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Tatsuji Munaka
Graduate School of Information and Telecommunication Engineering, Tokai University

Can ChatGPT Simulate Dementia? Building Japanese Dialogue Data for Early Detection Models

Abstract

Japan's rapidly aging society has made early detection and preventive intervention of dementia increasingly critical for improving patients' quality of life and reducing caregiver burden. Conventional assessments rely on questionnaires and interviews in clinical settings, creating challenges related to evaluator expertise and limited opportunities for repeated testing. Recently, approaches to detecting cognitive decline from natural conversation have gained attention; however, Japanese-language dementia dialogue datasets remain scarce, hindering the development of machine learning–based evaluation models.

To address this gap, we generated synthetic dementia-like dialogues using ChatGPT, focusing on five core symptoms: memory impairment, disorientation, language disorder, impaired judgment, and executive dysfunction. These dialogues were then reformatted into NLP task structures—natural language inference, semantic similarity, and question answering—following the JGLUE benchmark framework. A Japanese BERT model was fine-tuned on these tasks, enabling classification of 20 dementia-specific speech features, including semantic confusion, confabulation, and misrecognition of persons or time.

To capture symptom progression over time, we applied time-series cross-validation and leave-one-out cross-validation (LOOCV) on one-week dialogue sequences. The time-series evaluation enabled the detection of gradual conversational changes, while LOOCV assessed generalization to unseen "virtual patients." This design demonstrated the potential of the model to track cognitive decline dynamics and supported its utility for individualized monitoring.

Our findings suggest that synthetic dialogue resources can help mitigate the scarcity of Japanese dementia speech data and establish a methodological foundation for future research. While results indicate feasibility for detecting conversational markers of dementia outside clinical environments, validation with real-world patient data remains essential. This study provides a first step toward scalable, language-specific tools for monitoring cognitive health in aging populations.

Biography

Tatsuji Munaka is a Professor at the Graduate School of Information and Telecommunication Engineering, Tokai University. He joined Mitsubishi Electric Corporation and worked until 2015. He received a DE degree in science and engineering from Shizuoka University, Japan, in 2003. One of his current research areas is the realization of healthcare services using IoT technology.

Hava Dayan (PhD, LLB)
School of Criminology, Faculty of Law, University of Haifa

Homicide Crimes Scene Staging: Forensic Challenges in Prosecution

Abstract

Homicide crime scene staging refers to the deliberate manipulation or alteration of a death scene with the intent to mislead investigators and obstruct the criminal justice process. By concealing the true nature of a crime—often transforming a homicide to appear as an accident, suicide, or natural death—offenders aim to evade detection and accountability. This behavior represents one of the most perplexing and intriguing facets of homicidal offending, yet it remains among the least systematically studied phenomena in forensic and criminological research. The implications of crime scene staging are profound. It can significantly hinder society's ability to accurately identify and classify homicides, leading to unsolved cases, wrongful conclusions, and miscarriages of justice. The deliberate misrepresentation of a crime scene introduces complex barriers for investigators and prosecutors alike, particularly when crucial physical evidence is altered, destroyed, or obscured. This presentation draws upon findings from an empirical study of 56 documented staging cases in the Israel between 1980 and 2019. It seeks to illuminate the unique criminolegal challenges associated with staged homicides, including the reliance on circumstantial evidence, the high threshold of proving guilt "beyond a reasonable doubt," and the loss or degradation of evidence due to both the act of staging and investigative shortcomings.

Dr. Jiaxin Cai
Associate Professor
Xiamen University of Technology
China

Later Temporal Attention in Computer Aided Medical Diagnosis

Abstract

The clinical course of COVID-19, as well as the immunological reaction, is notable for its extreme variability. Identifying the main associated factors might help understand the disease progression and physiological status of COVID-19 patients. The dynamic changes of the antibody against Spike protein are crucial for understanding the immune response. This work explores a temporal attention (TA) mechanism of deep learning to predict COVID-19 disease severity, clinical outcomes, and Spike antibody levels by screening serological indicators over time. We use feature selection techniques to filter feature subsets that are highly correlated with the target. The specific deep Long Short-Term Memory (LSTM) models are employed to capture the dynamic changes of disease severity, clinical outcome, and Spike antibody level. We also propose deep LSTMs with a TA mechanism to emphasize the later blood test records because later records often attract more attention from doctors. Risk factors highly correlated with COVID-19 are revealed. LSTM achieves the highest classification accuracy for disease severity prediction. Temporal Attention Long Short-Term Memory (TA-LSTM) achieves the best performance for clinical outcome prediction. For Spike antibody level prediction, LSTM achieves the best performance. The experimental results demonstrate the effectiveness of the proposed models. Simple factors like LDH, Mono%, ALB, LYMPH%, DM, and Sex are critical factors in disease severity. LDH, Neu#, hs-CRP, PLT, and Urea are critical factors in clinical outcomes. We further find that Age, RDW_CV, PLT, LDH, eGFR (CKD-EPI), LYMPH#,RDW_SD, PCT, and TCHO are the Top-9 significant predictors of the Spike antibody level. The proposed models can provide a computer-aided medical diagnostics system by simply using a time series of serological indicators.

