

# **Kabarak University International Conference On Computing And Information Systems - 2021**

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## **Book of Abstracts**



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## Empirical Evaluation of Adaptive Optimization on the Generalization Performance of Convolutional Neural Networks

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Recently, we have witnessed the rise of deep learning with deep neural networks garnering significant interest and popularity in a variety of fields of research due to their effectiveness in search for an optimal solution given a finite amount of data. However, the optimization of these networks has become more challenging as the neural networks become deeper and datasets growing larger. The choice of the algorithm to optimize a neural network is one of the most important steps in model design and training to obtain a model that will generalize well on new, previously unseen data. In machine learning, three main kinds of optimization methods exist. The first one is called batch or deterministic gradient methods that process all training examples simultaneously in a large batch. The second one is the stochastic or online methods that use only one example at a time. The third one is called minibatch, which is a blend of the two whereby during model training, only a part of training set at each epoch is used. In deep learning, minibatch optimization methods are mostly preferred for supervised and unsupervised task. First, they accelerate the training of neural networks and since the minibatches are selected randomly and are independent, an unbiased estimate of the expected gradient can be computed. This paper examines the minibatch-based adaptive algorithms on the generalization performance of convolutional neural networks (CNN) architecture that are extensively used in computer vision tasks. We give a comparative analysis on the behaviour of the minibatch optimization algorithms during model training on three large image datasets, namely, MNIST, Kaggle Flowers and Scene classification.

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## AN INTEGRATED MODEL FOR PUBLIC SERVICE VEHICLES OVERLOAD PREVENTION BASED ON MICRO-CONTROLLER

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Road transport means transportation of goods and services and people from one place to the other on roads. The form of transport most widely used by Kenyans is the “Matatu” which ferry people alongside goods. It has been reported that this mode of public transport in Kenya is at fault when it comes to issues on safety. Public Service Vehicles are designed to transit a specific weight and legalized to carry between 10 and 50 passengers depending on the category of the vehicle. They often ferry passengers and luggage in excess, in disregard to the laid out recommendation for each category. There are many rules and regulations that are there made by Kenyan government to overcome the problem of overloading but those rules are not followed by the people. When this is violated, the mass of the extra luggage and passengers compromises the handling of the vehicle and the braking system all together. This can cause fatal accident. The current systems in use have no means of detecting the weight. For the number of passengers, each vehicle has a maximum number of seats and the conductor of the vehicle checks manually to ensure that each seat is occupied. Although a vehicle could be carrying the right number of passengers it could as well be overloaded in terms of weight. Therefore this paper proposes an integrated model that will detect and prevent overloading in terms of both. To achieve the study objectives a proof of concept (POC) methodology was adopted to prove the concept of resolving the weaknesses of the existing models using a microcontroller based model. The POC focused on coming up with an integrated model that neither luggage nor passengers are in excess. Incase either is exceeded, then the cutout is activated and the engine will not start.

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## **A NOVEL APPROACH FOR DETECTING AND PREVENTING THE WI-FI EVIL TWIN ATTACK**

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Wi-Fi connectivity affords users unmatched convenience when it comes to accessing computer networks. However, this convenience comes at a huge security cost – Wi-Fi has been plagued by various security challenges that continue to expose users to a potential loss of the confidentiality, integrity and availability of their data. One of these challenges is the evil twin attack – an attack that involves creating a duplicate access point and redirecting users to connect to it. In a successful attack, the victim will unknowingly transmit all their communications through the attacker’s equipment, thereby risking interception. The ease of setting up such a rogue access point and the difficulty in detecting one pose a serious threat to the privacy and data security of both organizations and individuals who rely on Wi-Fi connectivity for their day-to-day needs. Substantial research has gone into finding a solution to this problem, but none of the proposed solutions seems to be effective as the attack remains prevalent and effective to date. It is against this background that this paper seeks to describe a novel approach for detecting and preventing the Wi-Fi evil twin attack. The main objective of the study is to identify an approach that can effectively detect a rogue access point and prevent unsuspecting users from connecting to it. Study methods used in the research includes systematic literature review and design science, while the theory of General Deterrence provides its theoretical underpinning.

