جامعة المنوفية

جامعة المنوفية
كلية الهندسة الإلكترونية بمنوف

دليل مشاريع التخرج

كلية الهندسة الإلكترونية بمنوف

٢٠٢٦/٢٠٢٥

يوليو ٢٠٢٦

مستقبل | تميز | إبداع | ابتكار

تحت إشراف وكيل الكلية لشئون التعليم والطلاب

أ.د / سعيد محمد عبد العاطي

قسم هندسة الالكترونيات والاتصالات الكهربية

Intelligent Cloud IoT Healthcare Monitoring System "HELIOS CARE"

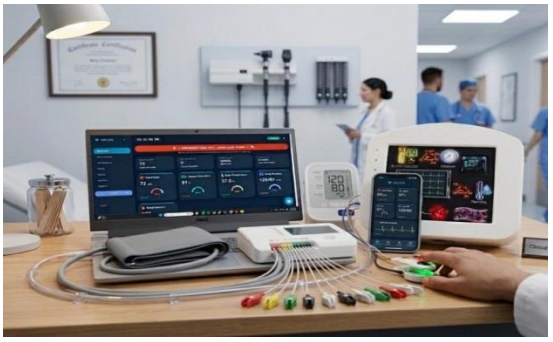
تحت إشراف | أ.د / محمد جلال السيد المشد

Abstract

HELIOS is an integrated smart healthcare platform designed to enhance patient care and improve the management of chronic diseases by integrating Internet of Things (IoT), Artificial Intelligence (AI), and Cloud Computing technologies. The system consists of a compact PCB-based medical device, cross-platform mobile applications, and a responsive web platform that provides real-time access to health data. It utilizes AI and deep learning to estimate blood pressure, glucose levels, and other vital signs while continuously analyzing patient data for early risk detection and predictive healthcare. HELIOS maintains comprehensive digital medical records, supports secure cloud-based synchronization, and offers interactive dashboards with detailed medical reports. The platform also includes emergency alerts with GPS location sharing, medication reminders, an AI-powered healthcare chatbot, and integration with laboratory systems. It provides healthcare professionals with real-time patient monitoring, enabling faster diagnosis and more effective treatment decisions. The platform is designed with a scalable and secure cloud infrastructure that ensures high availability, data protection, and reliable performance. Additionally, personalized health insights and recommendations are generated based on patient history and continuous monitoring, helping users adopt healthier lifestyles and prevent potential complications. By combining continuous monitoring, predictive analytics, and secure cloud technologies, HELIOS delivers a reliable digital healthcare solution that improves clinical decision-making and enhances patients' quality of life.

نظام مراقبة الرعاية الصحية الذكي السحابي بتقنية إنترنت ألأشياء "هيليوس"

Intelligent Cloud IoT Healthcare Monitoring System "HELIOS CARE"



قسم هندسة الالكترونيات والاتصالات الكهربية

MIMO Antenna For 5G Network

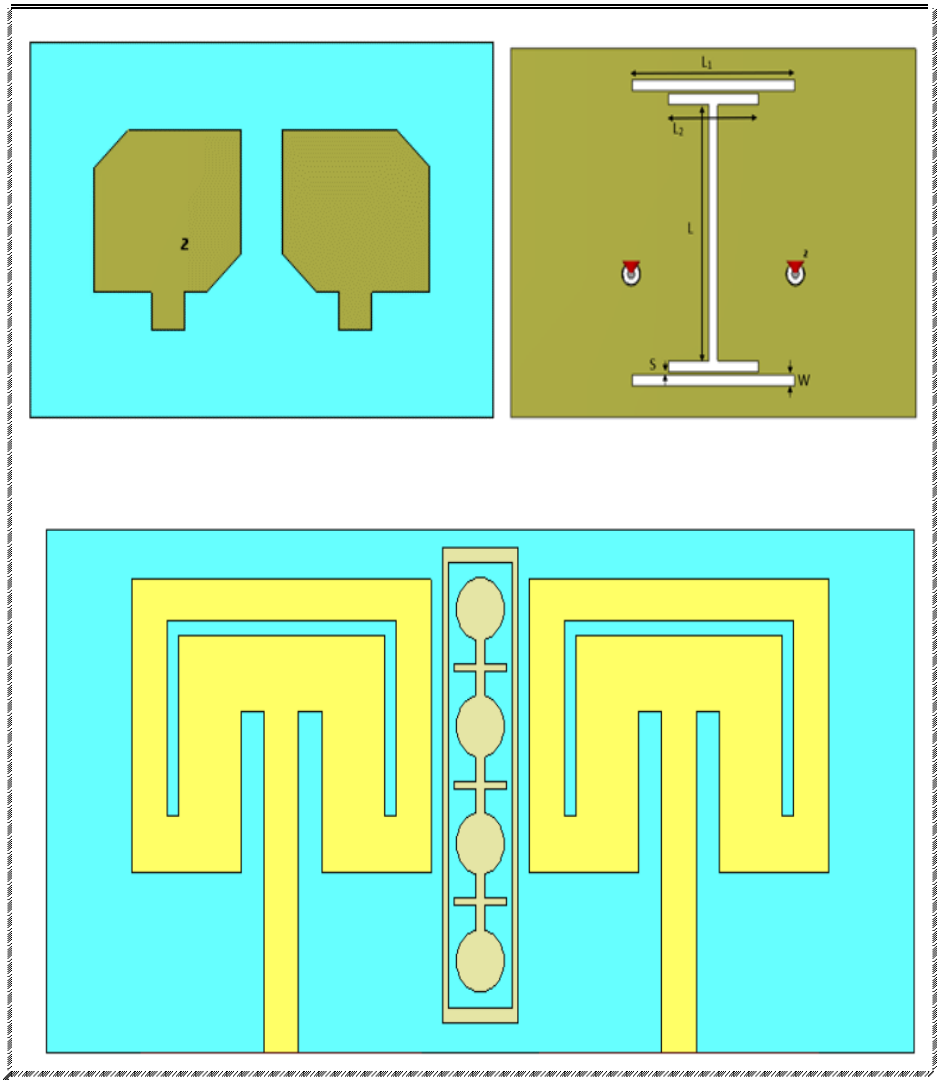
تحت إشراف	أ.م.د / مني مجدي بدوي

Abstract

This project aims to design and analyze an antenna for MIMO (Multiple Input Multiple Output) systems, which are widely used in modern wireless communication technologies such as 5G. MIMO technology enhances data rate, channel capacity, and signal reliability by using multiple antennas for transmission and reception. In this work, a multi-element antenna array is designed and simulated using electromagnetic simulation tools such as CST or HFSS to evaluate parameters like radiation pattern, gain, impedance matching, and isolation between antenna elements.

هوائي ذكي متعدد المنافذ لشبكات الجيل الخامس

MIMO Antenna For 5G Network



قسم هندسة الالكترونيات والاتصالات الكهربية

Smart Secure Enterprise Infrastructure with Redundancy, monitoring and Dual WAN Failover

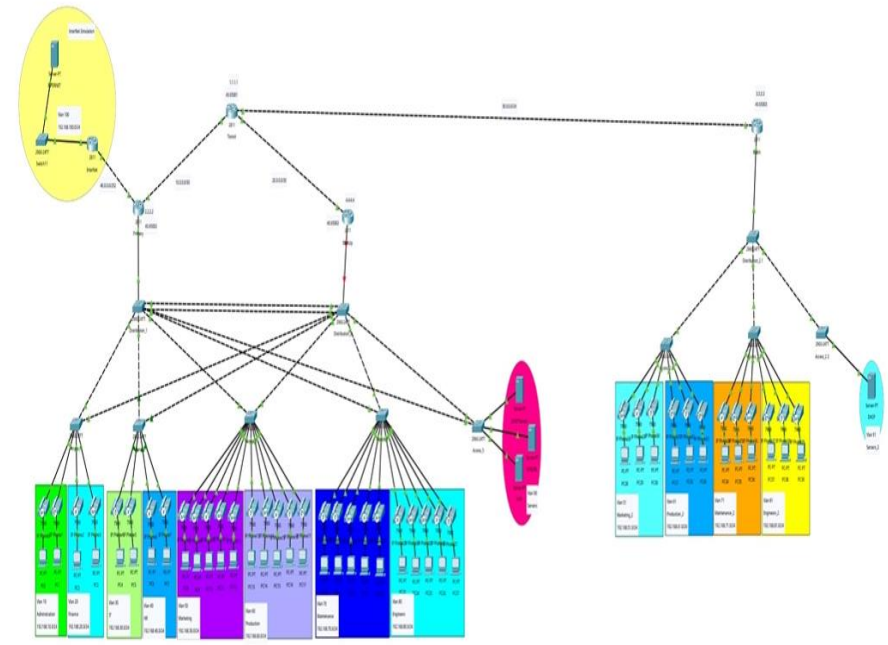
تحت إشراف	أ.د / محمد جلال المشد

Abstract

This project presents the design of a secure enterprise network for a multi-branch organization.The network uses a three-layer hierarchical model with a partial-mesh topology.VLANs, OSPF, BGP, EtherChannel, and FHRP were implemented for efficient routing and redundancy.These technologies improve network performance, scalability, and fault tolerance.DHCP, Syslog, and NTP were deployed for IP management, monitoring, and time synchronization.Security was strengthened using ACLs, NAT, Port Security, and BPDU Guard.AFortiGate next-generation firewall was included to provide advanced network protection.Cisco CME was implemented to enable reliable VoIP communication. The network was designed, configured, and tested using Cisco Packet Tracer. The results confirmed that the design meets enterprise requirements for security, performance, scalability, and reliability.