Biography

Jiaxin Cai received his Ph.D. degree in Information and Computation Science from Sun Yat-Sen University in 2014. He also received his M.S. degree and B.Sc. degree in Bio-medical Engineering from Southern Medical University in 2011 and 2008 respectively. Currently, he is an associate professor in the School of Mathematics and Statistics at Xiamen University of Technology. He has authored over 50 peer-reviewed papers at academic journals and conferences such as IEEE Trans as the first author or corresponding author, including 3 ESI Top1% highly cited paper. His current research interests include machine learning, computer vision and bio-medical engineering.

Wild Freitas da Silva Santos
State University of Feira de Santana and SENAI CIMATEC University

Comparative Performance of Machine Learning Models Applied to Public Lighting

Abstract

Compliance verification with the Brazilian public lighting standard ABNT NBR 5101 is a fundamental requirement to ensure safety, visual comfort, and energy efficiency in urban environments. Traditionally, this verification relies on detailed photometric simulations, which, although accurate, are computationally expensive and limit scalability in large-scale projects. Previous studies have demonstrated the feasibility of using Multilayer Perceptron (MLP) neural networks as surrogate models to accelerate this process; however, it remains unclear whether neural networks represent the most efficient approach for structured, tabular lighting data. The aim of this study was therefore to systematically evaluate and compare neural network models and state-of-the-art tree-based ensemble algorithms applied to public lighting projects. Six machine learning models were analyzed: Multilayer Perceptron (MLP), Extreme Learning Machine (ELM), Random Forest, XGBoost, LightGBM, and CatBoost. The models were evaluated in two complementary tasks: regression of photometric parameters, including illuminance and uniformity for roadways and walkways, and binary classification of project compliance with ABNT NBR 5101 requirements. The analysis was conducted using a large real-world dataset comprising more than 500,000 simulated public lighting projects, covering a wide range of geometric, electrical, and photometric configurations. To assess robustness and generalization, three data scenarios were considered: the raw dataset, a winsorized dataset with capped extreme values, and a cleaned dataset obtained through statistical outlier removal. Results showed that tree-based ensemble models consistently outperformed neural networks in regression accuracy, particularly after data cleaning. CatBoost achieved the best overall performance, with a mean squared error of 0.1240,

corresponding to an error reduction of approximately 94% compared to the MLP, while also presenting a very low inference time of 0.09 seconds. In the classification task, all models achieved accuracies above 99%, although ensemble methods demonstrated substantially superior computational efficiency. This study provides a clear comparative analysis of machine learning approaches for public lighting applications and indicates that tree-based ensemble models, especially CatBoost, represent a more accurate, robust, and scalable alternative for automating public lighting compliance verification and supporting large-scale urban lighting optimization.

Biography

Wild Freitas da Silva Santos received his B.Sc. degree in Electrical Engineering from Universidade Salvador and his M.Sc. and Ph.D. degrees in Electrical Engineering from the Federal University of Bahia (UFBA), Brazil. He is currently an Assistant Professor at the State University of Feira de Santana (UEFS) and at SENAI CIMATEC University. He has more than ten years of professional experience in public lighting projects, with expertise in the design, analysis, and optimization of large-scale urban lighting systems, including Public–Private Partnership (PPP) initiatives. His research interests include the application of machine learning techniques to engineering problems, particularly in public lighting systems, photometric simulation acceleration, neural networks, extreme learning machines, tree-based ensemble models, energy efficiency, and smart cities. He has published scientific articles in journals and international conferences and is actively involved in research and development projects focused on intelligent and sustainable urban infrastructure.

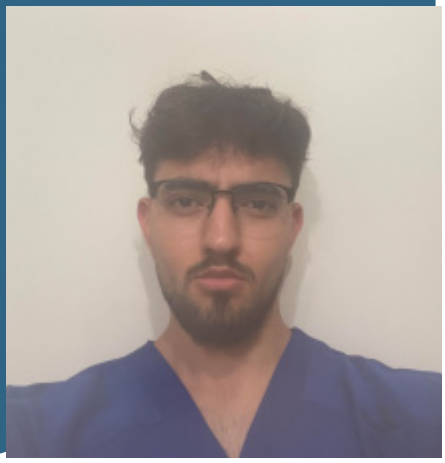
Zaid Mohammad Khrisat
Faculty of Arts and Educational Sciences, Middle East University (MEU), Amman, Jordan

