[3], Francisco Garcia-Sierra[4], Md. Al Hasibuzzaman[5], Fethi Ahmet Ozdemir[6], Gaweł Sołowski[6], Najmiatul Fitria[7], Marcos Altable[8], Adonis Sfera[9]

[1]*National University Of Sciences And Technology*
[2]*Department of Eastern Medicine, Government College University Faisalabad-Pakistan*
[3]*Department of Biological Sciences, Glorious Vision University, Ogwa, Edo State, Nigeria*
[3]*Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre (SVMCH&RC) Puducherry, India*
[4]*Department of Cell Biology, Center of Research and Advanced Studies of the National Polytechnical Institute, Mexico City, Mexico.*
[5]*Department of Nutrition and Food Science, University of Dhaka, Dhaka 1000, Bangladesh*
[6]*Department of Molecular Biology and Genetics, Faculty of Science and Art, Bingol University, Bingol, 1200, Türkiye*
[7]*Department of Pharmacology and Clinical Pharmacy, Universitas Andalas, Indonesia*
[8]*Department of Neurology, Neuroceuta, (Virgen de Africa Clinic), Spain*
[9]*Department of Psychiatry, Patton State Hospital, USA*
[*]*Corresponding author email:* __makram_0451@hotmail.com__

Abstract: *The design and usability of computer interfaces are crucial factors in improving user experience and productivity in the field of human-computer interaction. This overview examines the development of computer interfaces, starting with command-line interfaces (CLI) and moving on to graphical user interfaces (GUI), touch interfaces, and gesture-controlled interfaces. The guiding concepts of interface development* are highlighted: usability, accessibility and user-centered design. The harmony of form and function, the incorporation of cutting-edge technologies such as voice recognition and augmented reality, and the difficulties presented by the wide range of user requirements and preferences are important factors to take into account. Through an analysis of these factors, this brief seeks to offer perspectives on the future paths of computer interface design, emphasizing the importance of flexibility and intuition in meeting changes.

Key words: Voice control, virtual reality, GUI, computer interfaces and user experience.

Corresponding Author: Dr. Muhammad Akram Department of Eastern Medicine. Government College University Faisalabad.
E-Mail:makram_0451@hotmail.com

Introduction

The vital link that allows control, communication and access to digital information is provided by computer interfaces. From the text-based command line interfaces (CLI) of early computers to the easy-to-use graphical user interfaces (GUI) that transformed computing in the 1980s, the evolution of interfaces has played a crucial role in changing the way people interact with technology (Martinez et al 2011). CLI limited accessibility to users who were familiar with programming syntax by requiring users to enter commands via text. GUIs made computing more accessible by introducing visual components such as windows, menus, and icons (Cockburn et al 2014). This allowed users to interact with computers using recognizable graphical metaphors rather than learned commands. With the introduction of touch interfaces, ushering in the era of smart-phones and tablets, digital content could be manipulated directly using gestures on screens, further democratizing the technology (Vial et al 2019). With advances in speech recognition, augmented reality (AR), and virtual reality (VR), interfaces are evolving today to provide new levels of immersion and interactivity (Papadopoulos et al 2021). Effective interface design strikes a balance between functionality and user-centered design concepts, including usability, accessibility, and aesthetics (Cosgrove et al 2018). To meet diverse user demands and situations, modern interfaces aim to be clear, responsive and flexible. This introduction sets the context for examining how interface design affects user experience, productivity, and technical innovation in the digital age (Shneiderman et al 2010). Understanding the history and guiding principles of computer interfaces allows us to predict difficulties and trends in interface design that will influence how people will use technology in the future (Myers et al 2000).