بنية تحتية آمنة للمؤسسات مع التكرار والاعتمادية العالية والمراقبة المستمرة والتحويلالتلقائي بين مزود بالانترنت

Smart Secure Enterprise Infrastructure with Redundancy, monitoring and Dual WAN Failover



قسم هندسة الالكترونيات والاتصالات الكهربية	
Company Network Design And Implementation	
تحت إشراف	د/ محمد زين الدين

Abstract

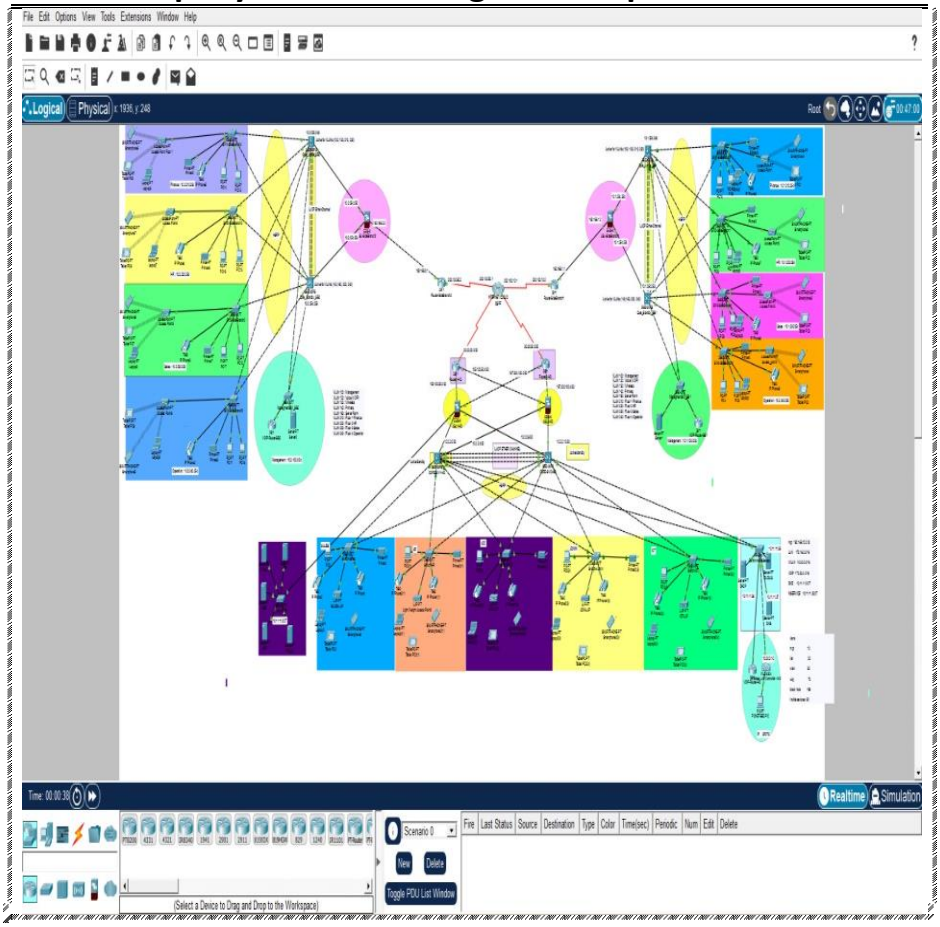
The Company Network Design and Implementation project aims to design, configure, and deploy a reliable, secure, and scalable computer network for an organization. The project begins with analyzing the company's requirements, including the number of users, departments, devices, and network services needed. Based on these requirements, a suitable network topology is designed, and appropriate networking devices such as routers, switches, wireless access points, and servers are selected.

The implementation phase includes configuring IP addressing, subnetting, VLANs, routing protocols, and essential network services such as DHCP and DNS. Security is a major part of the project, where firewalls, Access Control Lists (ACLs), port security, and user authentication are implemented to protect the network from unauthorized access and cyber threats. Network monitoring and troubleshooting tools are also used to ensure stable performance and quickly resolve any issues.

Finally, the completed network is tested to verify connectivity, performance, security, and reliability. The project provides efficient communication between departments, secure access to shared resources, Internet connectivity, and a network infrastructure that can be easily expanded as the company grows.

تصميم وتنفيذ شبكه الشركه

Company Network Design And Implementation



قسم هندسة الالكترونيات والاتصالات الكهربية

Design and Security of SD-WAN Architecture Using Fortinet Solution

تحت إشراف	أ.د / سعيد محمد عبد العاطى

Abstract

This graduation project presents a comprehensive design and implementation of a secure Software-Defined Wide Area Network (SD-WAN) architecture utilizing Fortinet solutions. To overcome the high costs and rigidity of traditional WANs, the project simulates an enterprise network comprising a main headquarters and a remote branch. These sites are securely interconnected via encrypted IPSec VPN tunnels over dual Internet Service Providers (WE and Vodafone) to ensure continuous connectivity and enhanced network reliability.

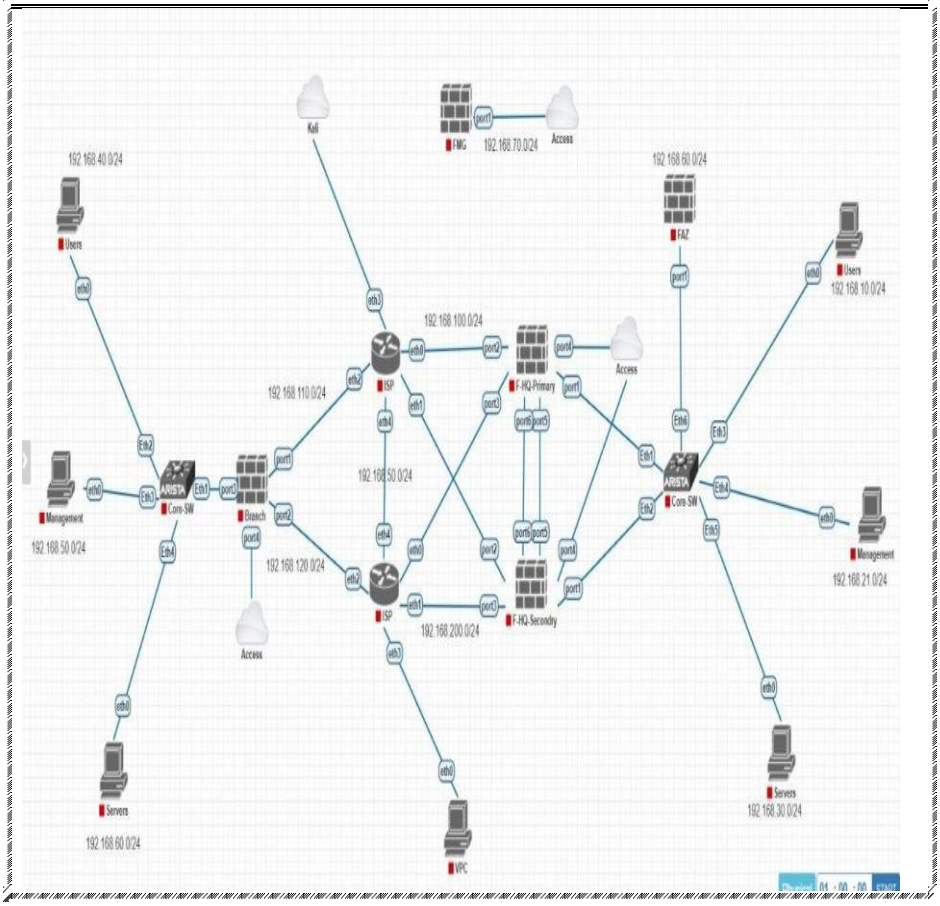
The architecture fundamentally relies on Fortinet devices, featuring an Active-Passive High Availability (HA) cluster at the headquarters to guarantee zero downtime. It also leverages FortiManager and FortiAnalyzer for centralized management and network monitoring. The entire network environment was built and simulated using the PNETLab platform on VMware Workstation, utilizing Arista Switches to represent the internal infrastructure and ISP components.

The project implements a broad spectrum of networking and cybersecurity technologies, including intelligent traffic steering (SD-WAN), Failover, VLAN segmentation, Static and Dynamic Routing (OSPF), Firewall Policies, NAT, DHCP, and DNS. Furthermore, advanced threat protection mechanisms such as Intrusion Prevention Systems (IPS) and DDoS mitigation are integrated into the architecture. Practical security testing was conducted using Kali Linux to simulate real-world cyberattacks and validate the effectiveness of the implemented security measures.

Ultimately, this project reflects a practical application of advanced networking and cybersecurity concepts, providing a scalable, cost-effective, and highly secure enterprise network model that meets the rigorous demands of modern business environments.

تصميم وتأمين بنية الشبكات الواسعة المعرفة برمجيا SD-WANباستخدام حلول فورتينت

Design and Security of SD-WAN Architecture Using Fortinet Solution



قسم هندسة الالكترونيات والاتصالات الكهربية

Smart Industrial Ground Inspection Robot: A Hybrid AI System for Oil & Gas Facility Auditing .

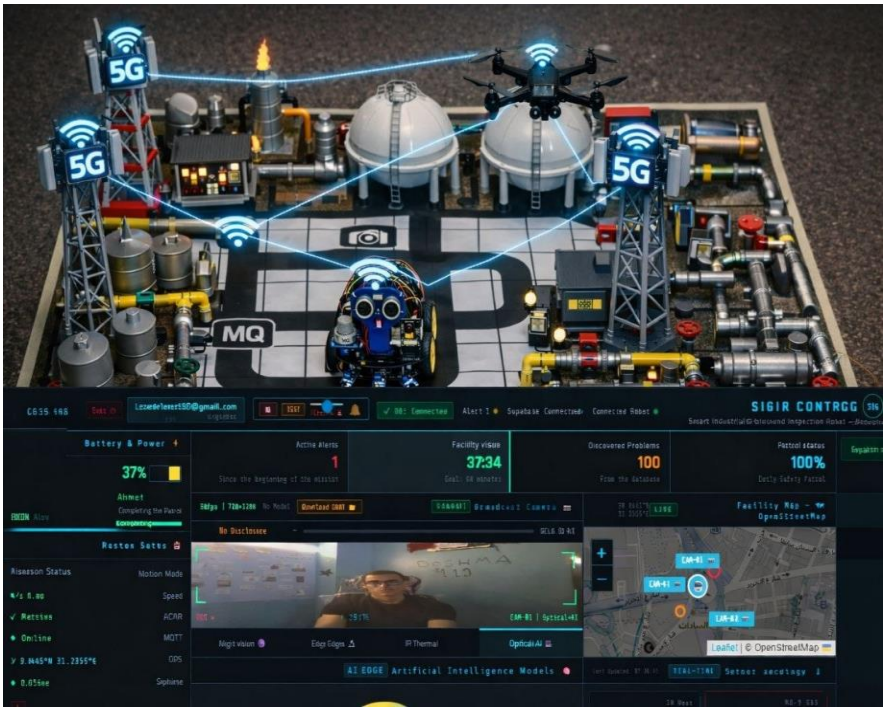
تحت إشراف	أ.د / سعيد عبدالعاطى أ.د / عصام جمعه

Abstract

SIGIR "The project aims to develop an intelligent ground robot for automated inspection in oil and gas facilities and stations. The system is based on Hybrid AI technology, where the robot collects data from multiple sensors, including LiDAR for 3D mapping, thermal cameras, gas sensors, and an IMU. The collected data is transmitted to an edge processing unit, where a YOLOv8 model runs for real-time hazard detection (such as gas leaks and hot spots), and a UNet model is utilized for precise pixel-level crack and corrosion detection. Additionally, LSTM and GRU models are employed to analyze sequential time-series data and estimate the Remaining Useful Life (RUL) of equipment to support predictive maintenance. A professional cloud-based Dashboard was developed using Supabase, featuring: * Live camera streaming. * Real-time mapping and instant alerts. * Real-time sensor readings. * Automated report generation. The project fundamentally aims to enhance personnel safety, minimize unscheduled downtime, and reduce overall maintenance expenses by shifting from traditional scheduled routines to smart predictive maintenance

روبوت التفتيش الصناعي الذكي: نظام هجين قائم على الذكاء االصطناعي لفحص محطات النفط والغاز .

