5th International Conference on Computing and Informatics (ICCI'2022)

9 – 10 March, 2022

Helnan Landmark Hotel, New Cairo, Egypt

Organized By

Faculty of Computers and Information Technology

Future University in Egypt

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Conference Co-Chair
Prof. Neveen Ghali
Vice-Dean, Faculty of Computers and Information Technology
Future University in Egypt

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Preface

As an ambitious mission, Future University in Egypt (FUE) is an educational institute committed to distinction, innovation, and quality standards. FUE's priority is to stay abreast with the national, regional, and international changes taking place in the interrelated fields of education, scientific research, and community development, while consolidating values and professional ethics.

To achieve such challenging goals, the Faculty of Computers, and Information Technology (FCIT) at Future University in Egypt (FUE) organizes an International Conference on Computing and Informatics (ICCI) every other year.

This year, 2022, FCIT organized the 5th occurrence of ICCI under the sponsorship of IEEE. The conference is held in Cairo during the period 9-10 March 2022 and addressed top-notch scholars who submitted original research works in different emerging eras of Computing and Informatics.

The number of submitted papers reached **111,** while, through a double reviewing process, only **64** papers have been accepted with a rejection rate of **43%**.

The conference program includes three keynote speakers of notch expertise in the field, an Industrial talk, and 12 sessions for papers' presentations.

Conference Chairs

Honorary Chair

Prof. Ebada Sarhan

President of Future University in Egypt

Biography:

Professor Ebada Sarhan is an Egyptian pioneer in the field of Computer Science and Information Technology with over 35 years of professional international and regional experience, over 45 scientific articles and books, and various consultancy projects.

He is the founding President of Future University in Egypt. He founded the Faculty of Computer Science & Information Technology at Helwan University, the first faculty of its kind in a public university in Egypt. Prior to that, he established the Scientific Computing Center at Helwan University and held several academic positions leading to his promotion to Dean of the Faculty of Computer Science & Information Technology at the University.

He is a member of several organizations including: the Egyptian Academy for Scientific Research and Technology, the Egyptian Computer Society, the Egyptian Engineering Syndicate, the Scientific Committee of the International Conference of Artificial Intelligence, the Egyptian Teachers' Syndicate. He is the editor in chief of Future Computer Journal.

He was also an active member of the National Information Committee at the Egyptian Academy of Scientific Research and Technology, the Egyptian National Council for ICT and a member of the Computer and Information Systems Sector Committee at Egyptian Supreme Council of Universities.

He is a member of several professional international organizations including: the British Computer Society, the UK Institution of Electrical Engineers, and the US Institute of Electrical & Electronics Engineers (IEEE). He was also a member of the Evaluation Committee of Information Technology Project and Undergraduate Degrees of Computer Science at Ajman Faculty at the Ministry of Higher Education in the United Arab Emirates.

Conference Chair

Prof. Dr. Mohamed Ismail Roushdy

Dean of Faculty of Computers and Information Technology

Future University in Egypt.

Biography:

Prof. Dr. Mohamed Ismail Roushdy received his Ph.D. in 1993, M.Sc. degree in 1984 and B.Sc. degree in 1979 from the Faculty of Science, Ain Shams University. His experimental doctoral research work was conducted at Bochum University in Germany during 1989-1991.
He is a Professor of Computer Science since 2007 till now and Dean of the Faculty of Computer and Information Sciences, Ain Shams University, Cairo, Egypt from 2010 till 2018. He is a Dean of Faculty of Computers and Information Technology, Future University in Egypt from Sept. 2019 till now.
He has Ain Shams University Appreciation Award in Technological Sciences (Year 2018)

His areas of research are Artificial Intelligence, Knowledge engineering, Machine Learning, Expert Systems, Intelligent Medical, Health Informatics, Image Processing, Pattern Recognition, Biometrics, Medical Data Mining and Robotics. He published more than ١٣٠ scientific papers in International Journals, International Conferences and Book Chapters.

He has been involved in more than 50 conferences and workshops as a Keynote speaker, member of several international program committees, organizer, and session chair.
He is the Editor of the International Journal of Intelligent Computing and Information Science IJICIS, Egypt from 2010 till 2018 and associate editor of Future Computing and Informatics Journal from 2019 till now.
He is a Member in Information Technology Executive Committee, Supreme Council of Egyptian Universities, Cairo, Egypt from 2010 to 2018, and Member in the promotion Committee for Professors and Associate Professors in Computer Science & Information systems, Supreme Council of Egyptian Universities, Cairo, Egypt from 2013 to 2016, Member in Syndicate of Scientific Professions, Egypt and Member in Egyptian Computer Society, Egypt.

Conference Co-Chairs

Prof. Awad Khalil

Vice Dean for Postgraduate and Research

Faculty of Computers and Information Technology, Future University in Egypt.

Biography:

Awad Khalil is a Vice Dean for Graduate Studies and Research of Faculty of Computers and Information Technology at Future University in Egypt. He received his B.Sc. in Electronics Engineering in 1970 from Military Technical College and M.Sc. and PhD. in Computer Engineering from Rennes-I university, France, in 1979 and 1981, respectively. Khalil contributed to developing many computer engineering and computer science programs at several national and private universities in Egypt and in the Arabic region. He organized several local conferences and workshops, and he is an active member in many international societies and program committees of several international scientific conferences. His current research areas include mainly Cybersecurity, Digital Web systems, Artificial Intelligence, and Big Data & Big Data Analytics

Conference Co-Chairs

Prof. Neveen I. Ghali

Head of Digital Media Technology Dept.,

Vice Dean for Community Service and Environmental Development.

Faculty of Computers and Information Technology, Future University in Egypt

Biography:

Neveen I. Ghali received her B.Sc. from Faculty of Science, Ain Shams University, Egypt. Finished her M.Sc. and Ph.D. degrees in computer science from Faculty of Computers and Information, Helwan University, Egypt in 1999 and 2003 respectively. She is currently a professor in computer science and vice dean, Faculty of Computers and Information Technology, Future University in Egypt. Her research areas are artificial intelligence and image processing,

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Keynote Speakers

Prof. Dr. N. CH. Sriman Narayana Iyengar

Sreenidhi Institute of Science &Technology, Hyderabad, India.

Title of the Presentation:

Securing Cloud Computing Environment against Distributed Denial of Service Attacks.

Biography of the Speaker:

Dr.N.Ch.SRIMAN NARAYANA IYENGAR (b1961) Currently Professor Information Technology & Dean (Library and Applied Research) at Sreenidhi Institute of Science and Technology (SNIST),Affliated to JNTUH, Hyderabad of SREENIDHI Group . He holds two Ph.D.'s in Applied Mathematics and Computer Science and Engineering.

Dr Iyengar had a rich teaching experience of 36 years out of which 23 years as Mathematics and CSE Professor at VIT University, Vellore-632014, Tamil Nadu, India with several Administrative Posts. He produced 12 Ph.D., 2 MS (Research), 3 M.Phil scholars and 168 M.Tech/B.Tech published project reports . His students are throughout Globe in high positions.

He had teaching and research contributions under MoU at abroad and India. His research interests include Distributed Secure Computing, Data Modeling and Analytics, IoT, Cloud based secure Health Care, and Fluid Mechanics. He has authored several textbooks and had nearly 260+ research publications in reputed peer reviewed International Journals. He involved in Sponsored Projects with his Scholars, organized several CONFERENCEs, FDP,s STTP's, CEP's, Work Shops sponsored by AICTE/DST/DRDO/…. He is life member of several professional bodies, delivered many key note lectures/Plenary Lectures/ Invited lectures and also served as session chair /PCM/reviewer for many International Conferences. He is Editor in Chief /Guest Editor for many international indexed Journals.

Prof. Dr. Dana Simian

Director of Research Center in Informatics and Information Technology, Lucian Blaga University of Sibiu, Romani.

Title of the Presentation:

Approaches for Optimizing the Models Selection in Machine Learning.

Biography of the Speaker:

Dana Simian received a degree in Engineering from the University of Sibiu, Romania, a degree in Mathematics from the University Babes-Bolyai of Cluj-Napoca, Romania and a Ph.D. in Mathematics from Babes-Bolyai University of Cluj-Napoca, Romania. She graduated many courses in Computer Science. She is the director of the Research Center on Informatics and Information Technology at the Faculty of Sciences, "Lucian Blaga" University of Sibiu, Romania. Her research and fields of expertise include modeling and optimization, theory of algorithms, machine learning, artificial intelligence, theory of computation, computational geometry, applied mathematics, and numerical calculus. She is a member of many international scientific committees and reviewer of many scientific publications. She serves as editor of various journals and is author of numerous publications.

Prof. Dr. Tarek El-Ghazawi

IEEE Fellow and Professor the George Washington University

Title of the Presentation:

Rebooting Computing- The Search for Post-Moore's Law Computing Systems

Biography of the Speaker:

Tarek El-Ghazawi is a Professor in the Department of Electrical and Computer Engineering at The George Washington University, where he leads the university-wide Strategic Academic Program in High-Performance Computing. He is the founding director of The GW Institute for Massively Parallel Applications and Computing Technologies (IMPACT) and was a founding Co-Director of the NSF Industry/University Center for High-Performance Reconfigurable Computing (CHREC). El-Ghazawi's interests include high-performance computing, computer architectures, reconfigurable and embedded computing, nanophontonic based computing. He is one of the principal co-authors of the UPC parallel programming language. At present he is leading and co-leading efforts for Post-Moore's Law processors including analog, nanophotonic and neuromorphic computing. Professor El-Ghazawi is a Fellow of the IEEE and selected as a Research Faculty Fellow of the IBM Center for Advanced Studies and a UK Royal Academy of Engineering Distinguished Visiting Fellow. He was awarded the Alexander von Humboldt Research Award, from the Humboldt Foundation in Germany, the Alexander Schwarzkopf Prize for Technical Innovation, The IEEE Outstanding Leadership Award by the IEEE Technical Committee on Scalable Computing, and the GW SEAS Distinguished Researcher Award. El-Ghazawi has served as a senior U.S. Fulbright Scholar and as a distinguished speaker in the IEEE Computer Society Distinguished Visiting Program.

Medhat Mahmoud

Title of the Presentation:

The Era of Artificial Intelligence

Biography of the Speaker:

Medhat is a senior ICT and Digital Transformation expert, and core member in Huawei's global Digital Transformation Office, currently serving as Chief Digital Transformation in the Northern Africa region at Huawei OpenLab, Enterprise Business Group, based in Cairo. Prior to OpenLab, he was a Senior Director, led Huawei's IoT Competence Center in Silicon Valley, California, USA.