Evolution of Computer Interfaces:

Since the early days of computing, computer interfaces have undergone substantial evolution. One of the first was the command line interface (CLI), which required text commands from the user to perform tasks (Fellmann et al 2007). Because they relied on exact syntax and did not provide visual feedback, CLIs intimidated non-technical users, even when they were powerful for technical users (Hardie et al 2012). By including visual components such as windows, menus, and icons, graphical user interfaces (GUIs) transformed computers in the 1980s. Using recognizable graphical metaphors instead of learned commands, users can now interact with computer applications (Blackwell et al 2006).Easier and more intuitive way thanks to graphical user interfaces (GUI). This change made computing more accessible and allowed a broader spectrum of people to interact with technology productively (Shneiderman et al 2010).

Principles of Interface Design:

Several guidelines for effective interface design focus on improving usability and user experience. The goal of usability is to create user interfaces that are error-tolerant, quick to learn, and efficient (Prabhu et al 1997). Accessible interfaces are designed to accommodate

users with a variety of requirements and abilities, including those with disabilities. To create interfaces that are aesthetically beautiful and easy to use, aesthetics play a critical role in interface design by striking a balance between visual appeal and functional clarity (Lawrence et al 2006). By reducing cognitive load and increasing user predictability, consistency in design features and behavior across interfaces improves usability (Wang et al 2014).

Technologies Shaping Modern Interfaces:

Technological advances continue to influence the field of computer interfaces. Voice recognition technology allows users to communicate with virtual assistants such as Siri and Alexa by giving commands on the device. By overlaying digital data on top of the real environment, augmented reality (AR) creates new interfaces for data and applications (Estrella et al 2019). By creating immersive environments, virtual reality (VR) allows users to participate in simulated events, such as virtual meetings and games. These innovations open up new options for interface design and give consumers more immersive and natural ways to interact with digital systems (Turner et al 2016).

Challenges in Interface Design:

In today's digital world, creating interfaces that work well involves a number of issues. Adaptability is a difficulty as interfaces must work seamlessly on multiple platforms and devices, each with a different screen size and input method (Miraz et al 2021). To avoid overwhelming users with options, feature-rich interfaces must strike a balance between simplicity and convenience of use. This is where complexity develops. Another important factor to consider is security, which ensures that interfaces are protected against illegal access and data breaches (Wittkop et al 2022). Iterative improvement requires incorporating user feedback, allowing designers to make improvements to the interface based on user preferences and real-world usage.

Future Directions:

Computer interfaces are expected to continue to be improved and innovated in the future. Improvements in natural language processing (NLP) will make it possible for users to interact with technology in more complex ways by understanding and reacting to human language in more subtle ways (Singh et al 2018). By enabling interfaces to better understand and react to user movements, gesture recognition technology will open up new possibilities for control and engagement. The integration of artificial intelligence (AI) will personalize interfaces by anticipating users' desires and behaviors to provide more personalized and intuitive experiences (Bader et al 2019). The next generation of interfaces will be shaped by these developments, increasing usability, responsiveness, and the technology's ability to integrate into everyday life (Stephanidis et al 2001).

Impact of Interfaces on User Experience:

Interfaces have a significant impact on productivity, happiness, and overall usability, as well as shaping the user experience. Tasks and workflows are streamlined through well-designed interfaces, which increase productivity by reducing the time and effort required to execute tasks (Unger et al 2023). Aesthetics, comfort of use, and the ability to quickly achieve goals all have an impact on user happiness. By pushing the boundaries of technology and creating new opportunities for users in a variety of industries, interfaces also promote innovation (Kaasinen et al 2015).

Conclusion:

From early command-line interfaces to today's easy-to-use graphical and touch-based systems, computer interfaces have undergone substantial evolution. Technology is now more efficient and easier to use thanks to these advances, which have also significantly improved accessibility and user experience. Future advances in artificial intelligence, augmented reality and speech recognition have the potential to completely transform the way people interact with digital systems. Effective interface design remains essential to ensure usability and user delight, even in the face of design complexity and security issues. The influence of interfaces on creativity, productivity and daily life will be crucial in determining how computing and human-computer interaction will develop in the future.