An Edge-AI Smart System for Real-Time Anomaly Detection and Energy Optimization in IoT-Enabled Buildings

Abstract

Smart systems are increasingly deployed to improve operational efficiency, sustainability, and user comfort in connected environments. However, many Internet of Things (IoT) deployments still suffer from delayed decision-making, high cloud dependency, and limited robustness to sensor faults and cyber-physical anomalies. This paper proposes an edge-intelligent smart system that performs real-time anomaly detection and adaptive energy optimization for IoT-enabled buildings. The proposed architecture integrates heterogeneous sensing (temperature, occupancy, power consumption, and air-quality signals) with an edge-based machine learning pipeline that combines lightweight feature extraction, temporal modeling, and online adaptation. Anomaly detection is formulated as a hybrid approach that fuses statistical change detection with a compact deep sequence model to identify abnormal patterns caused by sensor drift, equipment malfunction, or unusual occupancy behavior. In parallel, an energy optimization module dynamically adjusts HVAC set points and ventilation schedules using a constrained control policy that balances comfort targets and energy cost. A prototype implementation was developed using edge hardware and MQTT-based communication to ensure low-latency processing and resilient connectivity. Experimental evaluation on real and semi-synthetic datasets demonstrates that the system achieves high detection performance while maintaining near-real-time inference, and reduces energy consumption without violating comfort constraints. The results highlight the practicality of deploying smart systems with edge AI to enhance reliability, privacy, and responsiveness in modern cyber-physical environments. Future work will extend the framework with federated learning and security-aware adaptation to support large-scale smart cityapplications.

Keywords
Smart Systems; IoT; Edge AI; Anomaly Detection; Energy Optimization; Cyber-Physical Systems; Smart Buildings.



Yousef H. Hindi
New Vision University, Faculty of Medicine, Tbilisi, Georgia

Enhancing Forensic Blood Spatter Education through Simulation-Based Approaches

Abstract

Blood spatter pattern analysis (BPA) is critical in criminal investigations, but traditional teaching methods limit opportunities for hands-on learning and skill development. Artificial intelligence (AI) offers possibilities to improve tools and expand practical training opportunities for forensic students. This study aims to examine the effectiveness and potential of AI simulations in forensic blood spatter education. From a perspective standpoint, integrating simulation-based approaches into BPA education could provide students with interactive and controlled opportunities to explore blood spatter patterns. By allowing learners to adjust variables such as angle, force, and surface type, these approaches can help refine analytical skills and deepen understanding of spatter principles. Interactive simulations also offer repeated practice in a safe environment, complementing traditional hands-on exercises and exposing students to a wider variety of scenarios than might otherwise be feasible. These innovations have the potential to enhance critical thinking, problem-solving, and confidence in analyzing blood spatter. They can also support flexible learning, including remote or self-directed practice, making high-quality forensic education more accessible and engaging for a broader range of students. In conclusion, adopting simulation-based strategies in blood spatter education could effectively supplement conventional teaching methods. By providing immersive, repeatable, and controlled learning experiences, these approaches may better prepare students for practical forensic work and contribute to the ongoing development of forensic training. Further exploration will be valuable to determine how best to implement these strategies for maximum educational impact.

Biography

Dr. Ronit Ilouz is an Assistent Professor at the Azrieli Faculty of Medicine, Bar-Ilan University. Her research focuses on spatial signaling mechanisms in cancer and neurodegeneration, combining quantitative imaging, proteomics, and structural biology to identify clinically relevant biomarkers. She has contributed to defining Protein Kinase A (PKA) dysregulation in human disease, including lesion-specific biomarkers in prostate cancer.

Carlos GÁLVEZ MADRID
Policía de Investigaciones de Chile

Forensic characterization of deaths caused by high-altitude falls in Chile: Analysis of victim characteristics, injury patterns, and crime scene features

Abstract

First, a retrospective study (2016–2023) characterized 488 falls-related deaths in Chile. The findings indicated a predominance in men (72.3%) and adults (30–59 years old), with suicide being the main etiology (66.0%). Furthermore, 55 police cases were analyzed, where the injury analysis showed a high percentage of head impacts (42.6%) and multiple trauma as the most frequent cause of death (58.2%). The analysis of the scene identified balconies and windows without railings as the most common points of ejectment. The study provides the first national characterization of the phenomenon, highlighting the crucial association with mental health disorders and offering objective tools for criminal investigation. In addition, a mathematical equation was proposed that allowed empirical data on height and horizontal reach to be related, serving as a tool for evaluating cases of deaths due to falling from height.