Scheduled Program (General Map)

***** All times are given in terms of Cairo, Egypt time zone (UTC/GMT +2 hour) *****

Day 1 – Wednesday, March 9, 2022

9:00 – 10:00	Registration	Location
10:00 –10:15	**Opening Session** Prof. Dr. Ebada Sarhan – Honorary Chair Prof. Dr. Mohamed Roushdy – Conference Chair	Hall A
10:15 – 10:45	**Keynote Speech** **Chair: Prof. Dr. Mohamed Roushdy Co-Chair: Prof. Dr. Aliaa Youssef** **Speaker1: Prof. Dr. Dana Simian** Director of Research Center of Informatics and Information Technology Faculty of Sciences, Lucian Blaga University of Sibiu, Romania. **Approaches for Optimizing the Models Selection in Machine Learning**	Hall A
10:45 – 11:15	**Industrial Talk:** Eng. Medhat Mahmoud - Chief of Digital Transformation, Huawei Northern Africa. **The Era of Artificial Intelligence**	Hall A
11:15 – 11:30	**Coffee break**	
11:30 – 14:00	**Session D1-1-A** On-site Presentation Artificial Intelligence and Data Visualization **Chair: Prof. Dr. Reda El-Kherebi Co-Chair: Dr. Osama Hegazy**	Hall A
	Session D1-1-B On-site Presentations Artificial Intelligence and Data Visualization **Chair: Prof. Dr. Osama Imam Co-Chair: Prof. Dr. Mohamed Abdelmegid**	Hall B
	Session D1-1-C Online Presentations Artificial Intelligence and Data Visualization **Chair: Prof. Dr. Neveen Ghali Co-Chair: Dr. Heba Mohsen**	Hall C
14:00 –14:30	**Coffee break**	
14:30 – 17:00	**Session D1-2-A** On-site Presentation Data Science and Knowledge Discovery **Chair: Prof. Dr. Yehia Helmi Co-Chair: Prof. Dr. Amira Idrees**	Hall A
	Session D1-2-B On-site Presentations Image Processing and Pattern Recognition **Chair: Prof. Dr. Khaled Hosni Co-Chair: Dr. Khaled Wassef**	Hall B
	Session D1-2-C Online Presentations Data Science & Image Processing **Chair: Prof. Dr. Atef Galwash Co-Chair: Prof. Dr. Howida Shedeed**	Hall C

*** All times are given in terms of Cairo, Egypt time zone (UTC/GMT +2 hour) ***

Day 2 – Thursday, March 10, 2022

9:00 – 10:15	**Keynote Speeches** **Chair: Prof. Dr. Awad Khalil Co-Chair: Prof. Dr. Amira Idrees** **Speaker 2: Prof. Dr. Tarek El-Ghazawi, IEEE Fellow** Professor & Director of Institute for Massively Parallel Applications and Computing Technology (IMPACT), George Washington University **Rebooting Computing- The Search for Post-Moore's Law Computing Systems**	Hall A
10:15- 10:45	**Speaker 3: Prof. Dr. N.Ch.Sriman Narayana Iyengar** Ph.D (Computer Science & Engineering), Ph.D (Applied Mathematics) Professor Information Technology Dean (Library &Academic Research), Sreenidhi Institute of Science and Technology (SNIST), India **Securing Cloud Computing Environment against Distributed Denial of Service Attacks**	
10:45 – 11:30	**Coffee Break**	
11:30 – 14:00	**Session D2-1-A** On-site Presentation Computer Networks & Cybersecurity **Chair: Prof. Dr. Mohamed Hashem Co-Chair: Dr. Mohamed Hussein**	Hall A
	Session D2-1-B On-site Presentations SW Engineering & E-Commerce / Huawei Lecture: Digital Transformation **Chair: Prof. Dr. Ramadan Moawad Co-Chair: Dr. Fahd Kamal**	Hall B
	Session D2-1-C Online Presentations Computer Networks & SW Eng. **Chair: Prof. Dr. Fatma Emarah Co-Chair: Dr. Amira Sayed**	Hall C
14:00 – 14:30	**Coffee break**	
14:30 – 17:00	**Session D2-2-A** On-site Presentation IoT & Bioinformatics **Chair: Prof. Dr. El-Sayed El-Horbaty Co-Chair: Dr. Mahmoud Sami**	Hall A
	Session D2-2-B Online Presentations Cloud Computing **Chair: Prof. Dr. Mostafa Aref Co-Chair: Dr. Ahmed Salama**	Hall B
	Session D2-2-C Online Presentations Robotics & Embedded Systems **Chair: Prof. Dr. Amira Idrees Co-Chair: Dr. Amal Mehana**	Hall C
17:00 – 17:30	**Closing**	

Conference Abstracts

Artificial Intelligence and Data Visualization

Ensemble Federated Learning for Non-IID COVID-19 Detection

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Abstract—In light of the COVID-19 pandemic, the need for a chest X-ray scans classifier is crucial in order to diagnose patients and classify scans into normal, COVID-infected, and pneumonia. Federated learning was chosen for the classification as it uses a decentralized approach to train the model at the local servers belonging to each entity in various geographic locations. Therefore, information leakage that could happen from the traditional centralized approach of training is prevented, besides saving the huge cost of central storage. However, between the vast difference in the number of X-ray scans per data-silo (i.e. hospital), the dissimilar image-acquisition techniques, and the diverse morphological structures of the human chest, non-IID (non-Independent and Identically Distributed) skews are introduced in the data. In this paper, real-world datasets of COVID and pneumonia scans are used to satisfy all the non-IID data skews. An experiment was then conducted to test the effect of these skews using five federated learning algorithms, FedAvg, FedProx, FedNova, SCAFFOLD, and FedBN, under the same metrics. The obtained accuracy values are 79.5%, 76.92%, 5.57%, 79.18%, and 84.4%, respectively. In this paper, we present the different effects of non-IID skews on the training process and discuss the different federated learning variations to mitigate the data heterogeneity.

Keywords—Federated Learning, Non-IID, COVID-19.

Why Bee colony is the most suitable with multi-query optimization?

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Abstract—This paper presents the comparison results on the performance of the swarm algorithms with Multi-Query Optimization (MQO). First the paper discusses query optimization process and the challenges appear when applied on multi query. Then the paper tackles swarm algorithms and how did they confront these challenges and achieve good results. Finally, proved that Artificial Bee Colony (ABC) algorithm achieves the best results in time and performance.

Keywords— Multi Query optimization – swarm algorithms – Query optimization

Recognition of Emotion in Speech-related Audio Files with LSTM-Transformer

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Abstract—In our everyday audio events, there is some emotional information in almost any speech audio received by humans. Thus, Speech Emotion Recognition (SER) has become an important research field in the last decade. SER recognizes human emotional states through human speech or daily conversation. It plays a crucial role in developing Human-Computer Interaction (HCI) and signals processing systems. Moreover, human emotions change naturally over time. Thus, it requires a good model for learning the long-term dependencies in the speech signal. In this paper, a hybrid model which combines two widely used deep learning methods is proposed. The proposed model combines the Long-Short Term Memory (LSTM) and Transformer architectures to learn the long-term dependencies through the extracted Mel Frequency Cepstral Coefficient (MFCC) features. The preliminary results of the proposed model evaluated on the publicly available dataset called RAVDESS are presented. The model achieved 75.33% of weighted accuracy (WA) and 73.12% of unweighted accuracy (UA) over the RAVDESS dataset. The experiment's result indicates the effectiveness of the proposed model in learning the temporal information from the frequency distributions according to the MFCC features.

Keywords—speech emotion recognition, long-short term memory, Transformer, MFCC

Predicting Banking Customer Churn based on Artificial Neural Network

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Abstract—Customer churn has become one of the major issues in the banking industry. Because it is difficult to gain new clients, the major focus of customer relationship management is on existing clients. Customer Churn is defined as when customers switch to another provider due to their low prices and better offers. There are many research papers that found solutions to solve the customer churn problem with the help of the techniques of machine learning. In this research paper, we have suggested a framework that introduces a solution to the problem of customer churn in the banking industry. We used the techniques of deep learning namely the artificial neural network to analyze bank customer data and predict the customer churn. The experiment was conducted on a dataset called churn modeling and the results reveal that we were able to attain an accuracy of 87 % for bank customer data by using the ANN algorithm. The proposed framework presented a cost-effective option for maintaining bank customers, which increases bank profits by retaining customers.

Keywords— customer churn, customer retention, banking sector, deep learning, artificial neural network.

Emo-TTS: Parallel Transformer-based Text-to-Speech Model with Emotional Awareness

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Abstract—One of the pillars of human social interaction is the ability to communicate one's feelings and emotions. In recent years, there has been a fast growth in research on the subject of emotional voice synthesis. Regardless, the results leave something to be desired in terms of the clarity of the emotions expressed. In this study, we propose Emo-TTS, a parallel transformer- based text-to-speech (TTS) model modified to model emotions in speech. We use a conformer-based architecture that has been augmented with speaker and emotion embedding. An external speech emotion recognition (SER) model is utilized to incorporate classification loss and perceptual loss into the TTS model, which improves emotional expressiveness and allows it to train in a self-supervised way when no emotion ground truth is available. Improving speaker embedding is critical for training hundreds of speakers with minimal valid data, allowing us to generate realistic-sounding emotional voices with only minutes of audio. By combining effective emotion and speaker embedding, we may be able to model emotions for speakers with unseen emotions. Achieving strong emotional expressiveness with a small amount of viable data could significantly improve many fields, including automated audio-book reading and possibly replacing voice actors. We achieve an accuracy of 80% on a combination of 5 datasets in our SER task.

Keywords—text-to-speech, speech synthesis, emotional speech synthesis, deep learning, speech emotion recognition

Artificial Intelligence Techniques for Classification of Eye Tumors: A Survey

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Abstract—Tumors that have migrated to other regions of the body, particularly the breast, lung, bowel, or prostate, usually develop secondary tumors in the eyes. Retinoblastoma in children and melanoma in adults are two forms of primary cancers that develop within the eye. In this paper, we review the recent works of the artificial intelligence techniques that are applied for classification of ophthalmology tumors. The researchers had proposed different diagnosis systems of eye cancer; iris tumor, iris nevus, uveal melanoma and metastatic, malignant choroidal melanoma and retinoblastoma. The techniques used in these papers can be divided into three main methodologies. The main methodology depends on the Artificial Neural Network (ANN) and deep learning; Back Propagation Neural Networks (BPNN), Radial Basis Function Networks (RBFN), Auto Encoder (AE) Neural Network, hybrid Stacked Auto Encoder (SAE) Network, Deep Belief Network (DBN),Convolutional Neural Network (CNN) and Extreme Learning Machine (ELM). The second methodology depends on the Machine Learning (ML) approaches; decision tree, Fuzzy C[1]Means (FCM), Alternative Fuzzy C-Mean (AFCM), Support Vector Machine (SVM) and Decision Tree classifier. The third one depends on different image processing techniques and Apriori based algorithm. The highest recognition rate is achieved by applying different image processing techniques and BPNN with 98.5% and 95%, respectively.