REFERENCE:

1. Alapati, N., Prasad, B. V. V. S., Sharma, A., Kumari, G. R. P., Bhargavi, P. J., Alekhya, A., ... & Nandini, K. (2022, November). Cardiovascular Disease Prediction using machine learning. In 2022 International Conference on Fourth Industrial Revolution Based Technology and Practices (ICFIRTP) (pp. 60-66). IEEE.

2. Rao, S. D. P. (2023). RANSOMWARE DEFENSE IN THE CLOUD ENVIRONMENTS: ADAPTIVE STRATEGIES FOR EVOLVING THREATS.

3. Bharathi, G. P., Chandra, I., Sanagana, D. P. R., Tummalachervu, C. K., Rao, V. S., &Neelima, S. (2024). AI-driven adaptive learning for enhancing business intelligence simulation games. Entertainment Computing, 50, 100699.

4. Rao, S. D. P. (2024). SOLVING CLOUD VULNERABILITIES: ARCHITECTING AIPOWERED CYBERSECURITY SOLUTIONS FOR ENHANCED PROTECTION.

5. Rao, S. D. P. (2024). HARNESSING AI FOR EVOLVING THREATS: FROM DETECTION TO AUTOMATED RESPONSE.

6. Rao, S. D. P. (2022). PREVENTING INSIDER THREATS IN CLOUD ENVIRONMENTS: ANOMALY DETECTION AND BEHAVIORAL ANALYSIS APPROACHES.

7. Rao, S. D. P. (2022). THE SYNERGY OF CYBERSECURITY AND NETWORK ARCHITECTURE: A HOLISTIC APPROACH TO RESILIENCE.

8. Rao, S. D. P. (2022). MITIGATING NETWORK THREATS: INTEGRATING THREAT MODELING IN NEXT-GENERATION FIREWALL ARCHITECTURE.

9. Kanth, T. C. (2024). AI-POWERED THREAT INTELLIGENCE FOR PROACTIVE SECURITY MONITORING IN CLOUD INFRASTRUCTURES.

10. Kanth, T. C. (2023). ADVANCE DATA SECURITY IN CLOUD NETWORK SYSTEMS.

11. Kanth, T. C. (2023). SECURING DATA PRIVACY IN CLOUD NETWORK SYSTEMS: A COMPARATIVE STUDY OF ENCRYPTION TECHNIQUES.

12. Kanth, T. C. (2023). EFFICIENT STRATEGIES FOR SEAMLESS CLOUD MIGRATIONS USING ADVANCED DEPLOYMENT AUTOMATIONS.

13. Kanth, T. C. (2024). OPTIMIZING DATA SCIENCE WORKFLOWS IN CLOUD COMPUTING.

14. Kanth, T. C. (2023). CONTEMPORARY DEVOPS STRATEGIES FOR AUGMENTING SCALABLE AND RESILIENT APPLICATION DEPLOYMENT ACROSS MULTI-CLOUD ENVIRONMENTS.

15. Kanth, T. C. (2023). EXPLORING SERVER-LESS COMPUTING FOR EFFICIENT RESOURCE MANAGEMENT IN CLOUD ARCHITECTURES.

16. Nagarani, N., et al. "Self-attention based progressive generative adversarial network optimized with momentum search optimization algorithm for classification of brain tumor on MRI image." Biomedical Signal Processing and Control 88 (2024): 105597.

17. Reka, R., R. Karthick, R. Saravana Ram, and Gurkirpal Singh. "Multi head self-attention gated graph convolutional network based multi-attack intrusion detection in MANET." Computers & Security 136 (2024): 103526.

18. Meenalochini, P., R. Karthick, and E. Sakthivel. "An Efficient Control Strategy for an Extended Switched Coupled Inductor Quasi-Z-Source Inverter for 3 Φ Grid Connected System." Journal of Circuits, Systems and Computers 32.11 (2023): 2450011

19. Karthick, R., et al. "An optimal partitioning and floor planning for VLSI circuit design based on a hybrid bio-inspired whale optimization and adaptive bird swarm optimization (WO-ABSO) algorithm." Journal of Circuits, Systems and Computers 32.08 (2023): 2350273.