Smart Industrial Ground Inspection Robot: A Hybrid AI System for Oil & Gas Facility Auditing .



قسم هندسة الالكترونيات والاتصالات الكهربية

An Edge-AI Inertial Motion Estimation System for Velocity-Based Training: Embedded Data Acquisition, Digital Design, and Physical Implementation

تحت إشراف	أ.د / أسامة زهران أ.د./ مروة عباس

Abstract

VBT is a barbell-mounted chip performing the full velocity-based-training pipeline on a single piece of silicon. It integrates a 6-axis IMU (TDK ICM-42688-P), a 3-D orientation engine with Gram-Schmidt reorthonormalisation, an IIR filter chain, a trapezoidal velocity integrator, and an INT8 MLP classifier emitting per-rep lift quality together with peak and mean concentric velocity.

The architecture is rate-agnostic: sample timing is carried as an explicit per-sample dt. Every intermediate format (Q28 timestamps, Q30 rotation matrices, Q26 velocity accumulators, INT8 activations) is pinned to a measured fixed-point error budget.

Every block is verified bit-exact against a C golden model from 411 barbell repetitions via a 21-test Icarus Verilog regression. A full RTL-to-GDS run on SKY130 via OpenLane/LibreLane signs off with zero DRC/LVS violations. The same RTL runs on a Digilent Arty A7-100T FPGA using an open-source flow (Yosys/nextpnr/Icarus), streaming results over Bluetooth to an Android app.

نظام استشعار حركي معتمد على الذكاء الاصطناعي الحافي (Edge-AI) للتدريب القائم على السرعة: اقتناء البيانات المدمج، التصميم الرقمي، والتنفيذ الفيزيائي

An Edge-AI Inertial Motion Estimation System for Velocity-Based Training: Embedded Data Acquisition, Digital Design, and Physical Implementation

قسم هندسة الالكترونيات والاتصالات الكهربية

Smart solar cleaning Robot system

تحت إشراف	أ.د / محمد صلاح طبور

Abstract

The Smart Solar Panel Cleaning Robot is an automated system designed to clean solar panels efficiently without human intervention. The robot uses sensors and an intelligent control system to move across the surface of solar panels and perform cleaning operations automatically.

The main objective of the project is to remove dust, dirt, and other contaminants that accumulate on solar panels and reduce their energy conversion efficiency. By maintaining clean panel surfaces, the robot helps increase power generation, improve system performance, and reduce the need for manual maintenance.

To enhance energy efficiency and extend battery life, the robot is equipped with a small solar panel that assists in charging the battery during operation. This feature reduces the frequency of recharging and supports sustainable operation. The proposed system provides a practical, cost-effective, and environmentally friendly solution for maintaining solar energy systems and maximizing their performance.

development, and resource optimization

روبوت ذكي لتنظيف الالواح الشمسية

Smart solar cleaning Robot system

Design and Development of Smart and Secure IoT Systems

تحت إشراف | أ.د / احمد على رصاص

Abstract

Smart Farm Management System

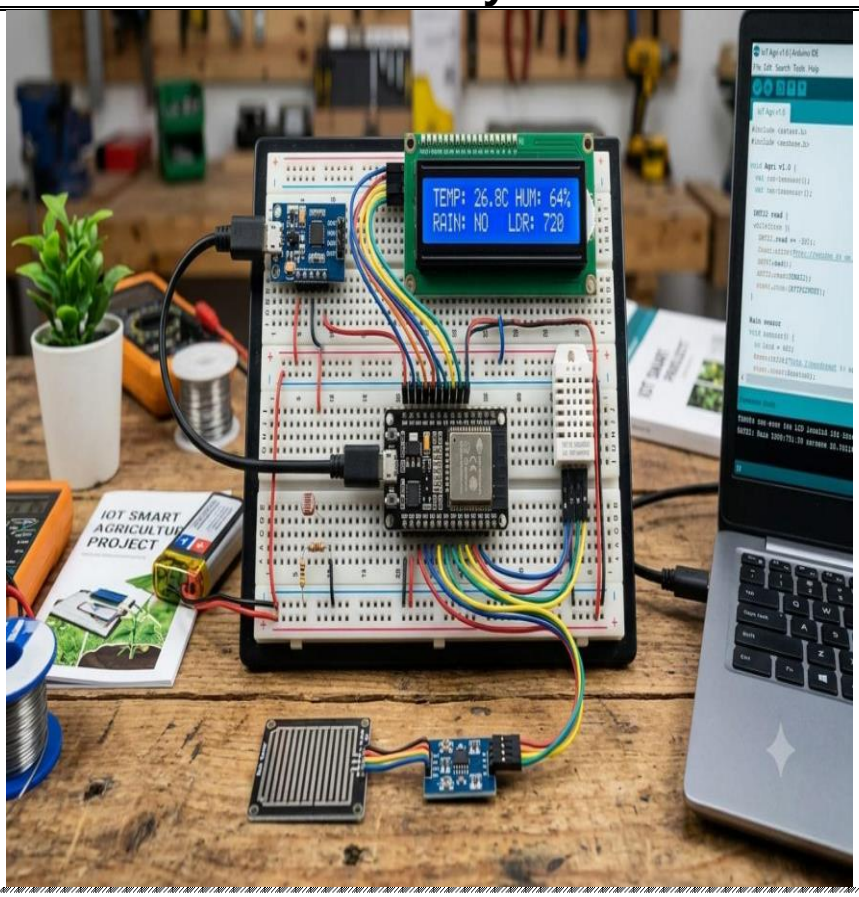
This project is a comprehensive Internet of Things (IoT) based smart farm system. It integrates hardware components using an ESP32 module for data collection and execution, a modern web frontend built with React for real-time monitoring and control, and a robust backend infrastructure powered by Firebase

Key Features:

Real-Time Monitoring: The system displays live, continuous readings of soil moisture levels, environmental temperature, water tank capacity, and sunlight exposure. Remote & Automated Control: Users can manually toggle the water pump on or off directly from the dashboard. It also features an "Automatic Mode" that manages irrigation based on customizable minimum and maximum soil moisture thresholds. Smart Weather Integration: The system utilizes local weather data to provide intelligent features like "Rain-Skip," which delays irrigation when rain is predicted, effectively conserving water. Data Visualization & Analytics: The interactive dashboard includes charts to track historical sensor data (such as weekly moisture trends), assisting in better agricultural decision-making. Secure Authentication: The system uses Firebase Authentication to ensure security, restricting access to the dashboard and admin controls to authorized users only..

تصميم و تطوير انظمة انترنت الاشياء الذكية و الامنة

Design and Development of Smart and Secure IoT Systems



قسم هندسة الالكترونيات والاتصالات الكهربية

AI-Based Smart Parking Management System

تحت إشراف	أ.د / محمد زين الدين

Abstract

This project develops an AI-based smart parking management system using computer vision and deep learning. A fixed camera captures parking area images, and a YOLOv11 model detects vehicles in real time. -The system compares detected vehicles with predefined parking coordinates to determine occupied or vacant slots. -The system compares detected vehicles with predefined parking coordinates to determine occupied or vacant slots.

نظام إدارة مواقف السيارات الذكى القائم على الذكاء الاصطناعى

AI-Based Smart Parking Management System

قسم هندسة الالكترونيات والاتصالات الكهربية	
LTE Performance Analysis	
تحت إشراف	أ.د / سعيد عبدالعاطي

Abstract

This project aims to study and analyze the level of mobile network coverage in different environments through real field measurements and the evaluation of signal quality and network performance. The importance of this study stems from the increasing dependence on communication and internet services in various aspects of daily life, making reliable and stable network coverage essential for ensuring high-quality service and enhancing user experience.The project relied on collecting real-world data from various locations including urban areas, rural regions, and highways using specialized applications and tools for network performance measurement. Several key technical indicators were recorded to evaluate coverage quality and signal strength such as signal strength, signal quality, and interference levels. Geographic coordinates were also collected and linked to digital maps to provide an accurate representation of coverage levels across different locations.

After completing the data collection process the results were analyzed using specialized software to compare network performance in different environments and identify the factors affecting communication quality. The findings revealed clear differences among the studied areas with signal strength being influenced by several factors including the distance from cellular base stations, population density, high-rise buildings, and natural obstacles that may limit the propagation of wireless signals.The study also showed that some areas suffer from weak coverage or poor signal quality which can lead to slower internet services and occasional call drops. In contrast other areas demonstrated strong performance due to the availability of suitable infrastructure and the effective distribution of cellular towers.Based on the obtained results the project proposed several recommendations to improve coverage levels and service quality. These recommendations include increasing the number of base stations in poorly covered areas, optimizing the distribution of cellular towers, and implementing advanced network management techniques to reduce signal interference. This project provides valuable information that can contribute to the development of future communication networks and enhance the efficiency of services delivered to users in different environments.


