



Proceedings & Abstracts of Papers

Organized by Department of
Forensic Sciences

Kristu Jayanti College,
Autonomous Bengaluru,
Karnataka

INTERNATIONAL CONFERENCE ON ADVANCES IN FORENSIC SCIENCE

ICAFS 2024 (HYBRID MODE)



1st & 2nd
February 2024

Post conference
workshops
3 February 2024



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Edited by

Suchita Rawat, PhD

Aditi Mishra, MSc(NET)



INTERNATIONAL CONFERENCE ON ADVANCEMENTS IN FORENSIC SCIENCE

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Department of Forensic Science
Kristu jayanti college, Autonomous
Bengaluru, Karnataka-560077



INTERNATIONAL CONFERENCE ON ADVANCES IN FORENSIC SCIENCE



Prof. Lorna Dawson

Head, Forensic Soil Science The James Hutton Institute, United Kingdom

Topic

The use of Soil in Criminal Investigations



Dr. S. K. Karthik

Professor and Head of the department, Forensic medicine and Toxicology, Dr. B. R. Ambedkar Medical College, Bengaluru.

Topic

The Art of Truth: Virtopsy's Digital Canvas in Forensic Inquiry



Mr. Renju Varghese

VP of Forensic & R&D, SISA Bengaluru, India

Topic

Digital Forensics in Artificial Intelligence



Dr. Deepak V

Head, Department of Forensic Dentistry, MR Ambedkar Dental College, Bengaluru, India

Topic

Faces, Fingerprints and Beyond: The Timeless Need for Human Identification



Dr. L. Shashikumar

Scientific Officer, Biology Section, Regional Forensic Science Laboratory, Mysuru, India

Topic

Potential Utility in Forensic Entomology



1st and 2nd February 2024



9.30 AM - 5.00 PM

HYBRID MODE

PREFACE

About the college

Kristu Jayanti College, founded in 1999, is managed by "BODHI NIKETAN TRUST", formed by the members of St. Joseph Province of the Carmelites of Mary Immaculate (CMI). The College is affiliated to Bengaluru North University and is ++ reaccredited with grade A in 2021 by NAAC in the Third Cycle of Accreditation. The college is recognized by UGC under the category 2(f) & 12B. The College has been accorded Autonomous Status since 2013 by the University Grants Commission, the Government of Karnataka & Bangalore University. In the NIRF 2023 colleges rankings, the college was placed among the top 100-150 colleges in the country and is one of the five colleges from Karnataka featured in the ranking. The college was accorded 'DBT Star College status under the strengthening component by the Department of Biotechnology, Ministry of Science & Technology, Government of India. The institution received first prize at the National Level for 'Clean and Smart Campus Award' from Shri. Dharmendra Pradhan, Minister of Education, Govt. of India. In the India Today - MDRA survey 2023, Kristu Jayanti College, Bengaluru is consecutively ranked as the Best Emerging College of the Century at National Level for Commerce, Science, Arts and Social Work. At the National level, the survey ranked the college as 4th Best in BCA, 12th Best in MSW, 20th Best in Arts, 21st Best in BBA, 22nd Best in Commerce, 28th Best in Science and Mass Communication Programmes. The College is ranked as 2nd best in MSW, 3rd best in Commerce, Arts & BCA, 4th best in Science, 6th best in Mass Communication and 7th best in BBA programmes among the colleges in Bengaluru. The college strives to provide educational opportunities to all aspiring youth to excel in life by nurturing academic excellence, fostering values, creating civic responsibility, inculcating environmental concern and building global competencies in a dynamic environment.

About the department

The Department of Forensic Science initiated the B.Sc. Forensic Science programme in the year 2019. Since then the department has grown in terms of infrastructure, faculty and students. Conferences, workshops, seminars, invited talks and the like are organised regularly to keep the students abreast with the knowledge in forensic science. The department has initiated the M.Sc. Forensic Science programme in the year 2022 and a dual major programme of Forensic Science and Biotechnology in 2023. The department is backed by laboratories with state of the art facilities. Instrumentation for forensic physics, biology, chemistry, questioned documents, fingerprints, crime scene investigation, psychology, biotechnology and digital forensics are adequately available. The department strongly believes in practical exposure and expert guidance and therefore engages the students with hands on experience and expert talks from across the globe.