20. Jasper Gnana Chandran, J., et al. "Dual-channel capsule generative adversarial network optimized with golden eagle optimization for pediatric bone age assessment from hand X-ray image." International Journal of Pattern Recognition and Artificial Intelligence 37.02 (2023): 2354001.

21. Rajagopal RK, Karthick R, Meenalochini P, Kalaichelvi T. Deep Convolutional Spiking Neural Network optimized with Arithmetic optimization algorithm for lung disease detection using chest X-ray images. Biomedical Signal Processing and Control. 2023 Jan 1;79:104197.

22. Karthick, R., and P. Meenalochini. "Implementation of data cache block (DCB) in shared processor using field-programmable gate array (FPGA)." Journal of the National Science Foundation of Sri Lanka 48.4 (2020).

23. Karthick, R., A. Senthilselvi, P. Meenalochini, and S. Senthil Pandi. "Design and analysis of linear phase finite impulse response filter using water strider optimization algorithm in FPGA." Circuits, Systems, and Signal Processing 41, no. 9 (2022): 5254-5282.

24. Karthick, R., and M. Sundararajan. "SPIDER-based out-of-order execution scheme for HtMPSOC." International Journal of Advanced Intelligence paradigms 19.1 (2021): 28-41.

25. Karthick, R., Dawood, M.S. & Meenalochini, P. Analysis of vital signs using remote photoplethysmography (RPPG). J Ambient Intell Human Comput 14, 16729–16736 (2023). https://doi.org/10.1007/s12652-023-04683-w

26. Selvan, M. A., & Amali, S. M. J. (2024). RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE.

27. Padgul, A. V., & Patil, R. N. A Study on the Impact of Performance Management Systems on Employee's Performance in Degree Institutions in Kalaburagi.

28. Kumaresan, G., Vijayakumar, P., Ravikumar, M., Kamatchi, R., & Selvakumar, P. (2019). Experimental study on effect of wick structures on thermal performance enhancement of cylindrical heat pipes. Journal of Thermal Analysis and Calorimetry, 136, 389-400.

29. Faizal, U. M., Jayachitra, R., Vijayakumar, P., & Rajasekar, M. (2021). Optimization of inbound vehicle routes in the collection of bio-medical wastes. Materials Today: Proceedings, 45, 692-699.

30. Vijayakumar, P., Kumaresan, G., Kumar, S. G., & Eswaran, M. (2021). A review on applications of nanofluid in evacuated tube heat pipe integrated with compound parabolic concentrator. Materials Today: Proceedings, 45, 1227-1232.

31. Vijay, R., Vijayakumar, P., Kumaresan, G., & Kumar, S. G. (2021). Performance study of FPSC integrated with twisted tape inserts. Materials Today: Proceedings, 45, 1222-1226.

32. Palanivel, V., Govindasamy, K., & Arunachalam, G. K. (2022). Optimization and prediction of pulsating heat pipe compound parabolic solar collector performances by hybrid deep belief network based bald eagle search optimizer. Environmental Progress & Sustainable Energy, 41(2), e13740.

33. Mohanraj, K. S., Vijayakumar, P., & Senthilkumar, R. (2017). Gokul Karthika,"Design And Analysis Of Semi Automatic Paper Cum Arecanut Plate Making". International Research Journal of Engineering and Technology (IRJET), 4(05), 3546-3550.

34. Vijayakumar, P., Kumar, S., Sakthivelu, S., & Prakash, R. S. (2017). Comparison of evacuated tube and flat plate solar collector—A review. World Wide Journal of Multidisciplinary Research and Development, 3(2), 32-36.