Keywords—Artificial Intelligence, Deep Learning, Healthcare informatics, Ophthalmology, Eye tumors.

A Survey on Generative Adversarial Networks based Models for Many-to-many Non-parallel Voice

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Abstract—Voice Conversion (VC) is a task of converting speaker-dependent features of a source speaker's speech without changing the linguistic content. There are many successful VC systems, each trying to overcome some challenges. These challenges include the unavailability of parallel data and solving problems due to the language difference between the source and target speech. Also, one of these challenges is extending the VC system to cover a conversion across many source and target domains with minimal cost. Generative Adversarial Networks (GANs) are showing promising VC results. This work focuses on exploring many-to-many non[1]parallel GAN-based mono-lingual VC models (nine models that are highly cited), explains the used evaluation methods including objective and subjective methods (eight evaluation methods are presented), and comments on these models.

Keywords—Voice Conversion, many-to-many Voice Conversion, non-parallel Voice Conversion, mono-lingual Voice Conversion, Generative Adversarial Networks (GANs), StarGAN-VC, CycleGAN-VC

Automated intelligent online healthcare ontology Integration

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Abstract—Knowledge graphs have emerged as a powerful dynamic knowledge representation model for predicting hidden patterns and relationships in medical and healthcare domains for medical diagnosis and disease prediction. However, generating, constructing, and integrating knowledge graphs for this domain is still challenging research area for such heterogeneous domain. In this paper, a framework for automatic disease knowledge graph (KG) construction and intelligent ontology integration with standard human disease ontology (DO) is developed. A major component of this framework is developing an enhanced diseases' knowledge graph that is based on collecting medical facts from medical platforms and social networks, including symptoms, causes, risk factors and prevention factors. This knowledge graph represents a major base for intelligent diagnosis and disease prediction systems. The developed disease knowledge graph includes diseases' symptoms, causes, risk factors and prevention factors and integrated with DO by more than 400 diseases. The knowledge graph presented is a step not only towards building an enriched knowledge graph for professional staff and normal users. The graph is also a step towards integrating two standard ontologies human disease and symptom ontologies that are not linked or integrated till now.

Keywords — Disease Ontology, knowledge graph, Entity linking, Ontology concept extraction, Ontology Integration.

A deep learning framework for predicting the student's performance in the virtual learning environment

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Abstract—Nowadays predicting the student's performance in the virtual learning environment is considered a critical point as it includes some of the student learning activities such as the course registration, tasks submissions, exams, as well as all the virtual interactions that happen so all of these are considered as a fertile field for research. In addition, Deep learning which is under the umbrella of artificial intelligence played an important role in the prediction's domain. Consequently, the study focused to discuss the role of artificial intelligence in the e-learning system in general and specifically the role of deep learning in predicting the student's performance, and it found that most of the studies focused only on the dropout prediction and neglect the other performance features as well as they didn't focus on improving the quality of the dataset. Consequently, the study proposed a deep learning framework to predict the student's academic performance in the virtual learning environment taking into consideration the quality of the dataset in the preprocessing layer, based on the deep neural networks the proposed model achieved a high accuracy of about 91.29% and low loss value about 0.18 compared to the other studies which utilized the same dataset.

Keywords— Deep learning, Deep Neural Networks, Student's performance prediction, online virtual learning, learning activities

Satellite Orbit Prediction Based on Recurrent Neural Network using Two Line Elements

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Abstract—Because of the hazards and challenges of the space environment, Satellites are usually exposed to orbit deviation, collisions with debris, or loss of tracking control. Therefore, orbit prediction can be defined as the critical and significant role for satellite monitoring and tracking control. This paper proposes a novel orbit prediction approach based on Two-Line Elements (TLE) using A Recurrent Neural Network (RNN) architecture with Long Short-Term Memory (LSTM). The proposed approach has been verified and evaluated its efficiency using the popular benchmark Clark tracks that describe the orbital satellites datasets. In the experimental study, the results show that the proposed approach can predict satellite orbits with high accuracy, which is presented by the two variables, position and velocity. The evaluation measured are R2 represents the goodness of fitness for the prediction accuracy is 98%, and the mean square error in position is 9.7*10-5 and in velocity is 10*10-3.

Keywords— Satellite Orbit Prediction; Two Line Elements, Long Short-Term Memory; Deep Learning; Recurrent Neural Network.

An English Islamic Articles Dataset (EIAD) for developing an IslamBot Question Answering Chatbot

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Abstract—A chatbot is one of the most vastly recommended technologies to be used during these decades, especially through the digitization era. It could save much consumed time for both the users and the customer service employees. Chatbots could provide an answer to the asked questions instantly. IslamBot is an Islamic religion chatbot "i.e.," responsible for answering any inquiries related to the Islamic religion. The aimed audience is non-Muslims people willing to join Islam or New-Muslims. Building such types of chatbots need to have an enormous amount of trusted data. Accordingly, in this paper The English Islamic Articles dataset (EIAD) is proposed as a benchmark reference for English Islamic question answering. So, this dataset contains about 10000 English Islamic articles. It is scrapped from authenticated and trusted websites like NewMuslims.com, IslamReligion.co, and IslamQA.com. The dataset is about 275 articles from NewMuslims.com, 1550 articles from IslamReligion.com, and 8292 articles from IslamQA.com. The EIAD dataset is a structured dataset "i.e.," labeled and categorized. This dataset contains about 15 different categories. Each category is covering several different topics. This paper focuses on discussing how The English Islamic Articles dataset (EIAD) has been collected.

Keywords—Natural Language Processing (NLP), chatbots, Conversational Agents (CA), Agent, Question Answering (QA) chatbot, Automation, Digitization, Datasets, English Datasets, Islamic Religion, Religions, Islam, New Muslims, Non-Muslims.

A Survey on Recommender System for Arabic Content

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Abstract—On the internet, where the number of choices of products and services is growing, users need to filter items or products to make better decisions. Recommender system is a type of information filtering system designed to provide recommendations to users based on various algorithms. These algorithms forecast the most likely products that users will buy or like based on their interests. In recent years, the number of recommender systems has increased, and famous companies have employed recommender systems to assist their users in finding the products or items that are appropriate for them. Therefore, we decided to review existing studies on recommender systems for Arabic content. Because many recommender systems focus on English content, we found a few studies in the field of recommender systems that address Arabic content. We summarize these studies based on some features, including recommender system types, domain, datasets, and if the recommender system is integrated with sentiment analysis. Finally, we discuss recommender systems with Arabic content studies, and we notice that most of these studies used sentiment analysis with recommender systems to achieve high-quality recommendations.

Keywords—Recommender Systems (RSs), Collaborative Filtering, Arabic, Natural Language Processing (NLP), Artificial Intelligence (AI), Machine learning, Sentiment analysis

Recent Applied Techniques for Open Dialog Generation Systems

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Abstract—Dialog Generation Systems (DGS) have emerged as a critical aspect of Natural Language Processing in recent years (NLP). It enables a diverse set of relevant applications to interact with humans in a natural and intelligent way. This study provides a systematic review of open DGS techniques that have recently been used. The major goal of this study is to discuss and analyze the most widely used approaches for implementing DGS's that have been published in recent years. Also, the most popular datasets for open DGS are enumerated, and some commonly used automatic evaluating metrics are presented. As a result, the explored methods are categorized into six main categories, Reinforcement Learning (RL), Hierarchical Recurrent Encoder-Decoder (HRED), Generative Adversarial Networks (GAN), Variational Auto-Encoder (VAE), Sequence to Sequence (Seq2Seq), and Pretraining Model.

Keywords— Deep Learning, Open-domain chatbots, Conversational agents, Retrieval based, Generative based.

Forecasting Vaccination Growth for COVID-19 using Machine Learning

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Abstract—In this digital era, machine learning (ML) is be[1]coming more common in the healthcare industry. It plays many essential roles in the medical field including clinical forecasting, visualization, and even automated diagnostics. This paper focuses on the future prediction of COVID-19 vaccination rates in different countries. Considering how destructive the novel Coronavirus has been and its continuous mutation and spread, clinical interventions such as vaccines serve as a ray of hope for many individuals. As of 2021, an estimated total of 8,687,201,202 vaccine doses by numerous biopharmaceutical manufacturers have been administered worldwide. This study intends to estimate the probable increase or decrease in global vaccination rates, as well as analyze the correlation between future trends of daily vaccinations and new COVID-19 cases, along with deaths and reproduction rates. Three models were utilized in forecasting and comparing the overall prediction toward the COVID19 vaccine rates; Auto-Regressive Integrated Moving Average (ARIMA), an ML approach, Long-Short Term Memory (LSTM), an artificial Recurrent Neural Networks (RNN), and Prophet which is based on an additive model. The Vector Autoregression (VAR) model will also be utilized to compare COVID-19 cases, deaths and reproduction rates to that of COVID-19 vaccine growth. ARIMA resulted to be the best model, while Prophet turned out to be the worst-performing model. In general, our comparison of employing the ARIMA model vs the other three results in the conclusion that adopting this method shows to be a more effective approach in projecting vaccination growth in the future. Furthermore, a visible increase in future daily vaccinations can be seen to be correlated with the increase in COVID-19 cases, deaths reproduction rates, and a fluctuating trend in COVID-19 deaths.

Keywords—COVID-19 Vaccination, Future prediction, Time-series forecasting, Evaluation metrics, Vaccine distribution, machine learning, LSTM, ARIMA, Prophet, VAR

Shallow And Deep Learning In Footstep Recognition: A Survey

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Abstract— Analyzing gait data is a branch of biomechanics that offers a degree of privacy, low-cost, and effortless objective identification for individuals. Consequently, gait recognition can be used as a replacement for passwords, or as an extra security measure with existing passwords. This paper focuses on surveying footstep recognition, comparing deep learning and shallow learning, and providing an overview of the current state of footstep recognition. It might be useful to both professionals and beginners in this field of research.

Keywords— Biometrics, Deep learning, Floor sensor, Gait, Neural network.