About the conference

The International Conference on Advances in Forensic Science will ensure that the recent developments in the field are tested and brought to this forum which will benefit the practice of forensic science across the globe. This conference is the third conference organised by the Department of Forensic Science since its inception. The conference will be held in the hybrid mode. Oral presentations and plenary sessions will be held in both online and offline mode. The conference aims to provide a forum for the exchange of innovative ideas on research and developments made in the different domains of forensic science. The conference aims to strengthen the practice of forensic science around the globe whilst providing a platform for researchers from diverse fields to share their research findings. With an array of sub themes, this conference is a great platform for researchers and budding scientists. The conference will be followed by a full day workshop. The workshop will be conducted on Digital Forensics, Disaster Victim Identification, and Advanced Forensic Instrumentation.



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Message from the Patron



Fr. Dr. Augustine George
Principal,
Kristu Jayanti College,
Autonomous
Bengaluru, Karnataka

I am elated to learn that the Department of Forensic Science, Kristu Jayanti College, Autonomous is organising an International conference on “Advances in Forensic Science” in Hybrid mode on 1st and 2nd February 2024. The focal theme of the conference is diverse and has contemporary relevance. I have always been fascinated by the applications in the field of Forensic Science and its impact on shaping the criminal justice system which in turn benefits the society. Forensic Science has emerged as a major facilitator in the criminal justice system and its efforts to address the various challenges in investigation of crime. From exciting breakthroughs in DNA analysis to innovative techniques in crime scene investigation, this conference promises to be a platform for cutting-edge research and collaboration. Join us as we explore the latest developments in forensic science, exchange ideas with fellow professionals, and learn from experts who are shaping the future of this critical field. Whether you are a seasoned forensic scientist or just beginning your career in this field, this conference will provide valuable learning opportunities through keynote speeches, presentations, and interactive workshops. Together, let us deepen our understanding of forensic science and its impact on solving crimes, delivering justice, and ensuring the safety of our communities. We look forward to seeing you at the conference and engaging in fruitful discussions that will further advance the practice of forensic science. I am sure that our highly committed and efficient faculty would ensure that all the participants of the international conference would be immensely benefitted from the intellectual exchanges and academic deliberations. I invite one and all for this conference on Advances in Forensic Science and hope that it will catalyse new relations, ventures and associations. I congratulate the conveners of this conference and all the faculty members in the Department of Forensic Science in organizing this conference and wish them all the very best.

Message from the Dean



Dr. Calistus Jude AL
Dean
Faculty of Sciences,
Kristu Jayanti College,
Autonomous
Bengaluru, Karnataka

The Conference on Advances in Forensic Science aims to bring together experts and practitioners from various fields to discuss the latest developments and advancements in forensic science. The conference will provide a platform for professionals to share their research findings, case studies, and best practices in forensic science. Participants will have the opportunity to engage in discussions and networking with leading experts in the field. Topics to be covered include Virtual Autopsy, Soil Analysis, Digital Forensics in Artificial Intelligence, Personal Identification and Forensic Entomology. The conference will also feature workshops and demonstrations to provide hands-on experience with cutting-edge forensic tools and techniques. Attendees can expect to gain valuable insights into emerging trends and challenges in the field, as well as practical strategies for improving investigative processes and evidence analysis. The Conference on Advances in Forensic Science offers a unique opportunity for collaboration and knowledge sharing, fostering advancements in the field and ultimately enhancing the accuracy and reliability. We extend our best wishes to all the participants of the conference. We hope that the diverse discussions and networking opportunities have provided valuable insights and inspiration for your work in the field of forensic science. All the best in your future endeavors and may you continue to contribute to the ongoing advancements and innovation in forensic science.

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ICAFS-OP-DF-01: Internet of Things: A Friend or a Foe?

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ABSTRACT

We are living in a digital age, where we are witnessing different types of technologies, one amongst them is the Internet of Things (IoT). IoT refers to the networked interconnection of everyday objects which are often equipped with ubiquitous intelligence, like smart TV, smartwatch, Alexa, Siri, etc. The recent advancements in hardware and information technology have accelerated the deployment of interconnected smart and adaptive devices in critical infrastructures like health, transportation, home automation, etc. Transferring data over a network without requiring any kind of human-to-human or human-to-computer interaction brings more reliability and convenience to consumers. However, it opens up a new threat and opportunity for adversaries, which imposes a new question to digital forensics. The IoT data could be a rich source of evidence, coming with diverse problems like the huge variety of devices, end-to-end encryption, right to privacy, etc. Due to its volatile nature, digital evidence must be acquired and analyzed using validated tools and techniques to ensure the chain of custody. Therefore, the purpose of this study is to identify and discuss the main issues involved in the complex process of IoT-based investigations.