MOBILE NETWORK PERFORMANCE & COVERAGE REPORT
A CASE STUDY: QUWAYSNA AREA
Telecommunications Research Center – Menofia
REPORT ID: MN-COV-2024-03
1 OVERVIEW OF SITE AND DRIVE ROUTE
DRIVE ROUTE & RSRP TRACE
Start Point Quwaysna
End Point Menofia Governorate
Qalyubia Governorate
Quwaysna Town
Menofia Governorate
Kafr El-Sheikh
0 2.5 5 7.5 10 km
KEY PERFORMANCE INDICATORS
AVG RSRP -95 dBm
BEST RSRP -72 dBm
WORST RSRP -125 dBm
TOTAL DISTANCE 12.4 km
RSRP LEGEND (dBm)
Excellent > -90 dBm
Good -90 to -105 dBm
Fair -105 to -120 dBm
Poor < -120 dBm
No Service < -130 dBm
COVERAGE SUMMARY
Strong signal observed in central Quwaysna area.
Coverage degradation observed towards eastern sector.
No critical coverage holes detected along the drive route.
Optimization is recommended for Sector-3 to improve weak areas.
RSRP DISTRIBUTION
32%
28%
23%
12%
5%
> -90 dBm (Excellent)
-90 to -105 dBm (Good)
-105 to -120 dBm (Fair)
< -120 dBm (Poor)
< -130 dBm (No Service)
SINR DISTRIBUTION
25%
30%
25%
15%
5%
> 20 dB (Excellent)
10 to 20 dB (Good)
0 to 10 dB (Fair)
< 0 dB (Poor)
No Service
THROUGHPUT ANALYSIS
Mbps
60
40
20
0
0 2 4 6 8 10 12 12.4
Distance (km)
This report is generated based on drive test measurements collected on 4G network in Quwaysna area.
Log File: Log_e&_4G_Menofia_2024.csv

قسم هندسة الالكترونيات والاتصالات الكهربية

Smart incubator With Mobil Application

تحت إشراف	Dr.Tarekkhedr Dr.Khalil Ramadan

Abstract

The incubator is controlled through a mobile application, allowing continuous monitoring of the baby and tracking any changes in the baby's condition in real time.

قسم هندسة الالكترونيات والاتصالات الكهربية

Train tracking System

تحت إشراف	أ.د / سعيد عبد العاطي أ.د / احمد راشد

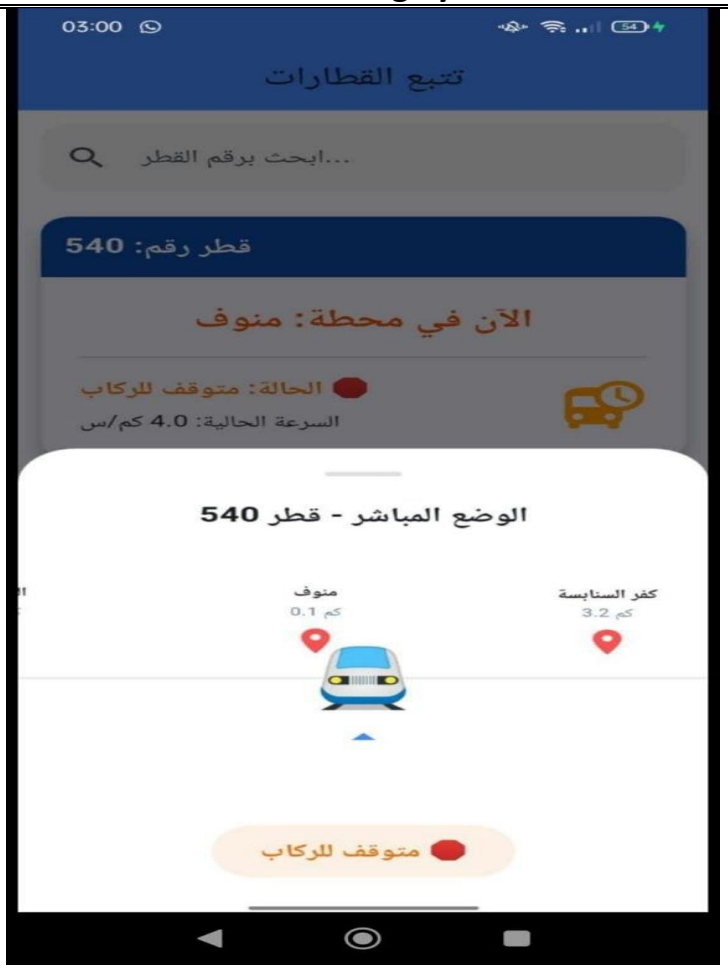
Abstract

The Train Tracking System is designed to provide real-time monitoring of train movements, enabling passengers and railway operators to access accurate and up-to-date information about train locations and journey progress. The system utilizes an onboard electronic device equipped with Global Positioning System (GPS) technology and a 2G communication module to continuously collect and transmit location data to a central server for processing and storage.

The platform includes a mobile application that allows users to view the train's current position on a map, identify the last station reached, and access essential trip information through an intuitive and user-friendly interface. By providing real-time updates, the system helps reduce uncertainty for passengers and improves overall travel planning.

The proposed solution relies on modern communication technologies to ensure reliable and efficient data transmission. In addition, the system can be expanded in the future to include advanced features such as estimated arrival time prediction, automated notifications when trains approach specific stations, and analytical tools for evaluating operational performance.

The Train Tracking System contributes to enhancing the passenger experience, improving information accuracy, and supporting railway operators with better visibility of train movements. As a result, it promotes more efficient railway management and supports the modernization of transportation services.


03:00
تتبع القطارات
ابحث برقم القطر...
قطر رقم: 540
الآن في محطة: منوف
الحالة: متوقف للركاب
السرعة الحالية: 4.0 كم/س
الوضع المباشر - قطر 540
منوف
0.1 كم
كفر السنابسة
3.2 كم
متوقف للركاب

قسم هندسة الالكترونيات والاتصالات الكهربية

Brain stroke classifier

تحت إشراف	د / محمد سامي عرفه

Abstract

This project aims to develop an intelligent system for classifying brain Computed Tomography (CT) scan images in order to distinguish between two major types of strokes: Hemorrhagic Stroke and Ischaemic Stroke. The proposed system utilizes Artificial Intelligence (AI) and Deep Learning techniques, specifically Convolutional Neural Networks (CNNs), due to their ability to automatically extract relevant features from medical images and perform accurate classification.

Three different experiments were conducted to assess the effectiveness of the proposed approach. These experiments included a basic CNN model without data augmentation, an augmented CNN model trained for 20 epochs, and an augmented CNN model trained for 50 epochs. Model performance was evaluated using several metrics, including Accuracy, Precision, Recall, F1-Score, Specificity, Confusion Matrix, and ROC-AUC.

Experimental results demonstrated that the basic CNN model achieved the best overall performance, obtaining an accuracy of 97.03% and a ROC-AUC score of 99.92%, outperforming the augmented models. The findings indicate that CNN-based approaches are highly effective for automated stroke classification from brain CT images and can serve as a valuable decision-support tool for healthcare professionals, contributing to faster and more accurate stroke diagnosis.

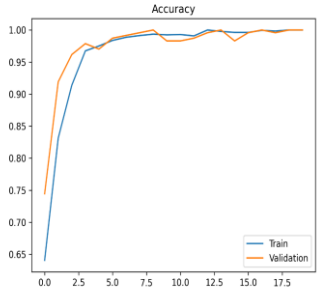
مصنف السكتة الدماغية

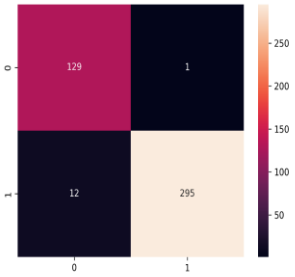
Brain stroke classifier

Sample CT images from the Hemorrhagic Stroke class

Sample CT images from the Ischaemic Stroke class

The training and validation accuracy





IoT Remote Cloud Monitor for Chronic Kidney Disease

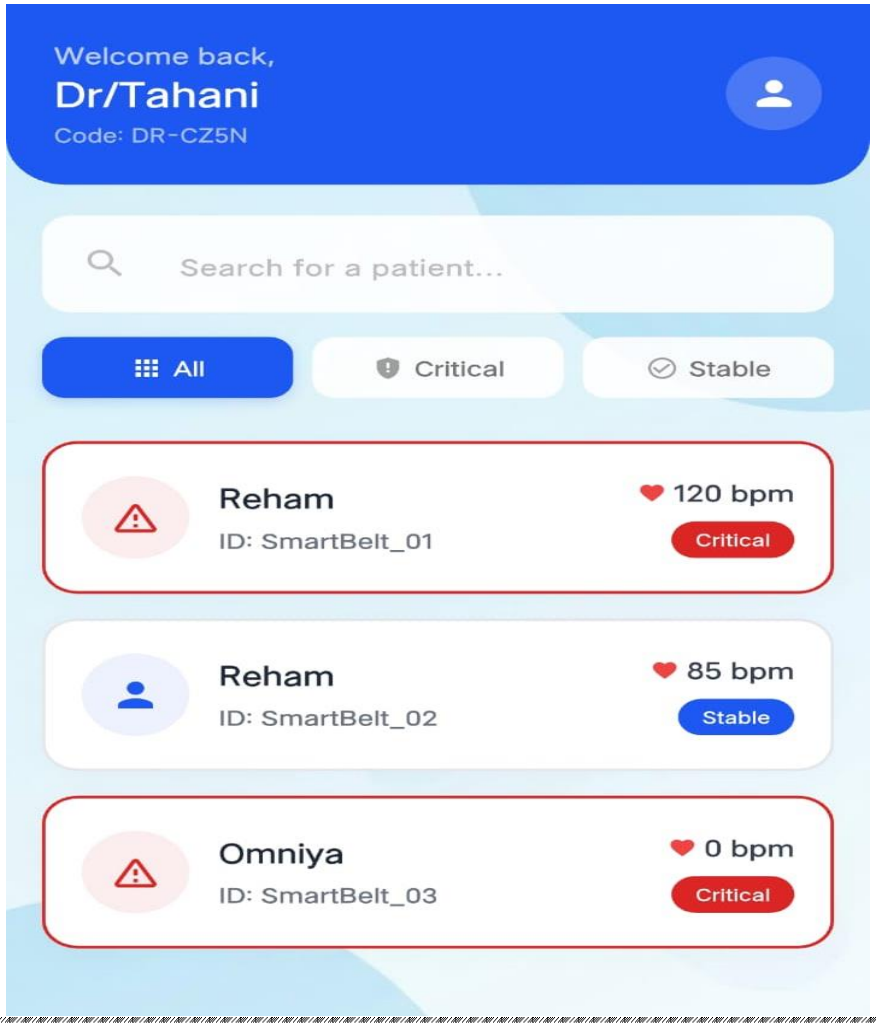
تحت إشراف | د / خليل فتح الله خليل

Abstract

The project is an integrated medical and engineering platform designed for remote, real-time chronic kidney disease patient management, aimed at preventing critical complications for patients undergoing maintenance hemodialysis. The platform features a sophisticated smart application providing a direct connection between patients and healthcare providers, equipped with a comprehensive risk management system that delivers real-time health alerts for critical vital sign deviations—such as severe blood pressure spikes or dangerous drops in heart rate and oxygen saturation levels—while also warning users of any sensor disconnections. All clinical data is securely transmitted and synchronized via a cloud database, enabling physicians to monitor patient status, review historical trends, and make proactive clinical decisions. On the hardware side, the system utilizes a stationary, non-wearable home monitoring station managed by a high-performance microcontroller. This hardware hub integrates an advanced medical sensor to capture photoplethysmography signals for continuous heart rate and oxygen saturation tracking to mitigate fluid overload and pulmonary congestion risks, while employing specialized algorithms for non-invasive hemoglobin estimation to manage chronic anemia and calculating systolic and diastolic blood pressure. For complete standalone operation, a built-in display screen allows patients to view their immediate vital signs directly on the station, ensuring that anyemergency threshold automatically triggers instant app alerts for rapid medical intervention.