Comparative study of machine learning techniques based on TQWT for EMG signal classification

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Abstract—Machine learning methods can be used to diagnose neuromuscular illnesses using electromyographic (EMG) signals. This research examines the tunable-Q factor wavelet transform (TQWT) for feature extraction and analyses various learning methods for classifying EMG signals in order to detect neuromuscular diseases. TQWT decomposes each type of EMG signal into sub-bands first. From each sub-band, statistical parameters such as mean absolute values (MAV), inter quartile range (IQR), kurtosis, mode, standard deviation, skewness, and ratio are calculated. Finally, the extracted features are fed into classifiers to differentiate between ALS, myopathy, and normal EMG data. The random forest classifier with TQWT achieved higher classification results in neuromuscular disorders diagnosis than the other classifiers tested in this study, according to experimental results. The accuracy of the random forest approach using TQWT was 98.64%, with an F-measure of 0.986 and a kappa value of 0.979.

Keywords—neuromuscular disorders, Tunable Q-factor Wavelet Transform, EMG signal, random forest

Using Machine Learning Techniques to Explore the Possibilities of Reducing the Spread of Corona Virus and its New Variants

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Abstract—The Corona pandemic has been around for a while, and its threat to the world is growing. We believe that climate parameters and health prevention measures could be related to the number of reported Corona daily cases. In the literature there were different views on the nature of these relations using several datasets recorded from various parts of the world. In our research, data collected from zones with concentrated Corona cases: China, Europe and the United States were analyzed to understand the relation with climate as well as data at the global level to understand the relation with health prevention measures. Feature importance analysis revealed that temperature is the most important contributing attribute to the Corona cases' prediction models, followed by relative humidity. As well, the percentage of mask use and percentage of fully vaccinated individuals were found to have a great influence on the number of new Corona daily cases. The designed machine learning ensemble techniques had a maximum predication accuracy of 89.08%, and the produced possible interpretations for the designed models agreed with the performed feature importance analyses. We believe that the analysis approach followed in this research as well as the achieved findings could be very useful to other researchers who are interested in conducting more research investigation in the same research area on the new Corona variants. We also believe that policy makers could consider the findings of our research as they effectively plan their future health precautions measures to avoid further spread of the virus.

Keywords—corona virus, climate change, health prevention measures, ensemble machine learning, model interpretation

Image Processing, Pattern Recognition and Computer Vision

Image Processing-Based Vehicle Class Identification in Mixed Traffic

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Abstract—Traffic composition plays a major role to characterize a heterogeneous traffic stream where various categories of vehicles with diverse static and dynamic characteristics share the common carriageway. Due to this diversity, the manual collection of classified traffic volumes often becomes difficult, particularly on busy roads. In this regard, the popularity of the videography method has increased significantly in the last few decades. Because the method offers flexibility to the enumerator(s) to extract the required data at their convenience by playing the video file on a computer screen. However, this method demands ample time and effort from the enumerator(s) that is considered as its major drawback. On this background, the present study proposes an advanced image processing-based approach which is helpful to identify the vehicle class in a video exhibiting the mixed traffic movements. The proposed methodology addresses two major limitations associated with the existing approaches; i) the problem of varying blob size, and ii) the thresholding problem. By eliminating these limitations, the proposed methodology has yielded an accuracy of 96.82% in identifying the right vehicle class. Apart from this, the proposed approach will significantly reduce the time and efforts devoted by the enumerator(s), and hence, it can be a decent substitute for the manual extraction of the classified traffic volume in the future.

Keywords—Heterogeneity, Image processing, Videography, Vehicle detection, Vehicle class

Image Cryptography: A Systematic Review

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Abstract—In recent years due to the observed growth of online multimedia applications, communication, and computer technologies, image security has been an essential demand. This survey paper summarizes existing image security approaches, their merits and demerits, and the area of future work. Along with the survey, the authors present a brief discussion of different multimedia data, as well as the attacks that affect the image transmission, general concepts of multimedia security, primary requirements, and recent applications. Multimedia security is classified into cryptography and data hiding techniques, including digital watermarking, steganography, and hybridization. Recent research work for cryptography techniques is discussed in the following sections.

Keywords— Multimedia data, Cryptography, Attacks, Copyright, Security.

Infrared Image Analysis for Human Face Recognition

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Abstract—Thermal infrared images have potential to captured the images without being affected by illumination. In this paper, we proposed a face recognition method using infrared images. The Convolution Neural Network are used to extract feature from the images with the combination of Haar Cascade, and Local Binary Pattern to indicate the face area. At the same time, images were acquired by using infrared camera and webcam. Compared between infrared and visible images, the experimental result from infrared images by using Convolutional Neural Network in combined with Haar Cascade show superiority in the measurement result of several parameters used with the highest score in accuracy up to 98% which outperforms the other experiment in this paper.

Keywords—Infrared images, Convolution Neural Network, Haar Cascade, Local Binary Pattern, Visible Images.

Iris Recognition System Techniques: A Literature Survey and Comparative Study

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Abstract—The main objective of this comparative study is to present a comprehensive review of literature on one of the biometric identification systems namely the iris recognition system. Biometric authentication has been introduced as one of the most fundamental security technologies. As most human phenotypes are unique, physiological features such as fingerprints, iris color, facial patterns, and geometry are used as security passwords. Because of its dependability, iris receives the greatest attention in the authentication. The segmentation, border defining, feature extraction, and matching methods are analyzed in this work. Most of the used iris datasets are also presented in the paper. The purpose of this research is to investigate current iris recognition systems and describe their phases.

Keywords—Biometrics, Iris Recognition, Convolutional Neural Network, Hough Transform.

Content-based Medical Image Retrieval based on Deep Features Expansion

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Abstract—The collections of various digital image databases have significantly grown and many users have recognized that finding and recovering important images from large collections is a difficult task. Where the success of any image retrieval system is heavily dependent on the feature extraction capacity of the feature descriptor, therefore successful and effective retrieval method has been developed to provide an effective and rapid search and retrieval process. We present a unique deep learning-based approach for extracting high-level and compact features from medical images in this paper. To capture the discriminative features of medical images, we use Residual Networks (ResNets), a popular multi-layered deep neural network. The query is then broadened by reformulating the query image using the mean values for deep features from each database class's top-ranking images. Two publicly available databases in various forms were used to evaluate the performance of our technique. These studies demonstrated the benefits of our proposed strategy, with retrieval accuracy greatly improved.

Keywords —Medical image retrieval, Deep learning technology, Residual Networks

An enhanced Skin-tone Block-map Image Steganography using Integer Wavelet Transforms

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Abstract—Steganography is the technique of hiding a confidential message in an ordinary message where the extraction of embedded information is done at its destination. Among the different carrier files formats; digital images are the most popular. This paper presents a Wavelet-based method for hiding secret information in digital images where skin areas are identified and used as a region of interest. The work presented here is an extension of a method published earlier by the authors that utilized a rule-based approach to detect skin regions. The proposed method, proposed embedding the secret data into the integer Wavelet coefficients of the approximation sub-band of the cover image. When compared to the original technique, experimental results showed a lower error percentage between skin maps detected before the embedding and during the extraction processes. This eventually increased the similarity between the original and the retrieved secret image.

Keywords—Steganography, skin detection, integer wavelet transform, YCbCr colorspace, blind extraction, skin block maps, imperceptibility

Camera-based Human Counting for COVID-19 Capacity Restriction

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Abstract—In this paper, a Human Counting system is implemented for COVID-19 capacity restrictions. It was implemented using the deep learning model You Only Look Once version 3 (YOLOv3) to detect and count the people in a room. The system also can monitor the social distancing between the people in the room while labeling each person as "safe" or "unsafe" depending on whether they respect the social distancing protocols that the World Health Organization recommended or not. To make the project user friendly, a Graphical User Interface (GUI) was implemented to allow the user to choose the source of their images that will be used as input to be processed by the system. An experiment was carried out to evaluate the performance of the system under different conditions and in different scenarios where the evaluation was done according to some metrics such as accuracy, precision and recall. The output results from this experiment were demonstrated in details and compared to a similar algorithm as both algorithms focused on people detection using images from an inclined camera. The results show an accuracy of 96% for detection and the number of people counted

Keywords—YOLOv3, people counting, social distancing

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Data Science and Knowledge Discovery

Smart Potato Disorders Diagnostic System Based on Fuzzy K-Nearest Neighbor

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Abstract—Towards smart agriculture, machine learning techniques are now used for different things in agriculture. One of these things is plant diagnosis. This paper aims to establish a smart system to diagnose the diseases of the potato plant with less number of symptoms from the user that appeared on the plant through knowledge discovery (data mining process) techniques, and provide the decision support to the farmer when farmer needs to know the treatment for the potato plant. The proposed model achieved an accuracy of 97%.

Keywords—Smart Agriculture, Artificial Intelligence, Machine Learning, Disorder Classification, Fuzzy KNN, Intelligent System

An Optimized Arabic Sarcasm Detection in Tweets using Artificial Neural Networks

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Abstract—This paper presents an optimized Arabic sarcasm classification model using artificial neural networks in conjunction with particle swarm optimization. Artificial Neural Networks (ANNs) are used to learn the extracted feature representation of a given text. Term frequency with inverse document frequency (TFIDF) is adapted for feature extraction and text transformation into numerical values. Particle Swarm Optimization (PSO) selects the most relevant features to optimize classification performance. Experiments show that the classification accuracy is optimized after using PSO from 82.12% to 86.85%.

Keywords— Arabic text, Sarcasm detection, Particle Swarm Optimization, Artificial Neural Networks

An Evaluation of Time Series-Based Modeling and Forecasting of Infectious Diseases Progression using Statistical Versus Compartmental Methods

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Abstract—As a case study for our research, COVID-19, that was caused by a unique coronavirus, has substantially affected the globe, not only in terms of healthcare, but also in terms of economics, education, transportation, and politics. Predicting the pandemic's course is critical to combating and tracking its spread. The objective of our study is to evaluate, optimize and fine-tune state of the art prediction models in order to enhance its performance and to automate its function as possible. Therefore, a comparison between statistical versus compartmental methods for time series-based modeling and forecasting of infectious disease progression was conducted. The comparison included several classical univariate time series statistical models, including Exponential Smoothing, Holt, Holt[1]Winters, and Seasonal Auto Regressive Integrated Moving Average (SARIMA), as opposed to an optimized version of the compartmental multivariate epidemiological model SEIRD, which is referred to in our study, as, Non-Linear L-BFGS-B Fitted SEIRD. The mentioned methods were implemented and fine-tuned to model and forecast COVID-19 outbreak situation represented by confirmed cases, recoveries, and fatalities in (Australia, Canada, Egypt, India, United States of America and United Kingdom). Through the implementing and tuning of both types of models, we have observed that while univariate time series forecasting models such as SARIMA produce highly accurate predictions due to their ease of use and procedure, as well as their ability to deal with seasonality and cycles in time series, multivariate epidemiological models are more powerful and extendible. Despite their complexity, epidemiological models have aided extensively in understanding the spread and severity of infectious disease pandemics such as the COVID-19 global pandemic. Using our optimized SEIRD, we have obtained a Mean Squared Log Error of 10-3 order, demonstrating the forecasts' elevated accuracy and reliability. In addition to forecasting the course of the pandemic for a 3 months season in all countries under investigation, we were able to estimate the transmission potential of COVID-19 represented by its effective reproduction number Rt. With Rt=1 is considered as the pandemic control threshold, it is evident that all of the countries under investigation are hovering just above the control threshold. This study might be relieving since it can demonstrate that the world is on the right track in terms of putting an end to the pandemic as soon as possible. The whole study shows how powerful is compartmental methods compared to classical statistical methods when used to model and forecast an infectious disease outbreak which encourages our further related research concerning the study of implementing advanced compartmental models considering additional parameters and controls.