35. Madhavan, V. M., Rahul, S., Vijayakumar, P., Dhal, P. K., Girimurugan, R., Ravivarman, G., & Joseph, J. (2023). Optimizing solar energy utilization and energy efficiency through thermal energy storage with phase change materials in a solar water heating system. In E3S Web of Conferences (Vol. 455, p. 02005). EDP Sciences.

36. Rajasekar, M., Faizal, U. M., Sudhagar, S., & Vijayakumar, P. (2021). Influence of heat treatment on tribological behavior of Al/ZrO2/fly ash hybrid composite. Materials Today: Proceedings, 45, 774-779.

37. Gokul Karthik, A., Saravanakumar, R., & Vijayakumar, P. (2021). Bald eagle search optimization on dual fueled reactivity controlled combustion ignition based engine characteristics by altering low reactive fuels. Environmental Progress & Sustainable Energy, 40(6), e13683.

38. Vijayakumar, P., Kumaresan, G., Faizal, U. M., Chandran, G. V., & Adharsh, K. V. (2019, September). Performance evaluation of compound parabolic concentrator with evacuated tube heat pipe. In IOP Conference Series: Earth and Environmental Science (Vol. 312, No. 1, p. 012008). IOP Publishing.

39. Mackerle, J. (2000). Finite element analyses and simulations in biomedicine: a bibliography (1985-1999). Engineering computations, 17(7), 813-856.

40. Mohanraj, D., Vijayakumar, P., Kiruthiga, V., Jadhavd, D., Krishna, M., & Nanthakumar, S. (2024). Examining the Combination of a Parabolic Solar Collector with Phase Change Material (PCM) in Solar Distillation. In E3S Web of Conferences (Vol. 529, p. 02006). EDP Sciences.

41. Vijayakumar, P., Kumaresan, G., Sudhagar, S., Chandran, G. V., & Adharsh, K. V. (2019, September). Development of Solar Oven employed with Parabolic Concentrator. In IOP Conference Series: Earth and Environmental Science (Vol. 312, No. 1, p. 012009). IOP Publishing.

42. Vivek, P. (2014). Heat Recovery Steam Generator by Using Cogeneration. International Journal of Engineering Research, 3(8), 512-516.

43. Velavan, R., Nandhakumar, S., & Vijayakumar, P. (2017). Experiment in EDM process by using brass electrode with Inconel material in Nano powder mixed dielectric medium. Pakistan J. Biotechnol, 14, 50-53.

44. Govindasamy, K., Palanivel, V., Meena, R. S., Muthusamy, S., Panchal, H., Shah, M. A., & Siddiqui, M. I. H. (2024). Performance analysis of evacuated tubes with thermosyphon heat pipe solar collector integrated with compound parabolic concentrator under different operating conditions. Energy Exploration & Exploitation, 42(1), 231-249.

45. Vijay, R., Kumaresan Govindasamy, P. Vijayakumar, and Godson Asirvatham Lazarus. "Experimental investigation on productivity enhancement of a solar still modified with the evacuated tube heat pipe using paraffin wax." PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART C-JOURNAL OF MECHANICAL ENGINEERING SCIENCE 236, no. 21 (2022): 10865-10876.

46. Arulsamy, A. N., Murugesan, B., Samuel Chelladurai, S. J., Selvaraj, M. K., Palanivel, V., & Balcha, G. (2022). Experimental investigation on microstructure and mechanical properties of friction welded dissimilar alloys. Advances in Materials Science and Engineering, 2022(1), 5769115.

47. Ahamed, S. K., Naidu, M. M., & Reddy, C. S. R. (2015). Outliers in data envelopment analysis. International Journal of Computer Science and Security (IJCSS), 9(3), 164-173.

48. Ahamed, S. K., Naidu, M. M., & Subba, R. R. C. (2016). Outliers: most influential observations in variable returns to scale data envelopment analysis. Indian Journal of Science and Technology, 9(2), 1-7.