Biography

Police Officer in Policía de Investigaciones de Chile (PDI), with over 15 years of experience in violent deaths investigations. Holds a Master's degree in Forensic Science from the University of Valencia. Holds a postgraduate degree in the Investigation of Crimes Against Persons (PDI), specializing in the investigation of homicides and crimes against human rights.

Mohammed S. ALrheem[1], Doaa A. Mansour [2] Asma O. Jebril [2]

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New HS-GC/FID and traditional enzymatic methods for Blood alcohol analysis in Myocardial Infarction patients: A comparative study in Libya

Abstract

Background and aims: In a state of Libya, alcohol intake is strictly prohibited by law and the presence of any detectable concentrations is illegal. For those people who suffer myocardial infractions (MI), determination of any detectable blood alcohol concentrations (BAC) is considered crucial, as data will be used evidence in a court of law. The selection of the efficient technique used for alcohol concentration determination is very important and any false results strictly cannot be acceptable when dealing with country laws. In Libya, since long time ago, Lactate dehydrogenase (LDH) enzyme technique has been chosen as the most valuable one used in determination of (BAC) in patients of (MI). However, when LDH concentration significantly exceed the typical levels of 800 IU/L, such technique is not appreciable compared to the recommended Head space-gas chromatography/flame ionization detector (HS-GC/FID) technique, since causes significant and falsely elevated results which may also lead to false convictions.
In this study, the efficiency of the new HS-GC/FID technique and the traditional (LDH) enzyme technique were examined for (BAC) concentrations detections at some hospitals of Tripoli city in Libya state.

Methods: The study targeted 48 individuals, of which half of them were (MI) patients. The obtained data were statistically evaluated using IBM SPSS Version 21 program. Median of data was calculated using descriptive analysis, and comparative analysis between groups was carried out using Mann-Whitney U test.

Results: Differences are considered statistically significant at $p<0.05$. As a result, the (BAC) (mg/dl) data for healthy and (MI) patients statistically showed a significant difference ($p<0.05$) using the (LDH) enzymatic method. Whereas, there were no significant upon using the (HS-GC/FID) technique. Pearson coefficients correlation (R2) of (LDH) levels against (BAC) concentration was 0.76 indicating somewhat strong positive relation, proving that when (LDH) levels in blood increases, the (BAC) concentration also increase.

Conclusions: It is recommended that future studies should concentrate on a large size of samples. Besides, great attentions should be payed to techniques with higher accuracies in results such as (HS-GC/FID) technique, mostly when dealing with forensic analysis.

Key Words: Blood Alcohol Contents (BAC), Myocardial infractions (MI) patients, Lactate dehydrogenase (LDH), Head space-gas chromatography/flame ionization detector (HS-GC/FID) technique.

Behrouz Vaseghi
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Security in the Transmission and Reception of Forensic Medical Images with an Emphasis on Chaos-Based Encryption

Abstract

In today's digital era, forensic medical images have become one of the most vital tools for establishing truth in legal proceedings. Let me address the topic in the requested order. 1- The Importance of Medical Images in Forensic Medicine Forensic medical images—including autopsy photographs, plain radiographs, CT scans, MRI, histopathological microscopic images, and even 3D reconstructions—form the foundation of many forensic opinions. These images provide objective, undeniable evidence that can determine cause of death, type of injury, timing of injury, victim or suspect identity, and even crime mechanism. In criminal cases, accidents, abuse, or suspicious deaths, these images are often the only evidence capable of confirming or refuting verbal accounts. Without highquality, reliable images, many cases reach dead ends and justice is not served. In recent decades, advances in imaging technology have dramatically increased the volume and precision of these images, making their role in courts even more prominent.

2- The Importance of Authenticity of Forensic Medical Images in Their Transmission and Reception One of the greatest challenges of the digital age is the possibility of image manipulation. A minor pixel alteration can completely change an image's meaning—for example, removing a bone fracture or adding a foreign object. In forensic medicine, authenticity and integrity mean preserving the chain of custody. When images are sent from laboratory to expert, from expert to court, or in international consultations, risks of interception, tampering, or substitution exist. If an image is altered in transit, it may lead to unjust verdicts, acquittal of the guilty, or conviction of the innocent. Therefore, ensuring confidentiality, integrity, and authenticity during transmission and reception is

not only a technical necessity but also an ethical and legal imperative.

3- Encryption Techniques for Forensic Medical Images Several encryption techniques are used to protect forensic medical images during transmission: - Full encryption using standard algorithms such as AES-256 or RSA, converting the image into unreadable data. - Selective encryption that encrypts only diagnostically important regions (ROI) to reduce processing load and preserve DICOM format. - Digital watermarking and digital signatures for authenticity and integrity assurance. - Combination of hashing (e.g., SHA-256) with encryption to detect any alteration. These methods are widely applied in telemedicine and hospital PACS systems.