Keywords—Time series forecasting, Compartmental models, SEIRD, SARIMA, Holt Winters', Holt Trend, Optimization, COVID19, Effective reproduction number, L-BGFS-B.

An Improved Wild Horse Optimizer for Traveling Salesman Problem

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Abstract—Traveling salesman problem (TSP) is well-known combinatorial optimization problems. Due to its importance in many applications such as engineering sciences, path planning, and sensor placement, many researchers have been attracted to solve this problem. In this paper, a new improved version of Wild horse optimizer (I-WHO) is proposed to boost its performance in solving global optimization and combinatorial optimization problems. To examine the performance of I-WHO, the obtained results are compared with state-of-the-art algorithms. To have an unbiased and accurate comparison, descriptive statistics such as standard deviation, mean, and Wilcoxon rank-sum test are also used. The computational result showed that I-WHO significantly outperforms other alternative algorithms.

Keywords—Traveling Salesman Problem, Wild Horse Optimizer, Global Optimization, Swarm Intelligence

The Impact of Twitter Sentiment Analysis on Bitcoin Price during COVID-19 with XGBoost

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Abstract—Bitcoin have become safe-haven for people who want to invest during COVID-19 with its volatile price. Numerous factors can affect the price but recently the most popular one was due to an Elon Musk tweet. We decided to investigate our questions. Do tweets regarding Bitcoin affect its price? Can we predict Bitcoin price by analysing sentiments from twitter? For our research, we decided to analyze the impact of twitter sentiments on Bitcoin price during the COVID-19 pandemic. Using VADER sentiment analysis, we attempted to find out what is the current public sentiment regarding Bitcoin. Coupling tweet sentiment with the Bitcoin price, we pursue making a predictive model to forecast whether Bitcoin price will rise or fall. We also compare whether having twitter sentiment analysis in our model will have an advantage compared to not using. In the end, we found out that twitter sentiment analysis have an impact to Bitcoin price. We hope that our research can help people during this financial stress period

Keywords—Sentiment analysis, natural language processing, bitcoin, twitter

An Advisory Student Achievement Model Based on Data Mining Techniques

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Abstract—Predicting student achievement is considered one of the most essential components of educational data mining. Academic institutions are concentrating on employing data mining techniques to improve student performance. Many prediction models have been presented to anticipate student accomplishment at an early stage in order to take preventative measures. This research looked at past models and presented a data-mining-based advising student achievement model. This study was carried out utilizing Artificial Neural Network (ANN), Decision Tree (DT), Naive Bayes classifiers, Random Forest, Support Vector Machine (SVM), and XGBoost to create a prediction model, with datasets containing 16 variables and 480 instances. Model produced satisfactory results, according to the findings of the experiments. With an accuracy of 84 percent without feature selection and 85.01 percent with feature selection using correlation, the XGBoost model was the most accurate of the four models.

Keywords— Education Data Mining, Prediction Model, Student Performance, XGBoost Algorithm

Forecasting COVID-19 Total Daily Cases in Indonesia Using LSTM Networks

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Abstract—The COVID-19 virus has taken over the course of the world for over two years; governments all over the world have been trying to mitigate its effects in several ways such as instilling most jobs to be done at home instead of working from the office. Thus, it is important to be able to see predictions of COVID[1]19 cases to better plan the intervention of the virus spreading. With the use of machine learning, our paper aims to propose and evaluate an LSTM (Long Short Term Memory) model that can forecast daily COVID-19 cases in Indonesia. Several tests show that 50 epochs and a batch size of eight are the best parameters to use for our model. Furthermore, after comparison with differing amounts of lookbacks, we have decided that 10 is best for our model as it consistently does better than other numbers of lookbacks. Based on our model, there will still be an increase of COVID-19 cases in the future.

Keywords—COVID-19, long short term memory, machine learning, artificial intelligence, forecasting, predicting.

Computer Networks & Cybersecurity

Group of models of error flow sources for discrete q-ary channels

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Abstract—An error in a digital data transmission channel is an event consisting in the fact that the data obtained by the message receiver does not match the original data. To describe the structure of errors in a communication channel, the concept of error flow is used, that is, sequences of symbols, the elements of which are equal to zero in the absence of an error and are non-zero if error presences, and the source of errors is understood as some conditional error flow generator. There are many mathematical models of error sources for binary channels, each of which adequately describes the interference environment of a particular type of data transmission channel. The use of error flow models is relevant for studying the quality of error-correcting codecs. But communication systems use not only binary, but also digital multi-position signals (q-ary signals). For q-ary data transmission channels, methods of mathematical modeling of errors have been studied little. The purpose of this work is to construct a q-ary version of the binary FIn-model. This model is the most general model from the group of models based on the use of fuzzy-interval sequences of random variables. A feature of the binary FIn-model is that it generalizes many well-known models and allows modeling fundamentally different cases of interference environment by changing only the internal parameters of the model. This paper presents such examples of model parameter settings that the properties of their error flows coincide with the properties of flows that are built by other well-known models. In this paper, a group of binary models built on the basis of the use of fuzzy-interval sequences of random variables is transferred to the case of Galois fields of cardinality greater than two. The generation of a non-binary error flow occurs in two stages. At the first stage, error positions are formed, and at the second stage, error values are generated. The mathematical q-ary FIn-model includes, as special cases, natural q-ary analogs of many well-known models of binary error sources, such as the models of Turin, Smith-Bowen-Joyce, Fritschmann-Svoboda, etc. It allows modeling errors of a complex structure, and also error flows of communication channels with time-varying characteristics.

Keywords — burst errors, error source, error flow, channel modeling.

Highly Available Internet Border Systems Survey and Reference Model

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Abstract—The exponential growth of organizations connecting to the internet increases the demand and expectations for technology professionals to provide highly available (HA), adaptable, always-on internet and network connectivity services to the enterprise. The rapid adoption of prevailing technologies and initiatives such as cloud-based workloads, Artificial Intelligence (AI), Machine Learning (ML), and digital transformation are fueling the growth. Organizations rely upon hardware, software, processes, and people, which form internet border systems. Internet border systems provide internet connectivity and access to external network services and resources. Despite the enterprise's increased connectivity demands, a standards-based model, blueprint, or reference architecture for designing and deploying HA internet border systems does not exist. This paper proposes creating a standards-based, modular, and reproducible HA internet border system model. The internet border model will provide a frame of reference and enable always-on, automated, resilient, and self-recovering internet border connectivity services for enterprise networks. The reference model will assist technology professionals in planning, designing, creating, and deploying HA internet border systems for enterprise networks.

Keywords—cloud, highly available, always-on, architecture, routing.

Dominant Meaning Technique for dedicating Social Criminal Twitter Posts

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Abstract—social media like Facebook, Twitter, and LinkedIn has gotten to be a portion of our lives. Cybercrime has ended up an imperative issue, particularly in creating nations. The spread of data with no hazard of being identified and brought leads to an increment in cybercriminals. In the meantime, the huge of information constantly generated from Twitter has made the method of detecting cybercriminals a troublesome task. This paper analyzes how content size such as tweets on Twitter, posts on Facebook, etc. on other social media played in the predict cybercrime. So, in this paper, we try to answer, "What are the fit content sizes that have more effects on accuracy?". This paper presents a solution based on two techniques: Dominant Meaning DM, and Term Frequency Inverse Document Frequency TF-IDF. This solution constructs super comparable vectors for both pockets negative and positive from different contents that have the same size. These vector plays a vital role to predict pocket for input tweets. To overcome this challenge, we compared the performance of the two mentioned methods. Our results introduced recommendations sizes of content that answered the question of research. However, the recommendation sizes may be disturbed by changes in the technique that generate super comparable vectors. The range of improvement which comes from dominant meaning for precision, recall, and F1 values is 75%, 75%, 70.07% respectively.

Keywords—Dominant Meaning, TF Inverse Document Frequency, Cyber-criminal Malicious Posts on Twitter, Dot product similarity.

A FUTURISTIC APPRAISAL OF MALWARE DETECTION BY EMPLOYING DATA MINING

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Abstract—The fourth industrial revolution is the artificial intelligence and digitization of everything, which turns the world into a global hub. The vast use of technology is essential, but it accompanies malwares that destroy confidential information. To overcome these challenges, the latest data mining techniques have been used. It squeezes all invisible information and analyzes massive databases. Malware is unstructured material that can't be determined directly. Various researches have endeavored to turn unstructured data into structured data to overcome this challenge. Due to the rapidly changing and complex pattern of Malware, data mining techniques are used to detect Malware. This survey is furnished with the latest apparatus and pledge information of Malware detection by opting the techniques of data mining. Besides this, it categorizes mainly into two Approaches for-instance signature-based method and the Behaviour-based method. The Focused points of this survey are to layout these First, A a detailed description of Challenges in malware detection by using data mining - Second A complete framework of latest approaches to Machine learning mechanism - Third, a search for an efficient method to detect Malware[1]Fourth, canvassing of all factor to determine malware approaches in data mining. Moreover, a detailed contrast of detected approaches is also present to facilitate the researchers. Evolution method, advantages and disadvantages are discussed to describe the proficiency. This survey is fully equipped with the latest techniques. In, this report we observed KNN with 22% MLB 16% MLA 12% NB 9% and other SVM 9% KM 7% API 7% and others are less than 5% in detecting malware in data mining., So, we find KNN approach with high accuracy.

Keywords—Malware detection, Data mining, malware attacks, invisible attacks, IOT.