نظام إنترنت الأشياء الذكي لمراقبة مرضى الفشل الكلوي المزمن

IoT Remote Cloud Monitor for Chronic Kidney Disease



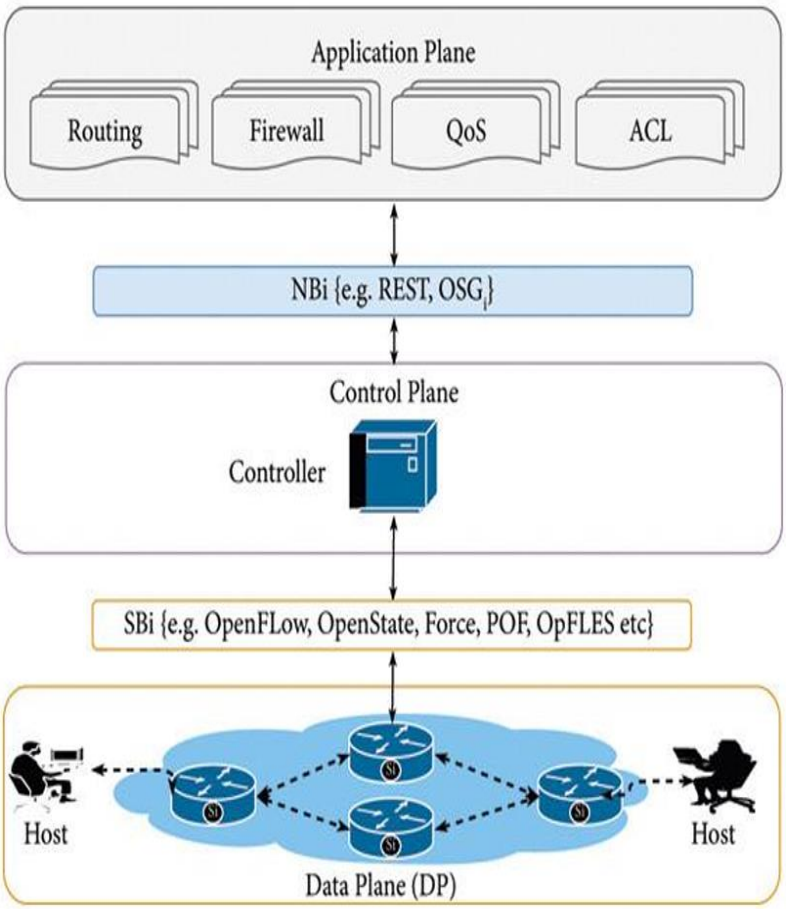
قسم هندسة الالكترونيات والاتصالات الكهربية

SDN Emulation System + Controller App on Mininet

تحت إشراف	أ.د / سعيد محمد عبدالعاطي أ.د / محمد جلال المشد

Abstract

The SDN Emulation System + Controller App on Mininet is an advanced and integrated Software-Defined Networking (SDN) emulation platform designed to develop a flexible and intelligent network architecture, revolutionizing how traffic is managed and routed within modern data centers and enterprise networks. By decoupling the Control Plane from the Data Plane, the system provides network administrators and engineers with a centralized, programmatically driven oversight of the network infrastructure, significantly enhancing operational efficiency while minimizing overhead costs. The framework leverages the Mininet virtualization environment operating on a Ubuntu Linux platform to model and deploy complex, dynamic network topologies (such as Tree, Ring, and custom architectures). This setup integrates a customized, intelligent control application built using the Ryu Controller in Python. Acting as the centralized brain of the network, the controller dynamically manages traffic flows and instantly updates the routing rules within the virtual programmable switches (OpenFlow Switches) in real time, according to current network demands. To ensure high performance and optimal resource utilization, the system incorporates advanced routing algorithms to compute shortest and cost-effective paths. It further implements sophisticated Traffic Engineering and Load Balancing mechanisms to mitigate congestion and reduce overall network latency, ensuring continuous, high-quality service delivery. Additionally, the platform provides a programmatic monitoring interface to track critical Network Quality of Service (QoS) metrics, such as Throughput and Packet Loss, in real-time. To achieve robust security and resilience against cyber threats, the controller application is reinforced with defensive mechanisms capable of early anomaly detection, such as Distributed Denial of Service (DDoS) attacks. The system automatically mitigates these threats by isolating malicious sources without disrupting the rest of the network. Furthermore, the architecture supports automated path restoration and fast Failover capabilities, ensuring absolute network stability even during sudden node or link failures. By combining flexible network emulation, centralized software control, and real-time traffic analysis, this project provides a cutting-edge model for next-generation networking. It seamlessly balances operational oversight, agile adaptability, and stringent security to support modern paradigms in telecommunications and cloud computing.


Application Plane
Routing
Firewall
QoS
ACL
NBi {e.g. REST, OSGi}
Control Plane
Controller
SBi {e.g. OpenFLow, OpenState, Force, POF, OpFLES etc}
Host
Host
Data Plane (DP)

قسم هندسة الالكترونيات والاتصالات الكهربية

Baseera

تحت إشراف	أ.د / محمد سامي عرفة

Abstract

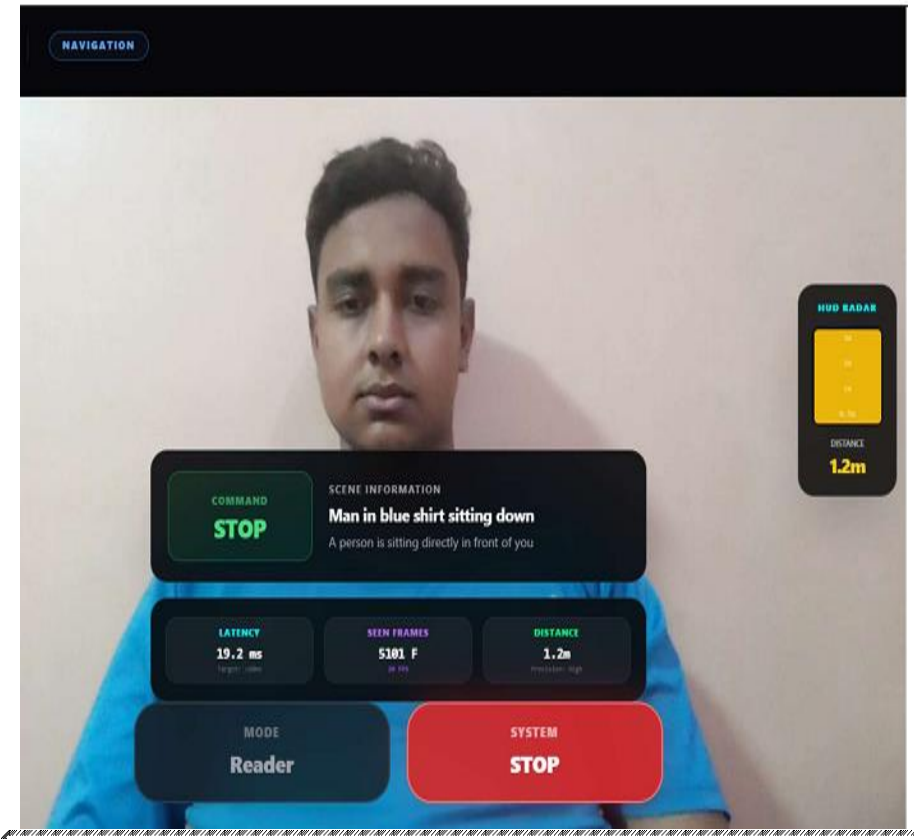
The BASEERA project is an integrated wearable engineering system powered by Edge Artificial Intelligence, designed to empower blind and visually impaired individuals and enhance their autonomy and safe navigation in unstructured environments through localized, 100% offline processing. The system consists of an ergonomic smart wearable frame that utilizes a smartphone as an advanced high-resolution optical sensor node. This node streams live, high-definition video to a local processing workstation via a local area network (LAN) or direct USB tethering, completely eliminating latency, lag, and streaming bottlenecks inherent in restricted microcontrollers like the ESP32-CAM, thereby guaranteeing absolute user privacy and uninterrupted service.

The architecture relies on advanced deep learning models optimized for real-time environment understanding. A YOLOv8 Nano model executes real-time object detection, spatial localization (Left / Ahead / Right), and dynamic distance estimation utilizing bounding box area ratio analysis. Concurrently, a multilingual EasyOCR pipeline extracts structural text from signs, product labels, and documents in both Arabic and English. This real-time telemetry data is synthesized by a localized Large Language Model (Local LLM - Phi-3 Mini), which acts as a semantic decision-making core to analyze the scene context and generate concise navigation commands capped at a maximum of 4 words to prevent cognitive overload. These commands are instantly converted into verbal guidance via an offline pyttsx3 text-to-speech engine.