49. Rekha, V., Reddy, L. V., Chaudhari, S. V., Gopi, A., Nithiya, C., & Ahamed, S. K. (2023, January). Automated Deep Learning with Wavelet Neural Network based Rice Plant Classification. In 2023 International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT) (pp. 345-350). IEEE.

50. Ahamed, S. K., Krishna, B. V., & David, D. B. (2021). Brain Tumor Segmentation and Classification based on Deep Learning-Based Inception Networks. Annals of the Romanian Society for Cell Biology, 5210-5219.

51. Ahamed, S. K., Naidu, M. M., & Reddy, C. S. R. (2015). Most influential observations-Super efficiency. International Journal on Computer Science and Engineering, 7(9), 82.

52. Sirajuddin, M., Ravela, C., Krishna, S. R., Ahamed, S. K., Basha, S. K., & Basha, N. M. J. (2024). A Secure Framework based On Hybrid Cryptographic Scheme and Trusted Routing

to Enhance the QoS of a WSN. Engineering, Technology & Applied Science Research, 14(4), 15711-15716.

53. Sharma, P., Prasad, J. S., Shaheen, & Ahamed, S. K. (2024). An efficient cyber threat prediction using a novel artificial intelligence technique. Multimedia Tools and Applications, 1-17.

54. Balasubramaniam, P. M., Satheesh, N., Guhathakurta, R., Ahamed, S. K., Sharma, D. K., Rangasamy, R., & Sengan, S. (2022). Design of Automotive Accident-Avoidance System at Speed Limit Zone Using GPS. In Innovations in Computer Science and Engineering: Proceedings of the Ninth ICICSE, 2021 (pp. 271-279). Singapore: Springer Singapore.

55. Singuluri, P. K., Basha, S. L. J., Ahamed, S. K., & Nithya, M. (2021, July). An Educated Peer Discovery Expanding Blockchain Framework. In Journal of Physics: Conference Series (Vol. 1964, No. 4, p. 042091). IOP Publishing.

56. Hussain, S. A., & khaleel Ahamed, S. (2020). SCALABLE AND SECURE DATA SHARING OF SENSITIVE INFORMATION PRESERVATION WITH EFFECTIVE SEARCH MECHANISM. INTERNATIONAL JOURNAL, 5(11).

57. Vaid, A. K., Parmar, M., Srikkanth, G. R., & Meera, K. L. (2023). Intellectual Property Rights And Business Security. AG Publishing House (AGPH Books).

58. Seshanna, S., & Seshanna, M. (2016). The impact personality traits, role conflict and work family conflicton customer orientation: a review of extant literature. International Journal of Research in Social Sciences, 6(2), 466-480.

59. Bhargavi, V. S., Choudhary, A., Gangadharan, S., Gambhir, V., KL, M., & Gupta, S. (2023). Social Sciences in Management Research: Interdisciplinary Approaches for Sustainable Business Practices. Journal of Informatics Education and Research, 3(2).

60. Vembu, N. R., Meera, K. L., Suganthi, C., Sawant, R., Ravichand, M., & Pathak, P. (2023). Differential Education as an Approach for Improving Future Specialist's General Competence. Journal of Informatics Education and Research, 3(2).

61. Lal, S., Mani, H., KL, M., Sharma, A., Sasidharan, A., & Radha, T. (2023). Developing a strategic planning framework for Small and Medium Enterprises (SMES). European Chemical Bulletin, 12(5), 460-469.

62. Seshanna, M., Periasamy, P., & Seshanna, S. (2021). ART AS AN ALTERNATIVE INVESTMENT ASSET CLASS IN EMERGING ECONOMIES: A STUDY LINKING PERSONALITY FACTORS TO INVESTOR BEHAVIOUR. Turkish Online Journal of Qualitative Inquiry, 12(6).