A New Approach of Cryptography for Data Encryption and Decryption

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Abstract—Nowadays in the modern digital world, everything is rapidly going to be fully dependent on internet communication. Effective use of the internet makes our life easier. The information that we share on the internet has great security risks and challenges in the present day. Cryptography is the solution to secure data from different security risks. To enhance the security of communication systems better cryptosystems technology is obvious in the area of cryptography. Our research focuses on data encryption and decryption technique for a better cryptosystem; where we have proposed a new approach that ensures better performance in comparison to the state-of-the-art solutions. In this work, after generating a unique key using random characters the plain text is encrypted into ciphertext. To do this encryption, a divide and circular left and right shift approach is followed, and conversely, the reverse is maintained for decryptions as well. According to the experimental results, our proposed algorithm provides better results using the chi-square test while comparing with different cryptography algorithms.

Keywords—Data Encryption Standard, Advanced Encryption Standard, Rivest Shamir Adleman, Least Significant Bit, Most Significant Bit

Deep Learning Toward Preventing Web Attacks

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Abstract—Cyberattacks are one of the most pressing issues of our time. The impact of cyberthreats can damage various sectors such as business, health care, and governments, so one of the best solutions to deal with these cyberattacks and reduce cybersecurity threats is using Deep Learning. In this paper, we have created an in-depth study model to detect SQL Injection Attacks and Cross-Site Script attacks. We focused on XSS on the Stored-XSS attack type because SQL and Stored-XSS have similar site management methods. The advantage of combining deep learning with cybersecurity in our system is to detect and prevent short-term attacks without human interaction, so our system can reduce and prevent web attacks. This post-training model achieved a more accurate result more than 99% after maintaining the learning level, and 99% of our test data is determined by this model if this input is normal or dangerous.

Keywords—SQL injection, XSS attack, deep learning, RNN, LSTM.

Sliding Time Analysis in Traffic Segmentation for Botnet Activity Detection

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Abstract—Botnets are a threat in a dangerous cyber era. Botnets involve malicious software to attack the system based on instructions from the botmaster. Previous research had introduced a botnet activity detection model, such as using activity time analysis through a sliding time-based traffic segmentation process. However, the introduced model has not analyzed the ideal time in the sliding process in the segmentation process. The sliding process is needed to detect the botnet attack activity chain correctly. This paper analyzed the ideal time in the sliding process in traffic data segmentation to detect botnet activity and obtain information about botnet attacks. It aimed to get the optimal time in the sliding process and see its effect on detection accuracy. The test was carried out using a public dataset, namely the CTU-13 dataset, based on the two detection models in previous research. The result showed that the optimal time in the sliding process was 30 minutes in both detection models, with the best scenario detection results of 231 and the best detection accuracy of 97.93%.

Keywords— botnet detection, traffic segmentation, slide windowing, network security, intrusion detection systems.

Prototyping Distributed Botnet Detection System in Computer Networks

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Abstract—Being dangerous threats and attacks in this cyber era, botnets require proper handling. Nevertheless, some bot detection models that have been proposed are centralized and can only detect at one point of attack, even though there are two known types of botnet activity: single and bot group. In fact, attacks from grouped bots can have a series of attacks with the same pattern at several different attack targets. So, it requires a distributed detection model that can detect bot attacks on some detection sensors and assemble them in the form of correlation analysis. This paper proposes a prototype distributed botnet detection model that can synchronize detection in each detection sensor and analyze a series of bot attack activities. It aims to obtain information on the series of attacks that occur at several attack points and state as a correlated botnet attack scenario. With the existence of a distributed botnet activity detection prototype, it will be able to facilitate the analysis and anticipation process from the system and network security administrators.

Keywords— bot detection correlation, Intrusion Detection System, network infrastructure, network security, distributed detection.

An Artificial Intelligence Approach for Deploying Zero Trust Architecture (ZTA)

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Abstract—Cybersecurity is critical in preventing infractions, maintaining digital workplace discipline, and ensuring that laws and regulations are obeyed. Zero Trust Architecture (ZTA), often known as perimeter-less security, is a novel method for designing and implementing secured IT systems. Zero trust's basic notion is "never trust, always verify," which indicates that devices should not be trusted by default. This means that each access from or to any asset must be assessed and follow the standard guidelines of the organization. Maintaining this type of control imposes a high burdenon IT security and system administratorsto be able to track and validate each control and manually sustain the configuration needed. With the power of Classification Algorithms in Machine Learning, we will explore in this paper an alternative solution to save time and effort and help maintain the same security posture with less human intervention. The proposed approach utilizes the information from available security feeds and statically configured policies to enforce and maintain zero-trust network policies. By analyzing the data, it will be feasible to identify the required policies to be configured and compare them against the traditional compliance rules to auto-configure the policies. This approach aims to enhance the existing security intelligence engines with more sophisticated rules and less time and effort.

Keywords — Cybersecurity, Machine Learning, Zero Trust

A predictive schedule based energy efficient MAC protocol for wireless sensor networks

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Abstract—A predictive schedule based energy efficient MAC protocol named as PSE2 -MAC is proposed in this paper for asynchronous wireless sensor networks. Although the asynchronous MAC protocol offers better performance than that of synchronous MAC in terms of energy but infrequently it suffers from beacon collisions as well as idle listening problem. Although many researchers avoid discussion on beacon collision but it has a great impact on asynchronous MAC. For this reason, the authors in this paper have highlighted the beacon collision problem and proposed a possible solution with prominent results. Along with the solution, the authors have proposed a prominent technique to solve energy consumption issue caused by idle listening. The performance of the proposed protocol has been evaluated and the evaluation result shows that PSE2 -MAC performs much better than conventional IEEE 802.15.4 protocol for managing the beacon collision. Also, the simulation results show minimal energy consumption due to idle listening. Thus, the proposed protocol helps to improve overall network performance and throughput.

Keywords— Duty-cycled MAC; beacon collision; energy; idle listening; predictive wake-up

Robotics & Embedded Systems

Real-Time Fixed-Point Hardware Accelerator of Convolutional Neural Network on FPGA Based

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Abstract—Convolutional neural networks (CNN), which have the advantage of automatically detecting the important features of the input data without any human interfere, are widely used in many applications such as face recognition, speech recognition, image classification and object detection. In real-time CNN applications, computation speed is very important as well as accuracy. However, in some applications with high computational complexity, available systems are insufficient to meet the high-speed performance demand at low power consumption. In this study, the design of the CNN accelerator hardware in FPGA is presented to meet the speed demand. In this design, CNN is considered as a streaming interface application. Thus, temporary storage amount and memory latency are reduced. Each layer is designed with maximum parallelism, taking advantage of the FPGA. Because fixed-point number representation has the advantage of low latency, it is preferred in design with negligible sacrifice of accuracy. Thus, forward propagation of a CNN can be executed at high speed in FPGA. In order to compare real-time performance, digit classification application is executed in this hardware designed in FPGA and ARM processor on the same chip. The real-time results show that the application in the hardware designed in the FPGA is 30x faster than the ARM processor.

Keywords—FPGA, ARM, CNN, hardware accelerator

Dependable CNC Controller using Raspberry pi and Cloud Computing

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Abstract—Numerically Controlled machines are widely used in many industrial applications. A CNC machine's essential element is the controller, and it is responsible for controlling and navigating the machine tools as well as implementing industrial processes. Despite the fact that numerous controllers have been invented and utilized in CNC applications in recent years, the vast majority of them have certain restrictions and drawbacks as a result of design methodologies. The goal of this article is to design and build a Fault detector and Diagnostic Automatic Controller (FDAC) to be used in CNC machines and is considerably improve the CNC machines performance. FDAC has a closed-loop control system that can automatically control and drive servo motors. FDAC will prevent losses of work pieces and damage of machine parts. FDAC could improve accuracy and reliability while enabling the rapid maintenance of industrial processes in a variety of CNC applications. FDAC records the alarm codes in real time on the cloud as well as their diagnostic history in order to build an accurate knowledge and reliability base system that does not depend on randomness or predictions. It also can be applied to traditional machines and is not expensive at all.

Keywords— Numerically Controlled machines, CNC controller, Fault detector, and Diagnostic Automatic Controller (FDAC), Alarm codes.

Brain Oscillatory Representations of Vibrotactile Parameters: An EEG Study

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Abstract—In the BCI community, haptic feedback allows us to interact with the world around us and, at the same time, perceive these interactions. For the development and maturation of neurophysiology related to haptic feedback, it is requisite to conduct more in-depth researches. To this end, we explored brain oscillatory representations of vibrotactile parameters. We utilized amplitude-modulated vibrotactile stimuli, which have four envelope frequency levels and four amplitude levels. Relevant brain oscillations in five frequency bands and ten channels were measured by noninvasive EEG technique, and they were represented in baseline-based power spectral density (PSD) forms. Results, expressed in interaction effect maps and P-value topographic maps mainly, showed that there were significant interaction effects among envelop frequency, amplitude, frequency band, and electrode position. In particular, when envelope frequency (Fe) = 40 Hz, from alpha band 1 to beta band 1, for all four amplitude levels, brain oscillations over the ipsilateral sensorimotor cortex decreased gradually. Additionally, a slight decrease of brain activation in the contralateral frontal regions was found in the two higher levels of amplitude. When amplitude (A) = 0.8 Grms, from alpha band 1 to beta band 1, for all four envelope frequency levels, brain oscillations over the bilateral sensorimotor cortex decreased gradually. In addition, a increase of brain oscillation in the frontal and parietal regions was found in the two higher envelope frequency levels. Results contribute to a deeper physiological understanding for physical vibrotactile parameter.

Keywords—vibrotactile stimuli, brain oscillations, haptic feedback, EEG, amplitude, envelope frequency

UVC Sanitizing Smart Kit

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Abstract—During the Coronavirus pandemic, the world counted on conventional sanitizing products that involved unsafe toxic chemicals. Ultraviolet Germicidal Irradiation or ultraviolet disinfection is introduced in many sanitizing applications, as it splits the DNA/RNA, forcing microorganisms unable to spread. For that, ultraviolet disinfection technology is presented in this project to replace the old nonenvironmental practices. Far-ultraviolet type C is a small part of the ultraviolet spectrum, with wavelengths from 207 nm to 222 nm proven effective against micrograms. This project aims to apply farultraviolet technology to design an easily used, reliable, and optimized system to control and monitor the sanitizing operation. Moreover, this project design combines two different sanitizing modes intended to serve the need of a dental clinic's daily sanitizing technique. The first mode is intended to sanitize the dentist's tools connected to a monitoring system that shows the ultraviolet type C intensity and the received dosage. The second mode is for the surfaces and handlers in the clinic; the sanitizing handheld will be attached to a distance identification system that guides the user to apply the sanitizing operation at the proper distance. Furthermore, this project will determine the disinfection parameters (dosage, intensity, exposure time, wavelength, and distance) according to the used far-ultraviolet source and the prototype design.