4- Drawbacks and Limitations of Conventional Methods in Forensic Medical Image Encryption Despite their effectiveness, traditional methods have significant shortcomings: - The large size of medical images (megabytes to gigabytes) makes full AES encryption computationally intensive and time-consuming, especially for real-time transmission. - These methods often destroy the standard DICOM format, requiring full decryption before viewing.- Key space is relatively limited and more vulnerable to brute-force or differential attacks on large datasets. - High pixel correlation in medical images means traditional block ciphers cannot adequately randomize data and are weaker against statistical attacks. - Key management in multi-user environments (e.g., international consultations) is complex and risky. These limitations have driven researchers to seek newer, more efficient approaches.

5- Introduction to Chaotic Systems and Forensic Medical Image Encryption Using Keys Generated by Chaotic Systems Chaotic systems are nonlinear dynamical systems that exhibit apparently random yet fully deterministic behavior. Their extreme sensitivity to initial conditions (the butterfly effect) is the key property. In image encryption, one-dimensional (e.g., Logistic Map), two-dimensional (Henon Map), or three-dimensional (Lorenz System) chaotic maps are used to generate pseudorandom sequences. The typical process involves two stages: - Confusion: Pixel position shuffling using the chaotic sequence (permutation). - Diffusion: Pixel value alteration via XOR or modular addition with the chaotic sequence. The encryption key consists of the chaotic map parameters and initial conditions (e.g., x_0 and r in the Logistic Map). These methods are particularly suitable for large, highly correlated medical images. Numerous recent papers in journals such as Chaos, Solitons & Fractals and MDPI have validated their effectiveness.

6- Advantages of Chaos-Based Encryption Methods for Forensic Medical Images Chaos-based methods offer significant advantages over traditional approaches: - Very large key space: Use of high-precision floating-point initial conditions (e.g., 10^{-14}) creates a vastly larger key space than AES, making brute-force attacks practically impossible. - Extreme key sensitivity: A tiny change in the key produces a completely different

ciphertext (excellent avalanche effect). - High resistance to statistical and differential attacks: Chaotic sequences have uniform distribution and very high randomness.- Better computational efficiency: Permutation and diffusion operations are highly parallelizable and faster for large images. - Preservation of diagnostic quality: Hybrid approaches can selectively encrypt sensitive regions without loss of diagnostic information. - Flexibility: Can be combined with DNA coding, neural networks, or quantum algorithms for enhanced security. Consequently, these methods provide not only higher security but are also ideal for real-time forensic and telemedicine applications.

Ken Munro
Lancaster University, United Kingdom

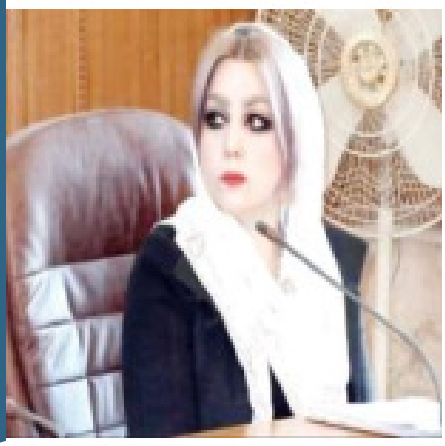
Flirting with AI: Pwning web sites through their AI chatbot agents and politely breaking guard rails

Abstract

Everyone is implementing AI chatbots to improve their customer experience and journey, without increasing call centre costs. But this comes with risk: get the configuration wrong and that chatbot can be convinced to part with data that it shouldn't. We think of conventional cyber security controls as being binary, yet AI can sometimes hallucinate, lie and mislead. It's a brave organisation that would trust their perimeter security exclusively to AI. We'll include some live demos to illustrate the problem and how to penetration test AI.

Key takeaways:

- AI chatbots can be manipulated into disclosing sensitive data if their configuration is weak.
- Unlike traditional security controls, AI systems can hallucinate, mislead, or bypass intended guardrails.
- Organisations should never rely on AI chatbots alone for perimeter security and must apply layered defences.