63. Seshanna, M., Kumar, H., Seshanna, S., & Alur, N. (2021). THE INFLUENCE OF FINANCIAL LITERACY ON COLLECTIBLES AS AN ALTERNATIVE INVESTMENT AVENUE: EFFECTS OF FINANCIAL SKILL, FINANCIAL BEHAVIOUR AND PERCEIVED KNOWLEDGE ON INVESTORS'FINANCIAL WELLBEING. Turkish Online Journal of Qualitative Inquiry, 12(4).

64. Seshanna, M. INVESTORS BEHAVIOURAL STUDY ON ART AS AN ALTERNATIVE INVESTMENT ASSET CLASS.

65. Seshanna, S., & Seshann, M. (2017). The applied experiential learningmethod in entrepreneurship education: A conceptual approach. International Journal of Research in Social Sciences, 7(5), 481-488.

66. Seshanna, S., & Seshanna, M. (2015). Learning Inclusiveness and Under-served Communities in India. International Journal of Physical and Social Sciences, 5(10), 142-147.

67. Seshanna, S., & Seshanna, M. (2018). Midas Ventures A case of a financial services aggregator. International Journal of Research in Social Sciences, 8(4), 159-162.

68. Lakhekar, G. V., Waghmare, L. M., & Roy, R. G. (2019). Disturbance observer-based fuzzy adapted S-surface controller for spatial trajectory tracking of autonomous underwater vehicle. IEEE Transactions on Intelligent Vehicles, 4(4), 622-636.

69. Roy, R. G. (2019). Rescheduling based congestion management method using hybrid Grey Wolf optimization-grasshopper optimization algorithm in power system. J. Comput. Mech. Power Syst. Control, 2(1), 9-18.

70. Baidya, D., & Roy, R. G. (2018). Speed control of DC motor using fuzzy-based intelligent model reference adaptive control scheme. In Advances in Communication, Devices and Networking: Proceedings of ICCDN 2017 (pp. 729-735). Springer Singapore.

71. Lakhekar, G. V., Waghmare, L. M., Jadhav, P. G., & Roy, R. G. (2020). Robust diving motion control of an autonomous underwater vehicle using adaptive neuro-fuzzy sliding mode technique. IEEE Access, 8, 109891-109904.

72. Lakhekar, G. V., & Roy, R. G. (2014, March). A fuzzy neural approach for dynamic spectrum allocation in cognitive radio networks. In 2014 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2014] (pp. 1455-1461). IEEE.

73. Roy, M. R. G. (2020). Economic dispatch problem in power system using hybrid PSO and enhanced bat optimization algorithm. J Comput Mech Power Syst Control (JCMPS), 3(3), 27-33.

74. Lakhekar, G. V., & Roy, R. G. (2014, March). Heading control of an underwater vehicle using dynamic fuzzy sliding mode controller. In 2014 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2014] (pp. 1448-1454). IEEE.

75. Roy, R. G., & Ghoshal, D. (2020). Search and rescue optimization algorithm-second order sliding mode control: AUV error tracking. Journal of Computational Mechanics, Power System and Control, 3(1), 10-20.

76. Roy, R. G., & Ghoshal, D. (2021). A novel adaptive second-order sliding mode controller for autonomous underwater vehicles. Adaptive Behavior, 29(1), 39-54.

77. Gupta Roy, R., & Ghoshal, D. (2019). Adaptive second-order sliding-mode controller for shank-foot orthosis system. International Journal of Control, 92(7), 1580-1589.

78. Roy, R. G., Lakhekar, G. V., & Tanveer, M. H. (2023). Designing of neural network-based SoSMC for autonomous underwater vehicle: integrating hybrid optimization approach. Soft Computing, 27(7), 3751-3763.

79. Tanveer, M. H., & Roy, R. G. (2021). Real-time machine learning control for robotic manipulator by LNB: Lion Naïve Bayes algorithm. Journal of Computational Mechanics, Power System and Control, 4(4), 17-22.