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## **Establishing Innovation Management Systems : The Case of Kabarak University**

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The growth of innovation and business incubation at Kabarak University has progressed steadily since its inception in the year 2000. At that point in time and for a number of years the University was not able to harness the creativity of its faculty and students in the areas of innovation and business incubation. This was occasioned by the lack of the requisite policies, structures and funding from the University and other partners. Upon this realization the University proceeded to establish the Directorate of Postgraduate Studies, Quality Assurance, and Research in 2008. In 2017 the research function was scaled up and established as the Directorate of Research, Innovation and Outreach. Since then the University has proceeded to develop a policy for Intellectual Property management, to establish a standing Innovation and Business Incubation committee, to appoint a coordinator for Innovation and Business Incubation, and to set up an innovation fund. As a result the University has now been able to build capacity among faculty and students in the area of innovation and IP management, to identify innovations from faculty and students and to protect that IP. The University is making progress towards the establishment of its Innovation and Business Incubation center. This paper will therefore present, in greater detail, the journey of Kabarak University with key lessons for other institutions who are also seeking to grow their Innovation and Business Incubation functions.

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## Design test of a Scalable Long-Range Model for Water Loss Detection and Audit

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Water Resource and utility companies experience difficulty and challenges in detecting water loss as well as undertaking reliable and efficient water audit. Water losses affect clients and consumers in the short-term, as well as the company's ability to provide quality services to them in the long-term. This challenge is mainly due to the fact that most water service providers in Kenya manually monitor water loss, and as a result, water consumption and distribution audits are largely fashioned in the same manual process. The cases of water loss are due to moribund infrastructure, wear and tear or human interferences like siphoning, which largely go undetected, and are probably only discovered after the fact. Consequently, mitigation of these incidences of water loss, as well as auditing of water distribution and infrastructure is difficult, largely uncoordinated and inherently cumbersome. This situation necessitates the need to implement a technology-based system that can enable rapid and instantaneous detection of water loss. A Long-Range (LoRa) based technology prototype is therefore designed and implemented to enable detection of water loss and audits to be performed remotely and affordably. LoRa technology has proven to be an adaptable and efficient model to manage data and provide solutions to long-lived water loss. This study enabled the design and development of a long range WPAN or Wireless Sensor Network (WSN) model based on IEEE 802.15.4g LoRa standard. This study reviewed the technological challenges, architectural and logical design for the implementation of a scalable long-range model to detect losses in real time, remotely and accurately. The study used the PPDIOO methodology towards achieving and implementing network design lifestyle. The designs prototypes were set-up in a testbed, monitored, reconfigured and adjusted for efficiency and applicability. The best data propagating design was chosen as a result. The study contributed to the body of knowledge.

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## The Role of IoT, Blockchain, Artificial Intelligence and Machine Learning in Maternal Health

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Ingeniously, the innovations are taking place in current medical era, where technology plays a dynamic role in pregnant women care taking both inside hospital and outside. Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning (ML) and Blockchain ensure the effective and efficient care of pregnant women in any environment because intelligent tiny devices like Radio Frequency Tags (RF-Tags), Sensors are attached with pregnant women, and all the activities of pregnant women can be monitored by professional medical staff from anywhere and anytime. The usage of these advanced destructive technologies in pregnant women care environment, absolutely eradicates the pregnancy complications and harmful incidents, but also promotes privacy, integrity and availability of maternal health systems. The purpose of this paper is to discuss the usage of IoT, artificial intelligence, machine learning and blockchain in pregnant women healthcare environments and articulates endorsements to promote future research, hence guarantee the pregnant women's data privacy is preserved. The study will apply an exploratory research design to review the existing literature on the destructive technologies and the results will be used to develop a conceptual framework that would be used to guide future research in healthcare.