Zainab Khalid Mohammed, Zarkoosh
Ministry of Water Resources, Directorate of Planning and Strategic Follow-up, Iraq

Smart Grid Technologies: Enhancing Energy Systems for a Sustainable Future

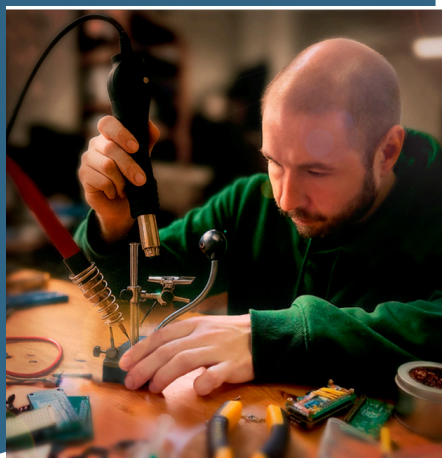
Abstract

Modernizing traditional power systems with smart energy and grid technologies is crucial to address growing energy demands, the integration of renewable energy, and the need for improved grid reliability and efficiency. This paper explores advancements in smart grid technologies, including advanced metering infrastructure (AMI), demand response systems, renewable energy integration, energy storage, and data analytics. We examine these technologies' potential to optimize electricity generation, transmission, and distribution, enhance grid resilience, and promote sustainability. The paper also discusses challenges and opportunities in smart grid deployment, including cybersecurity, regulatory frameworks, and economic considerations. The increasing global energy demand and the transition to cleaner sources necessitate a shift in power system management. Traditional grids struggle with the complexities of distributed and intermittent renewables. Smart grid technologies offer a more dynamic and intelligent energy infrastructure. Advanced metering infrastructure (AMI) is a cornerstone, enabling real-time, two-way communication between utilities and consumers. This allows for accurate billing, improved forecasting, and sophisticated pricing. Demand response systems use this capability to incentivize consumers to adjust electricity use, reducing peak demand and grid stress. Smart grid technologies also manage the variability of renewable energy sources like solar and wind through advanced controls, forecasting, and energy storage, enhancing grid stability. The data generated by smart grids offers opportunities for analytics to improve grid operations and predict outages. However, the transition to smart grids presents challenges. Cybersecurity is paramount, requiring robust measuresto protect grid infrastructure. Regulatory frameworks must evolve to

accommodate new technologies, and the economic viability of smart grid investments needs careful evaluation.

Biography

Zainab Khalid Mohammad is pursuing a doctorate in Information and Communication Technology at UNITEN, Malaysia. She holds a master's degree in Computer Engineering from JNTU, India, and certifications in Total Quality Management (TQM) and ISO 9001:2015. Zainab also pursued an aviation license at an aviation academy. She specializes in network server installation, maintenance, and security at the Iraqi Ministry of Water Resources. Her skills include cloud computing, website design, software development, and smart device applications. Zainab's interests include AI, IoT in natural disasters, Smart Cities, Intelligent Transportation, Circular Economy, and Cyber Security, with a particular interest in robotics and aviation. Zainab has been nominated for leadership roles in Saudi Arabia and Geneva as Director of Science and Technology, and is an active member of the Al-Nahrain Association of Iraqi Scientists in the USA. Her research centers on decision-making strategies, network security, and data analytics techniques, with a focus on their applications in robotics and aviation.



Amir Fatkulin
USBridge Technologies , Spain

USBridge: A Secure Edge Computing Device for Encrypted Remote Control and Autonomous Data Recovery

Abstract

Modern computing has become paradoxical: the more connected we are, the less control we truly have. Cloud dependency, remote locks, and ransomware have eroded user sovereignty over personal and professional machines. USBridge redefines this relationship by introducing a fully encrypted, standalone edge bridge that restores autonomy and trust between humans and computers. Built on a Radxa-based embedded platform, USBridge establishes a direct TLS 1.3/QUIC tunnel between a user and their remote system, enabling secure KVM control, ISO/NBD disk streaming, and autonomous Btrfs snapshot recovery — all without cloud services or external servers.

Unlike conventional cloud-based KVM or backup tools, USBridge performs all encryption, tunneling, and versioning locally, ensuring that no sensitive data ever leaves the user's encrypted domain. Its cross-platform client (Android, Linux, macOS, Windows, iOS) delivers real-time H.265 video, HID input, and instant rollback management, forming a seamless offline-first control ecosystem. This presentation demonstrates how localized encryption and peer-to-peer architecture can outperform centralized remote-desktop systems in latency, throughput, and resilience — proving that privacy and performance are not mutually exclusive.

Biography

Amir Fatkulin is an independent engineer and researcher from Ukraine, currently residing in Spain. His work focuses on embedded systems, data security, and human–machine interaction. With over a decade of experience in developing integrated hardware–software solutions for data protection and autonomous control, he now leads the development of USBridge, a compact encrypted KVM bridge that enables secure remote operations, system restoration, and resilient data management at the edge.