The system integrates a multi-threaded Flask-based Web Dashboard deployed on the local workstation to display the live AI video stream, track intelligence metrics, and maintain a real-time event log with historical timestamps. To guarantee optimal real-time performance and sub-millisecond execution loops, the deep learning pipeline undergoes rigorous Post-Training Quantization (PTQ), compressing model weights from Float64 down to Int16/Int8 precision. This optimization drastically reduces RAM utilization and maximizes frames-per-second (FPS) processing speed. Ultimately, BASEERA delivers a cutting-edge engineering blueprint that couples data security with robust edge computing to significantly elevate the quality of life and independence for the visually impaired

بصیره

Baseera



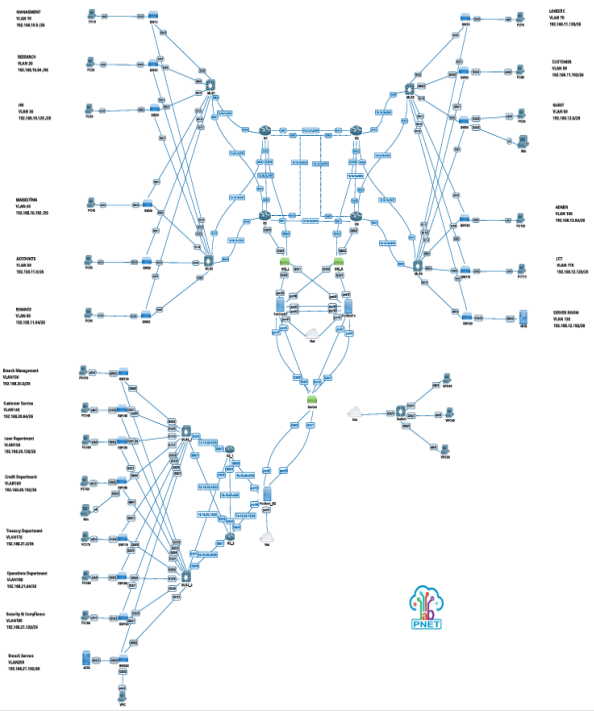
قسم هندسة الالكترونيات والاتصالات الكهربية	
Secure Bank Infrastructure	
تحت إشراف	**أ.د / محمد جلال المشد**

Abstract

This project presents the design and implementation of a secure enterprise banking network using Cisco networking technologies and FortiGate Next-Generation Firewalls. The proposed infrastructure consists of a Headquarters (HQ), a primary branch (B1), and a remote access branch (B2), providing secure and reliable communication across all locations. The network incorporates enterprise technologies including VLAN segmentation, OSPF dynamic routing, HSRP gateway redundancy, High Availability (HA), DHCP services, IPsec VPN, SSL VPN, and advanced security profiles such as Firewall Policies, NAT, IPS, Antivirus, Web Filtering, DNS Filtering, Application Control, File Filtering, Email Filtering, and SSL Deep Inspection. The entire solution was implemented and validated using PNETLab, where comprehensive testing confirmed high availability, secure connectivity, reliable network performance, and effective protection against common network threats. The resulting infrastructure provides a scalable, resilient, and secure enterprise banking environment that aligns with modern organizational networking and cybersecurity requirements.

تصميم بنية تحتية آمنة لشبكة بنك

Secure Bank Infrastructure



قسم هندسة الالكترونيات والاتصالات الكهربية

Intrusion Detection Honeypot

تحت إشراف	أ.د / محمد صلاح طبور

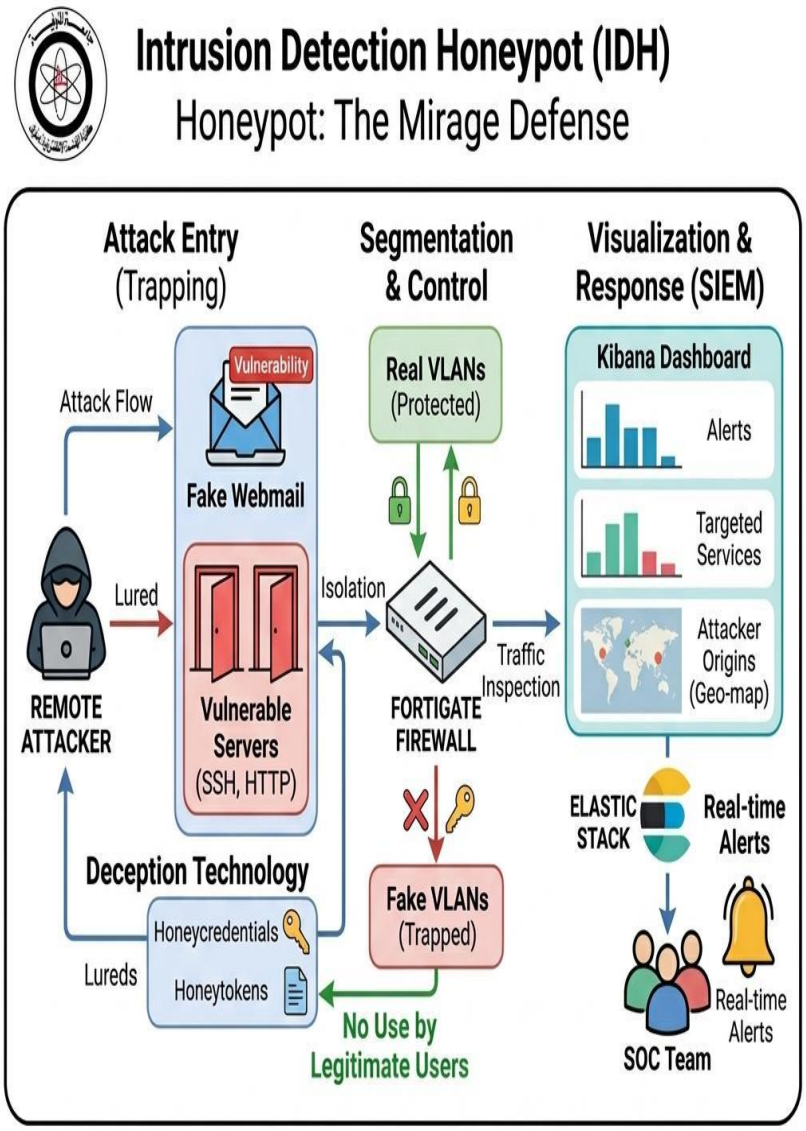
Abstract

The project focuses on designing and implementing a proactive defense framework based on deception and digital traps, named the "Mirage Cyber Defense Framework." This system aims to address the limitations of traditional security solutions that rely solely on digital signatures.

The framework utilizes network segmentation technology via a firewall to create two identical zones: one real and the other fake. The fake environment simulates the actual departments of the organization (such as Human Resources, Accounting, Information Technology, and Users) and includes digital assets and traps intentionally infected with vulnerabilities to lure attackers and isolate them away from the real systems. These traps include a fake email server infected with a software vulnerability, along with fake file transfer and remote control services.

The system features the integration of centralized tools for data logging, instant alerting, and visual display of attacks to gather accurate threat intelligence. In the end, the project succeeded in mapping simulated attack behaviors and matching them with famous global frameworks such as the Cyber Kill Chain and the MITRE ATT&CK matrix for adversaries, proving the capability of this framework to provide early detection of threats, eliminate false alarms, and safely contain active risks.

Intrusion Detection Honeypot



قسم هندسة الالكترونيات والاتصالات الكهربية

Smart solar panel system

تحت إشراف	أ.د / احمد نبيه زكى راشد أ.د / محمد محمد الحلوانى

Abstract

This project presents the design and implementation of an integrated smart solar energy system that serves enterprise network environments and light current applications, through the effective convergence of renewable energy technologies, enterprise communications infrastructure, and optical fiber communication into a single cohesive smart system. The system comprises sun-tracking solar panels driven by servo motors guided by LDR-based light sensors, voltage-boosting and power regulation circuits, and a fully simulated enterprise network environment that mirrors real-world organizational demands.

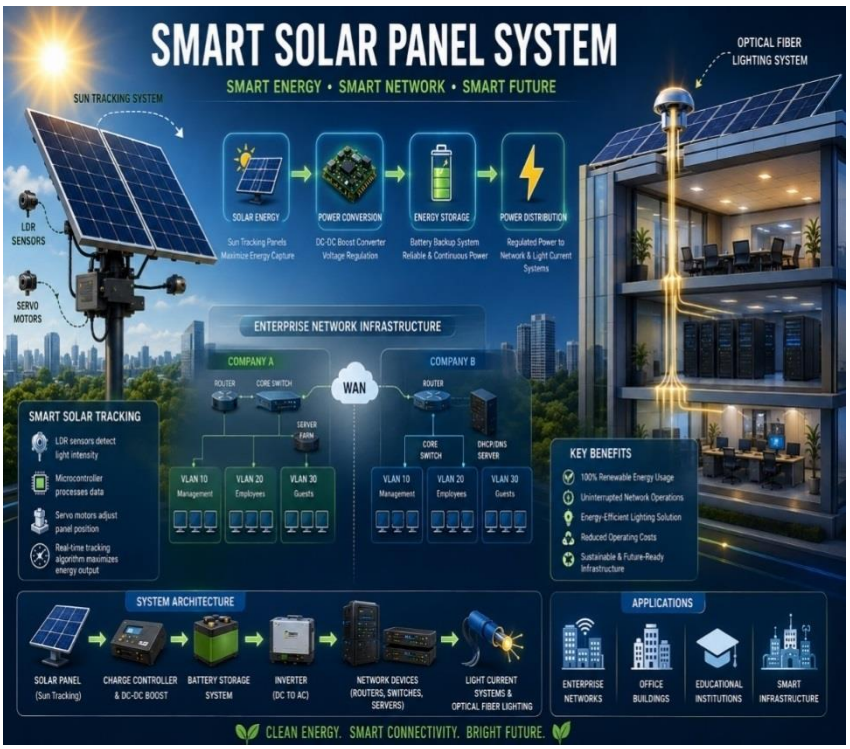
The system employs a continuous sun-tracking algorithm that analyzes light sensor signals in real time to orient the solar panels toward the highest available solar irradiance throughout the day, significantly increasing energy generation efficiency compared to conventional fixed-panel installations. The harvested energy is directed to power the enterprise network infrastructure and light current systems, supported by backup storage circuits to ensure uninterrupted operation during periods of low or absent sunlight.

On the networking side, two interconnected virtual companies were designed and fully simulated using Cisco Packet Tracer, incorporating the configuration of routers, switches, and essential network services including DHCP, DNS, and VLAN segmentation, accurately replicating a real-world enterprise environment powered entirely by renewable solar energy and reflecting actual communication and connectivity requirements.