Eye-Controlled Wheelchair

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Abstract—A powered wheelchair is a mobility device for moderate or severe physical disabilities or chronic disorders. Many patients with Amyotrophic Lateral Sclerosis and quadriplegia have to depend on others to move their wheelchairs. Although assistive mobility devices, such as manual and electrical wheelchairs, exist, these options do not suit all individuals who suffer from activity limitations. This project aims to use information technology to assist people with disabilities to move their wheelchairs independently in order to enjoy their lives and integrate into their community. The proposed hands-free wheelchair is based on an eye-controlled system. Different measurement systems for the eye trackers have been evolved, such as search coil, electrooculography, video-oculography, and infrared oculography systems. Usually, the eye-tracking systems add the techniques of eyeball tracking with hardware equipment and software. The movement of eyeballs is used to control the wheelchair movements instead of hands. The infrared eye-tracking system was adopted in this project for several advantages. To achieve this goal, a system consisting of a head-mounted eye-tracker, a powered wheelchair, and an obstacles detector has been designed and tested. The head-mounted eye-tracking system uses infrared light emitters and sensors in gaze detection. By measuring the intensity of the infrared light reflected from the corneal. The changes of the reflected intensity can be translated into signals to determine an eye position. After the gaze direction is determined, it is used to steer the wheelchair accordingly. Furthermore, the chair includes safety features that implement proximity sensors to prevent crashing into objects.

Keywords— Eye-tracking systems, Gaze point, infrared oculography, Pupil, Ultrasonic.

Multi-criteria selection of industrial robots: modelling users' preferences in combined AHPEntropy-TOPSIS

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Abstract—In this paper we explore the application of a hybrid approach for selecting industrial robots including the subjective Analytical Hierarchy Process (AHP) and the objective entropy approach. The comparative analysis of the traditional entropy method and the hybrid method based on an existing representative dataset reveals new possibilities to model the user's preference and to improve the quality of the decision process.

Keywords— industrial robots, multi-criteria decision making (MCDM), information entropy, TOPSIS, AHP

Software Engineering

NEKO: Proposal of the first super-agile methodology to improve work efficiency

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Abstract—Agile methodologies are the preferred strategy for work teams around the world thanks to their rapid response to changes and adaptability. However, this prioritization of efficiency and speed has neglected the well-being of the most important element of any project: the teams. This article presents NEKO as a super-agile methodology focused on people and that aims to prioritize the mental health of workers without neglecting effectiveness, relying on new technologies such as Artificial Intelligence to enhance its processes. During the research stage, using the methodology proposed by Kitchenham, fifteen articles were analyzed and allowed us to rescue the strengths and identify the problems presented by the agile methodologies most used today. Then, the proposal was developed dividing it into three phases; each including events, artifacts, and tools to achieve your goal. Later, during the discussion, the proposal was contrasted with the methodologies initially analyzed and it was concluded that taking the points in favor of these and adding state-of-the-art technology focused on the well-being of the teams is synonymous with efficiency, meaning a possible change in the paradigm of the current world of work.

Keywords— agile project management, methodology, mental health, work teams, effectiveness

Gamification Tool Design for Reducing Requirements Ambiguity during Elicitation

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Abstract—Software projects are susceptible to failure if requirements are ambiguous, inconsistent, and misunderstood. Previously, researchers have emphasized on reducing ambiguity either in specified requirements or after the elicitation phase. In this paper, we have designed a pro-active gamified tool 'Gamify4Req' for reducing requirements ambiguity during elicitation. Gamify4Req incorporated lexical and semantic ambiguity rules, game rules, and effective game elements to elicit unambiguous requirements from users. Furthermore, this study is a part of Ph.D. research on reducing ambiguity, whereas tool implementation, validation, and findings will be covered later.

Keywords— Gamification, game elements, requirements ambiguity, lexical ambiguity, semantic ambiguity

An Enhanced Parallel Automation Testing Architecture for Test Case Execution

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Abstract—Customer requests for incorporating complicated business logic into software applications are common. As a result, as business requirements expand, the demand on the testing team to deliver a high-quality product in a short amount of time grows. Software testing guarantees that customers receive high-quality software. Manual testing becomes difficult since it is timeconsuming. Besides, its cost rises as test suite sizes grow. In addition, human mistakes can slip into a system, resulting in losses for the company. Therefore, automation testing is best suited in situations when requirements change frequently, and a large volume of regression testing is required. Automation testing enhances accuracy while also saving the tester's time and the organization's money. The aim of this work is to propose an improved parallel automation testing architecture to significantly decrease testing time. The main problem with parallel testing is the existence of idle nodes that causes an increase in execution time. The proposed architecture solved this problem by running test cases in parallel using Selenium, Docker containers and implementing a dispatcher to ease and faster the process of distributing test cases between the network's nodes. As a result, the proposed architecture decreases testing process time, and no idle nodes exists anymore.

Keywords— automation testing, selenium, regression testing, docker, parallel test case execution

E-Commerce and E-Learning

A Framework for Enhancing the Supply of Scientific Research Projects Using Blockchain

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Abstract—Today's the scientific projects and corporate environment is more demanding than ever before. to satisfy the increasing demands of scientific research projects procurements by e-commerce applications are increasing their markets and functionality. Hackers can use security weaknesses in most applications to launch attacks. Information integrity, confidentiality, and availability have all been compromised as a result of the attacks. This paper described the current state the scientific research projects procurements and proposed a framework to enhance the procurement of scientific research projects to rationalize government spending by increase security and transparency of transactions using blockchain technology. A proposed framework consists two architectures. First architecture contains a conceptual architecture discuss a life cycle workflow for scientific research projects procurement application and a payment gateway for financial transactions. In the second architecture declare the layer's architecture to explain the role of each element in the layers and represent the blockchain architectures and transactions between researcher, supplier, and system admin using Smart contracts and cryptocurrency to overcome of weak security in financial transactions. and improving satisfaction, trust through transparency, preventing transactions counterfeit and sharing and reusing knowledge related to the project procurements with other systems.

Keywords— blockchain, smart contracts, e-commerce, procurement, Cryptocurrency, framework

Modeling and Simulation of Online Examinations Procedures in COVID-19 Pandemic Using Arena Software: A Case Study

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Abstract—The outbreak of Coronavirus disease 2019 (COVID19) has made higher education institutions around the world shift to online education. Online exams are exponentially expanding as part of this online education. Although online exams have been implemented a few decades back, there are still impacts on online evaluation methods, gaps in students' priorities, and challenges with academic dishonesty. In this study, Arena simulation is used for determining the feasibility of the framework proposed for online exams during the COVID-19 pandemic. The study investigates the implementation of online exams from three different perspectives that include students, academic staff and administrates at a state university in Sri Lanka that moved into online education and online exams amidst the COVID-19 pandemic. The framework is derived from the data collected through the mixed research method. By following a scenariobased study, the performance of the framework is simulated with Arena that determines its feasibility for real-world applications. Overall findings of this study suggest best approaches to conduct students' evaluations in online education as an alternative to coping with challenges where threats to continue academic performance.

Keywords—Academic Dishonesty, Arena Simulation, Online Evaluation Methods, Online Exams, Online Exams Framework, Students' Priorities

Internet of Things, Smart environments and Pervasive Computing

A PLC-SCADA Pipeline for Managing Oil Refineries

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Abstract—This paper proposes a PLC (Programmable Logic Controller)/HMI (Human Machine Interface) system for tracking oil products refineries. The proposed pipeline includes AOI (Add on Instruction) programming, and PLC to automatically display petroleum products terminal. It provides an AOI in programming to obtain the most utilization of processor capabilities. Besides, it makes use of AOI for programming in cooperation with a ladder logic program. This results in simplifying the ladder program, decreasing scan time, and making troubleshooting easier. The proposed system is constructed in two stages. First is the PLC controller programming stage. In the second stage, the HMI graphic presentations are drawn and connected to the PLC tags. The proposed system outcomes confirmed that the number of logic ladders, maximum program size, and maximum scan time has decreased. The outcomes imply that the AOI can assist in tracing the program more without difficulty in faults situations. Besides, it adds extra program commands in less processor memory, lowering system creation, and upgrade costs.

Keywords— SCADA/HMI; PLC; Real-time systems; Oil refinery process; Petroleum products

A Reliable Secure Architecture for Remote Wireless Controlling of Vehicle's Internal Systems based on Internet of Vehicles using RF and Wi-Fi

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Abstract—Internet of Vehicles is considered one of the most unprecedented outputs of the Internet of Things. No one has realized or even expected the rapidly-growing revolution regarding autonomous connected vehicles. Nowadays, Internet of Vehicles is massively progressing from Vehicular Ad-Hoc Networks as a huge futuristic research and development discipline. This paper proposes a novel reliable and secure architecture for ubiquitously controlling remote connected cars' internal systems, such as engine, doors' locks, sunroof, horn, windows' and lights' control systems. The main contribution is that the proposed architecture doesn't bypass the vehicle's original security coding, and doesn't require any electrical modifications to the vehicle's Engine Control Unit and Body Control Module wirings. The proposed architecture is composed of remotely connected embedded, software, and cloud-based platform systems. Two designs of wireless control boards based on RF and Wi-Fi are provided for enabling remote control using the original vehicle's encrypted key and mobile application. A simulation is implemented using the original vehicle's encrypted key and Android application proving matching results according to the proposed architecture. Experimental work is conducted on RF and Wi-Fi relays' control boards along with KEYDIY K909 RF encrypted key for controlling a 2013 Hyundai Elantra MD vehicle, and the studied results proved a successful and reliable remote wireless controlling of the vehicle's internal systems.

Keywords—Internet of Vehicles, vehicular ad-hoc networks, car ignition, remote control, voice command

Bioinformatics, Health Informatics and Biomedical Systems

Review of Personalized Cancer Treatment with Machine Learning

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Abstract—Cancer is a group of more than 100 diseases caused by abnormal cell growth that may spread to other parts of the body. Therefore, cancer treatment is considered one of the challenges in the medical field. According to the World Health Organization (WHO) "Cancer is the second leading cause of death worldwide; there were 9.6 million deaths in 2018". As scientists have learned more about cancer, they have found that some mutations are commonly found in several types of cancer so cancer tumors can have thousands of genetic mutations. Because of this, cancers are categorized by the types of genetic alterations that are approved to be the driver, not only by where the tumor developed in the body and how the cancer cells look under the microscope. They also have found that certain treatments worked better for some patients than for others which means that, the response of patients with the same cancer type and same treatment plan is different. Now, cancer treatment tends to personalize medicine (also known as precision medicine), taking into account an individual's genetic profile and medical or disease history before treatment, dealing with each DNA sequence as a separate case, and analyzing its mutations which is a time and effort consuming task. Studying each patient DNA sequence requires a medical team with several working days to make a decision for the single patient which is too difficult to do with the high number of patients. So, recently the effort is exerted in replacing the human effort with artificial intelligence-based algorithms to study the DNA sequence, extract its mutations and study the various treatment effect on DNA. In this paper, a review is introduced for recent researches that use the machine and deep learning algorithms to personalize cancer treatments.