Elena Griffor
Grenoble-Alpes University

IoT Information Assurance Engineering Use Cases

Abstract

The vision for IoT is that they can be composed and integrated into larger IoT systems. This includes ensuring their outputs are acceptable as inputs of other systems but also ensuring that critical information assurance concerns are addressed in the composed system. The goal of the information assurance framework for Design and Development of Information Assurance for IoT is to provide a structured approach to information assurance aligned to the characteristics and information states of an Information Assurance model to assist designers and developers. The result of using this framework to design and develop IoT is that one can assess whether key risks to information have been addressed. Using this framework ensures that the components of an IoT, once combined, satisfy requirements related to the chosen information assurance characteristics. This paper describes the software implementation of that information assurance framework and illustrates its use in applications to Transportation, Medical, and Sports IoT development. The proposed software-based tools address the complexities of IoT systems and the challenges of Information Assurance to ensure a consistent and comprehensive information assurance practice. Applied broadly in an IoT domain, this will contribute to the interoperability of IoT devices and systems. The implementation presented here uses Python 3.11 for the codebase, Visual Python for the graphic user interface (GUI), and a JSON schema for the storage and retrieval of IA analyses of IoT.

Biography

Elena Griffor will defend her Ph.D. in the Spring of 2026 from GrenobleAlpes University and holds MBA and MS in Information Assurance from the University of Detroit/Mercy. She is the CEO of MedVital, a medical IoT solution provider, and has published in Information Assurance since 2023.

Francisco Pérez-Hernández
Associate professor, Finance Department, EAE Business School, Madrid, Spain

A hybrid model integrating artificial neural network with multiple GARCH-type models and EWMA for performing the optimal volatility forecasting of market risk factors

Abstract

The 2008 financial crisis has highlighted the lack of precision in the market risk metrics that financial institutions must report to the regulator. The use of Machine Learning techniques in stock markets and the treasury (Front–Back Office) of financial institutions is a key tool for optimizing its own resources, internal processes and risk measures. We propose a hybrid methodology to better capture the volatility of market risk factors with Value-at-risk models in periods of stress, but also in periods of stability compared to traditional metrics. This hybrid model uses different types of artificial neural networks and traditional metrics to perform the optimal forecast of volatility applied to the main market risk nodes of the Spanish stock market. We use data from the following main market risk factors: returns on Santander Bank shares, the Spanish Stock Market Index, Euro/Dollar exchange rates and the index that measures the total return performance of a funded long credit position in the on-the-run iTraxx Crossover 5-Year-Index. Our contribution is a hybrid model that combines correct sequential pattern learnings with an improved prediction performance in the volatility of market risk factors. Our findings show that the Support Vector Machine and the Long-Short-Term Memory Model present better prediction results in all factors in the stability periods. Therefore, the proposed method is promising for application in risk management systems.

Xianbo Jiang
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Application of the Qwen1.5B and Qwen3B Pretrained Large Models in Detecting Illicit Bitcoin Transactions

Abstract

Cryptocurrencies such as Bitcoin have gained widespread popularity due to their anonymity and decentralized architecture, yet these same features also create opportunities for illicit activities, posing significant threats to global financial security. This study investigates the use of the pretrained language models Qwen1.5 and Qwen3B, in combination with the BitcoinElliptic dataset, to enhance the precision and efficiency of detecting illegal Bitcoin transactions through comprehensive extraction and analysis of transaction features. We first reconstruct transaction relationships and attributes into structured textual representations, then fine-tune Qwen1.5 and Qwen3B to adapt them to the detection task. Experimental results demonstrate that both models substantially outperform traditional machine-learning approaches across accuracy, precision, recall, and F1-score. These findings highlight the considerable potential of pretrained language models for blockchain data analysis and show that they can provide robust technological support for combating illicit activities while strengthening anti–money-laundering and counter-terrorism financing efforts.

Biography

He completed his Master's degree at Beijing University of Posts and Telecommunications (BUPT) in 2020. He is the chief of XXXX, a head Bio-Soft administration association. He has published more than 10 academic papers focusing on Bitcoin analysis and mobile device forensics.

Anabella De La Chica
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Enhancing Forensic DNA Workflows Through Interdisciplinary Collaboration: Integrating Laboratory Performance, Operational Needs, and Law Enforcement Priorities

Abstract

Effective forensic DNA delivery relies not only on scientific excellence but also on operational workflows, police requirements and realistic resource allocation. Despite this, the forensic literature often separates laboratory validation from the practical and financial pressures faced by law enforcement agencies. This research addresses this gap by adopting a deliberately interdisciplinary approach, combining laboratory evaluation, workflow mapping and end-user consultation to optimise DNA reference sample collection and processing in small or resource-limited jurisdictions.

Three DNA reference collection pipelines were assessed: a standard buccal swab workflow requiring extraction, an FTA-based EasiCollect system and a direct amplification Swab Lysate method using Go! Lysis Buffer. Each method was evaluated using key STR performance indicators (heterozygote balance, peak height ratio, peak area and stutter ratio) alongside an analysis of time, labour demand, storage requirements and practical constraints identified through engagement with police personnel and forensic practitioners. Statistical analysis confirmed significant differences in STR profile quality across workflows, with EasiCollect demonstrating superior balance metrics and direct amplification offering substantial efficiency benefits.