In addition, the project introduces an innovative application of optical fiber technology to transmit natural sunlight directly into building interiors, delivering energy-efficient natural illumination without dependence on artificial lighting during daylight hours, thereby directly reducing electrical consumption in enterprise facilities. By converging three complementary technical domains — smart renewable energy, enterprise networking, and optical communication — into a single unified infrastructure, this project delivers a forward-looking smart energy solution that embodies the principles of sustainable and connected infrastructure for the future.

نظام الالواح الشمسية الذكية

Smart solar panel system



قسم هندسة الإلكترونيات الصناعية والتحكم

Microcontroller Control of Distillation Column (As Chmical Process Control)

تحت إشراف	أ.د.بلال ابو ظلام

Abstract

This project aims to design and implement an intelligent control system for a Distillation Column using the ATmega2560 microcontroller. The system automates the distillation process by controlling the operating temperature and monitoring ethanol concentration.

The system continuously measures the reboiler temperature using a Thermocouple with MAX6675, while an MQ-3 gas sensor is used to detect the ethanol vapor concentration at the column outlet. The ATmega2560 processes the sensor data, compares it with the desired set points, and controls the electrical heater through a Solid State Relay (SSR) to maintain stable operating conditions and improve ethanol separation efficiency.

التحكم في عمود التقطير باستخدام المتحكم الدقيق
(كتطبيق للتحكم فى العمليات الكميائية)

Microcontroller Control of Distillation Column
(As Chmical Process Control)

Smart Energy and Comfort Management System Using Internet of Things (IOT) Technologies for a Green Building

تحت إشراف	د/ الخطيب كمال

Abstract

System Objectives

- Facility Automation

- Implement smart building concepts and automated control systems in modern car showrooms and electric vehicle (EV) charging stations.

- Enhancing Energy Efficiency

- Maximize energy efficiency through the intelligent integration of natural and artificial lighting.

- Dynamically manage electrical loads to reduce energy consumption and improve overall system performance.

- Enabling Remote Monitoring and Cloud-Based Control

- Provide facility managers with real-time access to sensor data for continuous monitoring.

- Enable remote control and management of system outputs from anywhere through a cloud-based mobile application dashboard.

- Enhancing Safety and Security

- Develop an intelligent and proactive safety framework.

- Predict potential hazards and enable early fire detection to improve the safety of occupants and protect facility assets.

Smart Energy and Comfort Management System Using Internet of Things (IOT) Technologies for a Green Building

نظام ذكي لإدارة الطاقة والراحة في المباني الخضراء باستخدام تقنيات إنترنت الأشياء

قسم هندسة الإلكترونيات الصناعية والتحكم

Remote-Controlled Smart Automated Parking System

تحت إشراف	ا.د/ مجدى قطب

Abstract

This project presents the design and implementation of an integrated, remotely controlled smart automated parking system that enhances electrical reliability, mechanical safety, and operational automation. The system is built around an Arduino Nano microcontroller (MCU) with Bluetooth connectivity, enabling short-range wireless monitoring and control. Automated entry and exit gates, together with infrared (IR) sensors, facilitate vehicle detection and real-time parking occupancy counting.

The power supply subsystem combines an 18 V solar photovoltaic panel with a rechargeable lithium-ion battery bank managed by a 3S Battery Management System (BMS). An automatic relay-based changeover circuit ensures uninterrupted operation by seamlessly switching between available power sources.

To strengthen vehicle security and prevent unauthorized theft, the parking garage incorporates retractable mechanical bollards that elevate physical security cards upon vehicle parking. Any unauthorized removal of a security card is detected by Light Dependent Resistor (LDR) sensors, which immediately activate an under-vehicle spike-strip (tire-killer) mechanism to immobilize the vehicle and prevent unauthorized exit.

The mechanical structure of the parking system was designed using AutoCAD and fabricated from high-strength Medium-Density Fiberboard (MDF) to provide durability and precision. A custom-designed Printed Circuit Board (PCB) integrates the electronic subsystems, improving electrical noise immunity, system reliability, and overall structural organization. Together, these features demonstrate a sustainable, intelligent, and secure parking solution suitable for modern smart parking applications

جراج سيارات ذكى ونظام ركن آلى يعمل بالتحكم عن بعد

Remote-Controlled Smart Automated Parking System

قسم هندسة الإلكترونيات الصناعية والتحكم

Smart incubator With Mobil Application

تحت إشراف	Dr.Tarek khedr Dr.Khalil Ramadan

Abstract

The incubator is controlled through a mobile application, allowing continuous monitoring of the baby and tracking any changes in the baby's condition in real time.

قسم هندسة الإلكترونيات الصناعية والتحكم

Smart Data Logging System for Pharmaceutical Refrigerator Monitoring

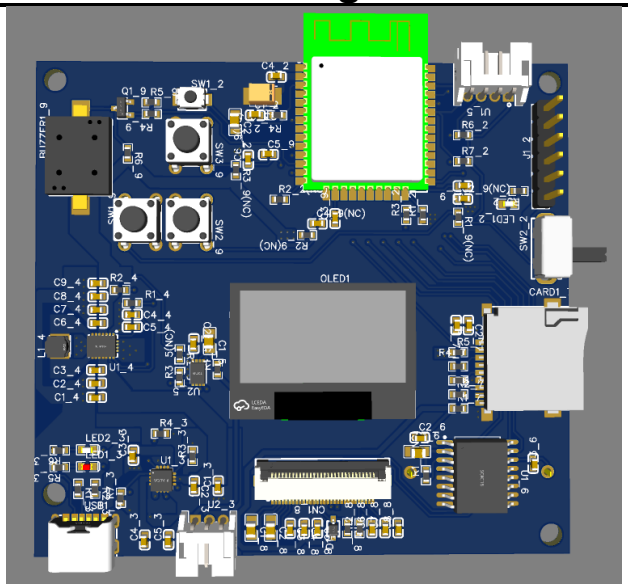
تحت إشراف	ا.د/ طارق أحمد محمود

Abstract

This project aims to design and implement a smart system for monitoring temperature and humidity levels within pharmaceutical storage refrigerators at Zeta Pharma. The scope of this system extends beyond providing an automated solution for continuous data monitoring and logging; it also features real-time display of readings for the immediate user. Furthermore, the system utilizes Wi-Fi technology for wireless broadcasting, ensuring that data is accessible to authorized personnel at any time and from any location. This ensures an immediate response to any technical emergencies or fluctuations.

نظام تسجيل وعرض بيانات ذكي لمراقبة ثلاجات الأدوية

Smart Data Logging System for Pharmaceutical Refrigerator Monitoring



قسم هندسة الإلكترونيات الصناعية والتحكم

HazMove Robot

تحت إشراف	د / عصام جمعه

Abstract

The graduation project involves the design and implementation of a robotic arm mounted on a linear motion line for use in chemical and hazardous-materials factories. The system receives the product after the manufacturing process is completed, then moves along the linear motion line to arrange the product in its assigned storage area.

In case of a defect such as gas leakage, the system detects it using a gas sensor mounted on the robotic arm, then transfers the product to a separate storage area for defective products. The robotic arm also includes a sensor in the end-effector to ensure that the product is present during the pickup process. If no product is detected, the system stops until a new product arrives.

The system supports multiple operating modes depending on the type of product on the production line. A mobile application was also developed to allow remote manual control of the robotic arm and to switch between operating modes via Wi-Fi. An ESP32 was used as the main controller because it has built-in Wi-Fi, eliminating the need for an external Wi-Fi module.

The robotic arm joints are driven by MG996R servo motors, while the rotating base is driven by a NEMA 17 stepper motor. The linear motion line is driven by a NEMA 23 stepper motor with a TB6600 driver.

روبوت هاز موف

HazMove Robot

قسم هندسة الإلكترونيات الصناعية والتحكم

Intelligent Agriculture Systems (Automation, IoT, Computer Vision & AI)

تحت إشراف	د/ جلال عتلم

Abstract

intelligent plant care system designed for plants that require special care. It integrates Automation, IoT, Computer Vision, and Artificial Intelligence (AI) to automate farm operations, enable real-time remote monitoring and control, and continuously collect environmental and soil data through smart sensors.

The system also provides live plant monitoring and analyzes plant images using image processing and AI to detect diseases, evaluate plant health and growth, and generate comprehensive reports that support timely and accurate decision-making.

قسم هندسة الإلكترونيات الصناعية والتحكم

SMART P.V. CLEANING ROBOT

تحت إشراف	
د./ حسني شعلة.	

Abstract

Dust accumulation reduces PV panel efficiency by up to 30%. To address water scarcity, this project introduces a fully automated Dry-Cleaning solution that optimizes energy yield without using water. Built with lightweight Aluminum Profiles to fit the width of a single PV panel (100 - 114 cm), the robot utilizes U-Groove drive wheels and Nylon side rollers to ride securely on the panel's outer frame without slipping, while a 114 cm ultra-soft cylindrical Nylon brush sweeps dust smoothly without scratching the glass. The system features a Dual-Controller Architecture where the Arduino manages real-time mechanical tasks, reads Limit Switches for edge detection, and interfaces with the L298N driver to control high-torque JGB37-545 Worm Gear Motors, while the ESP handles wireless connectivity, hosting a local Web Dashboard over Wi-Fi for remote monitoring, telemetry, and manual overrides.