Keywords— Biomedical, Personalized Treatment, Drug Response Prediction, Deep Learning

Epileptic Seizure Detection using EEG Signals

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Abstract—Epilepsy is a common neurological disorder which can be diagnosed by neurologists or physicians by using electroencephalogram or EEG signals. Since the manual examination of EEG for this purpose is very time consuming and requires trained professionals, it calls for the need of an automatic seizure detection method. In this study, time and frequency domain features are extracted from the EEG signals after preprocessing the raw EEG data and then using machine learning algorithms such as Logistic Regression, Decision Tree, Support Vector Machines, etc. to detect generalized seizures in the Temple University Hospital (TUH) corpus. A detailed account of the TUH dataset is also given. This work summarizes and compares the results of each of the algorithm trained, in terms of the performance metrics. Using the proposed approach, SVM obtained the highest accuracy of 92.7% in binary classification.

Keywords—EEG, Epileptic Seizure, Machine Learning, Feature Engineering, TUH, Binary Classification

Survey of Blockchain Methodologies in The Healthcare Industry

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Abstract—Blockchain has been the focus of the research area in the past few years. It is considered the foundation of cryptocurrencies such as Bitcoin and Ethereum. Decentralization is the main feature of Blockchain. Blockchain provides a higher level of security and scalability. Major industries have started to consider blockchain on their platforms such as the healthcare industry which uses the blockchain to secure the patients' data, make them anti-tampering and keep track of their Electronic Health Records (EHRs). The work in this paper provides a state of art of different blockchain types and consensus mechanisms. Also, the paper recommends some guidelines to select the appropriate blockchain type, consensus mechanism and blockchain interoperability method that fulfills the healthcare industry requirements.

Keywords—Blockchain, Healthcare, Consensus Mechanisms, Interoperability

Deep learning techniques for the fully automated detection and segmentation of brain MRI

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Abstract—Over the past decade, auto-segmentation for tumors has drawn a lot of attention due to its significant impact on cancer treatment. Auto-segmentation architectures have a significant role in alleviating the enormous workload on the medical staff. This has motivated us to explore the latest solutions in auto-segmentation to use it in auto-segmentation. It works on automatically contouring tumors to make radiology treatment more attainable since manual contouring is repetitive and subjective to human error. Auto-segmentation usually strives to achieve high accuracy to reduce the time the radiologists take to contour the tumor. Saving time is critical as instead of contouring all the tumors, the radiologist can spend the time editing on the segmented tumor thus more patients can be diagnosed in less amount of time. There have been a lot of auto-segmentation architectures created for general purposes like the Segnet which is sometimes used in medical segmentation, but such architectures fail to achieve high accuracy especially in the details of the tumor. The U-Net is an auto-segmentation architecture specifically created for autosegmentation on medical images like MRI and CT. The U-Net architecture can achieve high accuracy of segmentation with fewer amounts of data. We improved U-Net performance by using residual blocks on each layer of the architecture itself usually referred to as Res-U-Net. Our final proposed fine-tuned Res-U-Net model has achieved 97.10% on the used data which was the best of our 3 proposed fine-tuned models. The used data was Low-grade gliomas (LGGS) brain tumor dataset.

Keywords—Auto-Segmentation, Brain MRI imaging, Deep learning, Segnet, U-Net.

A Hybrid Metaheuristic Approach for Automatic Clustering of Breast Cancer

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Abstract—Breast cancer is one of the most widely prevalent cancer in both men and women, however, it is far more common in women. Early diagnosis can help reduce the risk of metastasis to other organs and reduce death rates. Many research studies managed to cluster Breast cancer datasets and help in the accurate detection of tumors nevertheless a few ones could detect the number of clusters automatically. Clustering aims to partition the data into malignant or benign tumors. Recently researchers focused on automatic metaheuristic techniques reforming them to solve the clustering problem. In this paper, a new hybrid technique is proposed to determine the number of clusters with no need of prior information. The genetic algorithm is hybridized with cuckoo search algorithm to automatically cluster the Wisconsin Breast Cancer dataset. Also, a study among obtained results showed that the hybrid genetic cuckoo search algorithm outperformed the standard genetic algorithm and cuckoo search algorithm achieving an adjusted rand index of 0.84 and an adjusted mutual information of 0.74 and accuracy of 84 percent. Moreover, hybrid genetic cuckoo search algorithm was compared to the competing algorithms mentioned in the literature review showing a superior performance.

Keywords— : Automatic clustering, Cuckoo Search Algorithm, Genetic Algorithm, Metaheuristics, Swarm Intelligence, Breast Cancer

Detecting Chronic Kidney Disease(CKD) at the Initial Stage: A Novel Hybrid Feature-selection Method and Robust Data Preparation Pipeline for Different ML Techniques

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Abstract—Chronic Kidney Disease (CKD) has infected almost 800 million people around the world. Around 1.7 million people die each year because of it. Detecting CKD in the initial stage is essential for saving millions of lives. Many researchers have applied distinct Machine Learning (ML) methods to detect CKD at an early stage, but detailed studies are still missing. We present a structured and thorough method for dealing with the complexities of medical data with optimal performance. Besides, this study will assist researchers in producing clear ideas on the medical data preparation pipeline. In this paper, we applied KNN Imputation to impute missing values, Local Outlier Factor to remove outliers, SMOTE to handle data imbalance, K-stratified K-fold Cross-validation to validate the ML models, and a novel hybrid feature selection method to remove redundant features. Applied algorithms in this study are Support Vector Machine, Gaussian Naive Bayes, Decision Tree, Random Forest, Logistic Regression, K-Nearest Neighbor, Gradient Boosting, Adaptive Boosting, and Extreme Gradient Boosting. Finally, the Random Forest can detect CKD with 100% accuracy without any data leakage.

Keywords—Early Diagnosis, Machine Learning, Preprocessing, Healthcare Informatics

Cloud Computing, Fog Computing and Semantics Web

Cloud computing security based on OWASP

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Abstract—In recent years, the use of cloud computing is grown up due to several reasons such as economic and efficiency. The major issue faced in cloud computing is security and how to ensure files protection. The vulnerabilities in cloud computing are considered a big challenge for the end-users that are not filled yet. The main objective of this paper is to enable people to protect their services and products running on clouds by controlling threats and attacks based on the operations, experience of development, and security communities. We proposed in this paper a new model based on the security issues related to tracking tasks, ideas, and problems which can implement in various forms such as using the threats in Software Development Life Cycle (SDLC) and using control stories to make sure the identified threats are mitigated. To evaluate the performance of the proposed model, we used the execution time. For our test, we used a 654 byte file for encryption and decryption. The obtained results indicate that our model is efficient especially for the small files in encryption. Moreover, the proposed model was decrypting the file much faster than the traditional model.

Keywords—cloud computing, cloud security, security, OWASP.

New Graphical Ultimate Processor for Mapping Relational Database to Resource Description Framework

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Abstract—The World Wide Web Consortium (W3C) RDB2RDF Work Group (RDB2RDF-WG) recommended two mapping languages, Direct Mapping (DM) and Relational Database to RDF Mapping Language (R2RML) for Mapping Relational Databases (RDBs) to Resource Description Framework (RDF). Direct Mapping directly maps the RDB schema to RDF using a collection of simple transformations, whereas R2RML is a language for manually created mappings from RDB tables to RDF output. The manual creation of mapping is complex, error-prone, and time-consuming, where any single mistake could produce an invalid output document. In this paper, a new Graphical Ultimate Processor (GUP) is proposed for mapping from RDBs to RDF. The proposed mapping processor is called RDB2RDF-GUP, but for simplicity, we shall represent RDB2RDF-GUP by RUP. This processor acts as a standalone tool with a Graphical User Interface (GUI) that facilitates the mapping process and supports a diversity of other features. This new processor is a useful tool for integrating the databases in Semantic Web applications that incorporate all data formats into a combined knowledge model. Through a small set of GUI screens, RUP enables the users to perform the most required tasks by selecting from the available lists most of the time rather than writing. This processor is simple and very useful for domain experts and semi-experts. Our results show that the proposed processor, RUP, outperforms other existing processors in the usability and the number of supported features.

Keywords—Direct Mapping (DM), R2RML, Relational Database (RDBs), Resource Description Framework (RDF), RDB2RDF Mapping, Semantic Web (SW).

FAML: Fog Descriptor Language for Fog Service Development and Deployments

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Abstract—Cloud-centric services are experiencing major challenges due to the tsunami of computations and data streaming. Some of these challenges are bandwidth, latency, uninterrupted requests, continuous data streaming by the end devices, and computation dependability. Fog computing is a new computation paradigm that attempts to address delay and latency challenges in cloud services, mainly by offloading computations to computing nodes near the consumers. One of the main challenges to this computation model adoption is the lack of standardized software development kits (SDKs), tools, and run-time environment. This paper introduces a new descriptor and annotation language that can be used to develop an offloadable fog service from an already existing cloud service. FAML is an abbreviation for Fog Annotation and Meta Language; a language that can be used to develop a fog service. The FAML compiler has been implemented to work with Golang cloud service implementations. The generated fog services have been offloaded into fog nodes in the same local network of the service consumer as part of the experiment's evaluation. The paper presents the usage of the proposed language in three different service development use cases: image enhancement service, weather forecast service, and bulk update service.

Keywords—cloud computing, fog computing, fog application development

Cloudlet Selection Strategy According to the Types of Applications in Cloud Networks

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Abstract—The selection of the most suitable cloudlet that allows running users applications rapidly in the cloud is still an urgent problem. For the elimination of resource shortages, power consumption, and delays in communication channels on mobile devices, the remote cloud servers are placed adjacent to devices. The delays on communication channels and power consumption on mobile devices are reduced through cloud-based mobile computing. In the paper we propose a strategy for selecting a cloudlet with high computing productivity, which provides a fast solution, considering the complexity degree of the application (file type). Also, in the paper, the solution of the task in a cloudlet close to the user, the downloading of the task to the cloudlet, the sending of the outcome to the user, and the minimization of network interruptions are presented.

Keywords— mobile cloud computing, cloudlet, power consumption, communication channel, file types, network delays