Beyond laboratory outcomes, this study incorporates operational and financial perspectives that are rarely integrated into forensic method evaluation. Police officers,

evidence submitters and laboratory staff were consulted to identify bottlenecks in sample storage, sample transport, administrative burden and outsourcing delays. These insights were then combined with cost-based modelling to determine the real-world value of alternative workflows, demonstrating how scientific optimisation can directly address law enforcement pain points. The findings show that improved workflows, particularly FTA-based systems and direct amplification, can reduce cold-storage reliance, streamline submission processes, shorten turnaround time and lower overall resource use.

This integrated method of combining laboratory experimentation with operational insight and business-case assessment provides a decision-making framework applicable to any jurisdiction seeking to modernise or scale forensic DNA services. It also demonstrates a model of collaborative research in which law enforcement needs actively shape scientific inquiry, ensuring that proposed solutions are not only effective in the laboratory but also feasible, sustainable and aligned with policing realities.

By bridging disciplines that are typically siloed, this research contributes a novel perspective to forensic science, highlighting the importance of end-user engagement and demonstrating the value of joint approaches between forensic scientists and law enforcement agencies.

Biography

Anabella De La Chica is a final-year PhD researcher at Liverpool John Moores University specialising in forensic DNA workflow optimisation and interdisciplinary collaboration between forensic scientists, policing agencies and service providers. Her research uniquely integrates laboratory validation with operational assessment and business-case analysis to improve the efficiency, sustainability and real-world usability of DNA pipelines, particularly for small or resource-limited jurisdictions.

Before beginning her PhD, Anabella worked for nearly three years as a molecular microbiologist during the COVID-19 pandemic, screening the population of Gibraltar and contributing to the territory's SARS-CoV-2 genome sequencing programme using next-generation sequencing to identify circulating variants of concern.

She has one published paper, another currently under review and two further manuscripts expected for submission next year. Her broader interests include end-user-driven forensic innovation and the translation of scientific methods into operational policing contexts.

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Forensic Sciene Laboratory (FSL), Delhi, India

Maintaining Evidence Integrity in Real-World Crime Scene Operations: Operational Challenges and Field-Driven Practices

Abstract

Preservation of evidence integrity is fundamental to reliable forensic analysis and judicial outcomes. In operational crime scene environments, particularly within metropolitan settings, practical challenges such as limited resources, dynamic scene conditions, inter-agency coordination, and variations in evidence handling practices can influence the continuity and management of forensic exhibits. Emphasis is placed on practical approaches to maintaining chain of custody, minimizing contamination risks, and ensuring accurate documentation from scene processing to laboratory submission. Field-informed insights and adaptive best practices highlight strategies that strengthen collaboration between forensic professionals and investigating agencies, ultimately enhancing the reliability and admissibility of forensic evidence.

Biography

Dr. Monu Kumari is a Scientific Officer at the Forensic Science Laboratory (FSL), Government of NCT of Delhi. She completed her Ph.D. in Life Sciences (Biotechnology) from PGIMER, Chandigarh, focusing on dye-based analytical approaches for biomarker detection and translational diagnostics. Her expertise spans clinical biochemistry, analytical methods, and applied forensic science. She has authored multiple peer-reviewed publications and received the Best Oral Presentation Award at ICMS 2024 (AIIMS, New Delhi). In her current role, she is involved in crime scene examination, evidence documentation, and scientific reporting, combining research-driven analytical expertise with practical forensic application.

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Quantum-Resistant Cryptography for SCADA Systems: Enhancing Security in the Quantum Era

Abstract

Industrial control systems (ICS) are predominantly SCADA systems, which play a vital role in managing critical infrastructure tasks like energy, water, and transportation. Quantum computing advancements have exposed conventional cryptographic algorithms like RSA, DSA and ECC to significant security risks. This work discusses the potential use of quantum-resistant cryptography to handle future risks in SCADA systems. This manuscript proposes an architecture for SCADA System with IEC 60870-5-104 and QKD-Enabled Encrypted Communication, reviews the quantum-proof algorithms and protocols, analyzes the challenges associated with legacy system transitions, and suggests ways to upgrade SCADA security using post–quantum cryptography.

Biography

Dr. Asha Durafe has finished her M.Tech in 2011 from V.J.T.I., Mumbai India and PhD in year 2022 from SPSU, Udaipur, India. She is a Certified Ethical Hacker from EC Council. She is working as I/C HoD in Electronics and Computer Science Department of Shah & Anchor Kutchhi Engineering College, Mumbai, India. She has Published more than 30 papers in International Journals and conferences and has published 4 patents in the research field.


Thank You