قسم هندسة الإلكترونيات الصناعية والتحكم

Smart Autonomous Industrial Vehicle (SAIV)

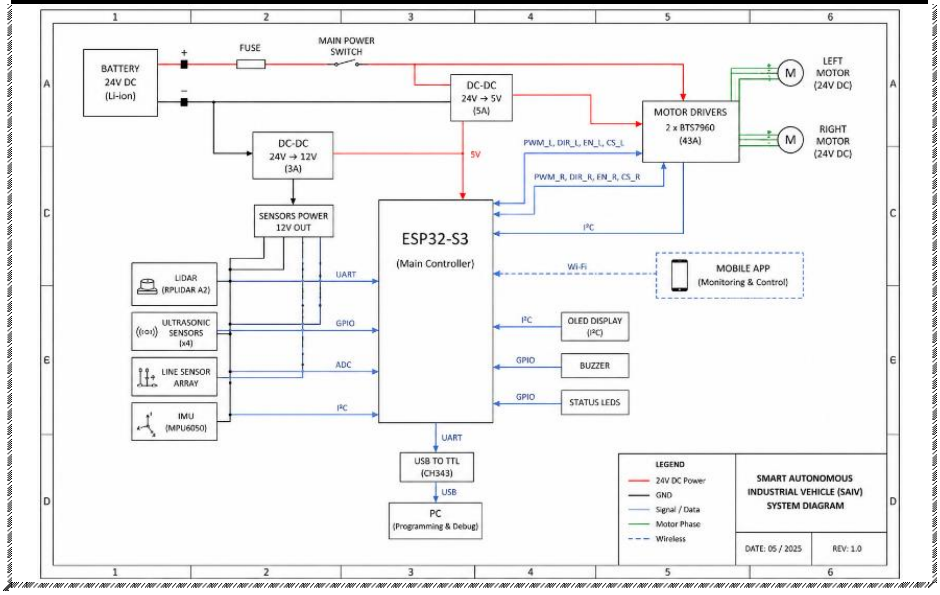
تحت إشراف	د. محمد عبده

Abstract

The project aims to design and implement a Smart Autonomous Industrial Vehicle (SAIV) for transporting products between production lines, storage areas, and shipping zones both inside and outside industrial facilities. The vehicle is capable of recording, storing, and replaying routes, in addition to being monitored and controlled through a mobile application using Wi-Fi communication. The project aims to provide a flexible and cost-effective alternative to traditional conveyor systems while reducing dependence on human labor in product transportation processes. It can also serve as an alternative to certain forklift operations, thereby enhancing production efficiency, improving safety, and reducing operational costs.

مركبة صناعية ذكية ذاتية الحركة

Smart Autonomous Industrial Vehicle (SAIV)



قسم هندسة الإلكترونيات الصناعية والتحكم

Smart Access-Controlled Automation and Monitoring System

تحت إشراف	ا.د. طارق احمد محمود

Abstract

The Smart Access-Controlled Automation and Monitoring System is a secure, multi-mode automated system designed to integrate access control, environmental monitoring, and power management. The system authenticates users via RFID, keypad, or mobile application, and controls motors, relays, and fans. It provides both local and remote monitoring through an ESP32-based IoT dashboard, and sends SMS alerts for unauthorized access attempts via the SIM900 GSM module. The system supports multiple power domains (5V / 12V / 24V) and is expandable to smart garage, smart factory, server room, and lab automation use cases.

قسم هندسة الإلكترونيات الصناعية والتحكم

Production Line

تحت إشراف	د/ عمر شاهين

Abstract

The project aims to design and implement an automated liquid filling production line using industrial control systems. The system automatically transports and fills containers while monitoring all stages of operation to ensure accuracy and quality. It improves productivity, reduces waste, and enhances manufacturing efficiency.

خط إنتاج

Production Line

قسم هندسة الإلكترونيات الصناعية والتحكم

Multi-Task Medical Robotic Arm

تحت إشراف	دكتور / صلاح حلمي

Abstract

Our project is a multi-tasking medical robot, but our graduation project focused on using it to collect samples from patients with infectious diseases. The primary goal is to reduce direct contact between the patient and medical staff, thus minimizing the risk of infection. The robot consists of a robotic arm controlled using an Arduino, with servo motors for movement and an ESP camera to monitor the patient and determine the work area. We started by designing it on SolidWorks, then built it and tested its movement and accuracy, with the potential for future development by adding artificial intelligence and using it in other medical applications.

ذراع روبوتية طبية متعددة المهام

Multi-Task Medical Robotic Arm

قسم : هندسة الاتصالات و الشبكات

Campus Area Network

تحت إشراف	د. محمد المشد

Abstract

The project consists of a designed and implemented a secure, scalable, and reliable enterprise campus network using VLANs, OSPF, HSRP, and RSTP to improve performance, redundancy, and network availability. It also integrated essential services such as DHCP, DNS, SSH, and PAT to enhance connectivity, security, and ease of management. The modular design supports future upgrades, including IPv6, ACLs, LLDP, SNMPv3, and Syslog, ensuring long-term scalability and reliability.

قسم الهندسة الطبية الحيوية و التكنولوجيا

Non Invasive Glucose Monitoring System (NIGM)

تحت إشراف	أ.د محمد اسماعيل كرار

Abstract

The aim of this project is to design and implement a non-invasive system for glucose monitoring and early diabetes diagnosis using physiological signals and embedded artificial intelligence. The proposed system focuses on eliminating the need for traditional invasive methods such as finger pricking, which are often painful and inconvenient for users.

نظام مراقبة الجلوكوز غير الجراحي (نجم)

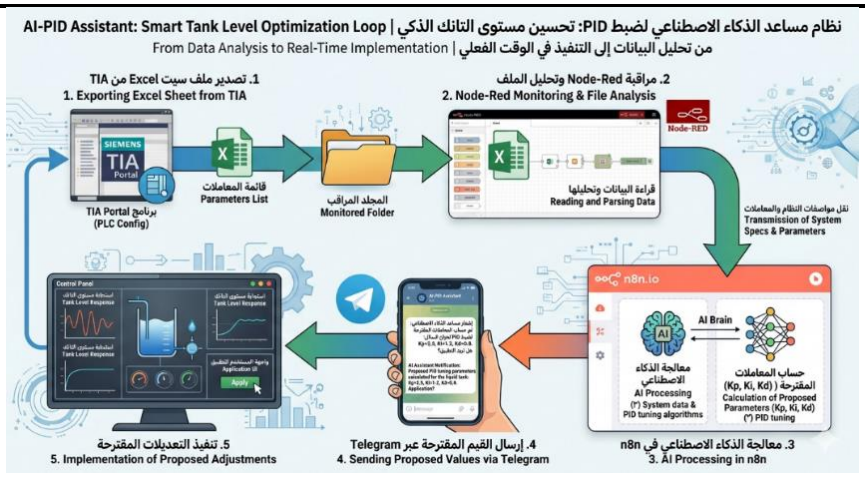
Non Invasive Glucose Monitoring System (NIGM)

قسم هندسة التحكم الصناعية	
AI-Assisted PID tuning system	
تحت إشراف	**أ.د. محمد إبراهيم عبده**

Abstract

Developed an AI-powered assistant that analyzes industrial process dynamics and recommends optimized PID controller parameters to support control engineers during controller tuning. The system evaluates process response characteristics—including rise time, settling time, overshoot, steady-state error, and control performance indices—to understand the behavior of the controlled system. Based on this analysis, it generates intelligent tuning recommendations that help engineers achieve improved control performance while reducing the time and effort associated with traditional trial-and-error tuning methods. The platform is designed as a decision-support tool, combining control engineering principles with artificial intelligence to simplify and enhance the PID tuning process.

AI-Assisted PID tuning system



قسم هندسة التحكم الصناعية

SmartSort: Smart Recycling Sorting System

تحت إشراف	أ.د. محمد إبراهيم عبده

Abstract

SmartSort AI is an intelligent industrial system designed to transform traditional sorting lines into data-driven smart production units using Artificial Intelligence (AI), Computer Vision, and Industrial Internet of Things (IIoT) technologies.

To validate the concept, a functional prototype of an automated recycling sorting machine was developed. The system classifies materials such as plastic, paper, cardboard, and metal using image processing techniques instead of relying solely on conventional sensors. A camera mounted above the conveyor belt captures images of each item in real time. These images are analyzed using AI-based classification algorithms to determine the material type. Based on the classification result, a mechanical actuator directs the item to its corresponding output channel.

Beyond physical sorting, the system collects operational data and transmits it to a smart monitoring dashboard, enabling factory owners to track real-time production rates, material distribution percentages, and system performance indicators.

Egypt generates more than 20 million tons of solid waste annually, while only a limited percentage is efficiently recycled due to inefficient sorting mechanisms. By increasing sorting accuracy and reducing material contamination, SmartSort AI enhances recycling efficiency and supports the transition toward smart manufacturing. The project

aligns with Egypt Vision 2030 by promoting digital transformation, sustainable industrial development, and resource optimization

سمارت سورت: نظام ذكي لفرز المواد القابلة لإعادة التدوير

SmartSort: Smart Recycling Sorting System

برنامج هندسة الأمن السيبراني و تحليلات البيانات	
Real-Time Endpoint Detection & Response System	
تحت إشراف	**ا.د/ نرمين البهنساوي**

Abstract

This project aims to develop an advanced malware detection system that relies on a hybrid approach combining real-time monitoring of system behavior and deep on-demand memory analysis. Instead of relying on traditional file scanning or continuously and resource-intensively pulling memory images, the system focuses on the dynamics of processes and their transformations over time.

The project aims to provide an efficient and fast security solution, capable of operating in enterprise environments as a detection and response tool (EDR). The system balances the 'lightness' of continuous monitoring with the 'power' of forensic investigation, ensuring immediate response to evolving threats and reducing the time gap between infection and detection.

برنامج هندسة الأمن السيبراني و تحليلات البيانات

AL-ARRAF: AI-Powered Fugitive Tracking System

تحت إشراف	ا.د/ نرمين البهنساوي

Abstract

"AL-ARRAF" is an advanced AI-powered security system designed to track fugitives and persons of interest by automating the analysis of CCTV surveillance footage. To overcome the limitations of manual video review, the system utilizes deep convolutional neural networks (specifically FaceNet) to extract high-dimensional facial embeddings from a single query image. It then leverages ultra-fast similarity search technologies, utilizing Facebook's AI Similarity Search (FAISS), to cross-reference this unique facial signature against massive databases of faces previously extracted from video archives. The system successfully reconstructs the subject's spatio-temporal trajectory, pinpointing their exact locations and times of appearance across multiple cameras. Developed with a strong emphasis on cybersecurity and data privacy, AL-ARRAF provides law enforcement with a rapid, precise, and secure digital forensics tool.

برنامج هندسة الأمن السيبراني و تحليلات البيانات	
SOC Model or Mini SOC Project	
تحت إشراف	د/ احمد المحلاوي

Abstract

In this project we try to simulate a real soc model ; we can use it in small company or startup company.

Menoufia University

Faculty of Engineering

Electronic Engineering Department

Menoufia University

Guide to Graduation Projects

Faculty of Engineering
Electronic Engineering Department

2025 / 2026

July 2026

Innovate | Create | Excel | Lead

إعداد وحدة تكنولوجيا المعلومات (IT Unit)

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