80. Roy, R. G., Ghorai, P., Eskandarian, A., & Kasi, V. R. (2022, December). Design of a new nonlinear predictive PI controller for cascaded control system applications. In 2022 Eighth Indian Control Conference (ICC) (pp. 109-114). IEEE.

81. Roy, R. G., & Ghoshal, D. (2020). Advanced heavy water reactor control with the aid of adaptive second-order sliding mode controller. Engineering Computations, 37(4), 1237-1259.

82. Tanveer, M. H., Koduru, C., Roy, R. G., Lakhekar, G. V., & Chun, C. (2023, November). A Robust Control Technique for Pitch Control of an Aeropendulum. In 2023 6th International Conference on Robotics, Control and Automation Engineering (RCAE) (pp. 257-261). IEEE.

83. Roy, R. G. Design and Development of Adaptive Second Order Sliding Mode Controller for Industrial and Robotic Applications.

84. P. Rajendran, Lavakush Singh, D. Barani, & Meera K. L. (2024). IoT AND MACHINE LEARNING IN NONPROFIT MANAGEMENT TRANSFORMING SOCIAL AND ECONOMIC DEVELOPMENT PRACTICES. In COMMUNITY PRACTITIONER (Vol. 21, Number 06, pp. 637–648). Zenodo. https://doi.org/10.5281/zenodo.11615948

85. Thangapalani, L., Dharini, R., & Keerthana, R. (2023, May). Securing Medical Image Transmission using Memetic Algorithm. In 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI) (pp. 1-8). IEEE.

86. Hemalatha, P. (2015). A Clinical Study for the Role of Eustachian Tube Function for Successful Mastoidectomy and Middle Ear Surgeries (Doctoral dissertation, Thanjavur Medical College, Thanjavur).

87. Vennila, D., Vinotha, C., Shanthakumari, A., & Thangapalani, L. Convex Optimization Algorithm for Product Recommendation Using Microblogging Information. Journal of Data Mining and Management, 2(1).

88. Dinesh, A. (2019). Collaborative Language Learning (CLL) in Indian ESL Classrooms: A Study of Regional Medium ESL Learners.

89. Ramarajan, M., Dinesh, A., Muthuraman, C., Rajini, J., Anand, T., & Segar, B. (2024). AI-Driven Job Displacement and Economic Impacts: Ethics and Strategies for Implementation. In Cases on AI Ethics in Business (pp. 216-238). IGI Global.

90. JPP, J., & Amali, S. M. J. (2023). Secure and low PAPR OFDM system using TCCM. Annals of Telecommunications, 78(7), 459-474.

91. Kumar, V. S., Thansekhar, M. R., Saravanan, R., & Amali, S. M. J. (2014). Solving multi-objective vehicle routing problem with time windows by FAGA. Procedia Engineering, 97, 2176-2185.

92. Sudha, S., Baskar, S., Amali, S. M. J., & Krishnaswamy, S. (2015). Protein structure prediction using diversity controlled self-adaptive differential evolution with local search. Soft Computing, 19, 1635-1646.

93. Sivananaithaperumal, S., Amali, S. M. J., Baskar, S., & Suganthan, P. N. (2011). Constrained self-adaptive differential evolution based design of robust optimal fixed structure controller. Engineering Applications of Artificial Intelligence, 24(6), 1084-1093.

94. Brindha, S. (2021). A robust and adaptive fuzzy logic based differential evolution algorithm using population diversity tuning for multi-objective optimization. Engineering Applications of Artificial Intelligence, 102, 104240.

95. Gowsalya, R., & Amali, S. M. J. (2014). Naive Bayes based network traffic classification using correlation information. International Journal of Advanced Research in Computer Science and Software Engineering, 4(3).

96. Sivaramkumar, V., Thansekhar, M. R., Saravanan, R., & Miruna Joe Amali, S. (2018). Demonstrating the importance of using total time balance instead of route balance on a multi-objective vehicle routing problem with time windows. The International Journal of Advanced Manufacturing Technology, 98, 1287-1306.