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## A Design of an RFID Based Microcontroller Integrating Real Time Media Auto-Stream For Vehicle Packing

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Microcontrollers control the actions and features of a product. They are embedded controllers inside devices. Microcontroller based devices are dedicated to a single task that run one specific program at a time. It integrates with advanced peripherals like a graphics processing unit (GPU), a Wi-Fi module, or one or more coprocessors. A number of devices currently are taking advantage of minimal requirements for memory and program length, with no operating system, and low software complexity. Typical input and output devices include switches, relays, solenoids, LED's, small or custom liquid-crystal displays, radio frequency devices, and sensors for data such as temperature, humidity and light levels. In our discussion we are coming up with an architectural design of an RFID based microcontroller for car packing. The design is created using a Qemu system running Raspbian on Windows 10. Specifically focusing on how the components that relay data interface with each other. While discussing standard definitions, challenges, and benefits of this microcontroller based technologies, as well as some interesting players in this space.

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## Sentiment Analysis Model for Online Public Participation Forums

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Public participation (PP) is a key constitutional principle outlined in the Constitution of Kenya. It promotes democratic and accountable exercise of power. It gives the citizens opportunity to enhance self-development and service delivery while accounting for their leaders' actions. However, lack of/insufficient public participation in Kenyan county governments is impeding effective devolution process. Among the reasons advanced for this development are inadequate communications. Still even in cases where PP has been successfully carried out, capturing, and analysing the sentiments of the participants remain a serious challenge. Therefore, an online PP tool with embedded sentiment analysis algorithms specifically designed for the counties can be quite resourceful under the circumstances. The main objective of the study was to develop a sentiment analysis model for use in public participation forums in County Governments in Kenya. The specific objectives are to; evaluate the difficulty in obtaining sentiments; determine the challenges faced in the design of an effective sentiment analysis model for public participation forums; design a sentiment model for public participation forums in county governments and evaluate the performance of sentiment analysis model for public participation forums in county governments. The study was conducted through the design thinking process. The population of interest of this study comprised of county management and staff also area residents in Nakuru, Busia and Baringo counties who have participated in public participation forums before. A sample size of 514 respondents comprising 23 county administrators and 491 residents were purposively sampled for the project. The findings indicates that there exists a statistically significant difference in public participation amongst the three counties (Baringo, Busia and Nakuru). The results of regression analysis revealed that human-based factors significantly influence public participation ( $\beta=0.520$ ;  $p<0.05$ ) while technological factors affect public participation significantly ( $\beta=0.449$ ;  $p<0.05$ ). These findings were incorporated on the model design.



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## Implementation of a Scalable Long-Range Wireless Based Model for Water Loss Monitoring

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Water companies experience challenges in detecting water loss and undertaking reliable and efficient water audit. Consequently, mitigation of these incidences of water loss, as well as auditing of water distribution is difficult, largely uncoordinated and inherently cumbersome. A Long-Range (LoRa) based technology prototype is designed and implemented to enable detection of water loss and audits to be performed remotely and affordably. This study enabled the design and development of a long-range Wireless Sensor Network (WSN) model based on IEEE 802.15.4g LoRa standard. This study reviewed the technological challenges, architectural and logical design for the implementation of a scalable long-range model to detect losses in real time. The study used the PPDIOO methodology towards achieving and implementing network design lifestyle. The designs prototypes were set-up in a testbed, monitored, reconfigured and adjusted for efficiency and applicability. The study contributed to the body of knowledge in design of applicable water systems architectures

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## Design of an Integrated Model for Public Service Vehicles Overload Prevention Based on Micro-Controller.

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**Abstract:** The load capacity of a PSV vehicle is normally determined by tare weight and not the available cargo space as stated in section 56 of the Traffic act Cap 403, Kenya. Unfortunately, law enforcers on Kenyan roads only check the number of passengers in a PSV vehicle. This can be misconstrued to deem the PSV vehicle as compliant, while in real sense the actual tare weight is above its capacity. There are numerous instances where PSV vehicles are overloaded, and this has a direct contribution to increased road carnage. This study examined the implementation of an integrated microcontroller-based technology to observe and monitor tare weight in the PSV industry and introduced solutions that might resolve the misconception of overloading, while enhancing safety within the industry. This study provides the design of an integrated model for prevention of PSV overloading using a smart microcontroller. The resulting design was tested using Arduino microcontroller environment for purposes of validating applicability and feasibility. The study uses a proof of concept (POC) methodology and contributes to the body of knowledge in automated and integrated micro-controller-based safety monitoring industry.

**Keywords:** PSV, Tare weight, Overloading, Micro-controller.