ICAFS-OP-DF-02: Forensic Exploration of Paytm: Mapping Digital Footprints in Financial Application

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ABSTRACT

In today's digital age, where financial landscapes are increasingly shaped by technology, the Paytm application emerges as a trailblazer, facilitating seamless transactions. This study takes a deep dive into the intricate digital realm of Paytm, where the fusion of financial transactions and advanced security measures presents a significant challenge for forensic experts. The incorporation of passwords and fingerprints within these applications adds a layer of complexity, requiring a nuanced forensic approach. Our research is dedicated to unraveling these encrypted layers, meticulously extracting vital digital forensic traces like account IDs, account names, associated banks, and transaction details. Beyond shedding light on the technical intricacies specific to Paytm, our study contributes to the broader field of digital forensics. It promises advancements that not only enhance our understanding of Paytm's inner workings but also strengthen our collective ability to combat the ever-evolving cyber threats in the realm of financial technologies.

Keywords: Paytm, Digital Forensics, Financial Transactions, Cyber Threats, Fintech Security, Cybercrime in Financial Technologies

ICAFS-OP-DF-03: Digital Forensics in the Modern Era: Advancements, Challenges and Prospects

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ABSTRACT

Digital forensics is the application of forensic and scientific knowledge to retrieve information legally from any digital device such as computers and smartphones, and then presented as a piece of evidence in the courtroom. It encompasses domains like network forensics and memory forensics and plays a crucial role in retrieving legal information from digital devices. As cyber threats rise, forensic experts face challenges in the interconnected realms of data recovery and carving. Recent advancements demand extending digital forensic techniques to diverse subdomains, including mobile devices and databases. This paper evaluates the existing state of Digital Forensics, highlighting technical challenges and proposing future research directions. It includes the current advancements in fields like Internet of Things (IoTs) forensics, cloud forensics, Big Forensic Data, memory forensics, network forensics, and challenges associated with these fields. It advocates for a standardized approach through a high-level abstract meta-model and highlights the importance of a centralized tool repository for sustained accessibility and development in the field.

Keywords: Digital Forensics, Network Forensics, Internet of Things, Big Forensic Data, Centralized tools.

ICAFS-OP-DF-04: Integration of Artificial Intelligence and Machine Learning in Forensic Science: A Comprehensive Review of Application across Forensic Domains

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ABSTRACT

Artificial Intelligence (AI) and Machine Learning (ML) emerge as a promising solution for addressing the challenges faced in the Forensic science domain. This paper reviews the current and future applications of AI and ML in various domains of forensic science, assisting in the reasoning process, reduces errors influenced by cognitive bias, and facilitating complex data analysis. However, it is important to acknowledge that these rely on extensive knowledge databases, and their performance may be compromised if inputs fall outside the scope of their training data. This raises ethical and legal considerations that need to be addressed. Forensic science is a specialized field that requires the skills and judgment of trained professionals. AI serves as a valuable supplementary tool, easing the workload and enhancing the understanding of complex cases. The collaboration between human experts and intelligent machines is essential to achieve optimal results in forensic analysis.

Keywords: Artificial Intelligence, Cyber Forensics, Deep Learning, Digital Forensics, Forensic Science, Machine Learning, Post-Mortem Interval, Proactive-Policing.

ICAFS-OP-DF-05: Silent Intruders: Unmasking SIM Box Fraud's Global Threat to Telecom Revenue and National Security

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ABSTRACT

Bypass fraud is a type of telecom fraud that diverts international calls to a cellular device through the internet, using various gateway equipment such as SIM boxes, Voice over Internet Protocol (VoIP), Global System for Mobile communication (GSM), VOIP to GSM, and fixed line gateway. SIMBox fraud within the global telecommunications sector, exposing its profound repercussions on revenue, service quality, and national security. SIMBox fraud involves redirecting international calls through cellular devices equipped with multiple low-cost or unpaid SIM cards, exploiting the pricing gap between local and international charges. The Communications Fraud Control Association estimates staggering global losses of \$28.3 billion from SIMBox and interconnect bypass fraud, with SIMBox fraud contributing \$4.27 billion. The study meticulously dissects the methodologies employed by fraudsters, encompassing SIM Box Interconnect Fraud and GSM Gateway Fraud, utilizing VoIP-GSM gateways to sidestep tariffs. Telecom companies are strongly urged to proactively implement measures, including real-time fraud-fighting tools to fortify defenses against SIMBox fraud. The study details an array of fraud detection methods to analyze call quality, providing a comprehensive toolkit for identifying and preventing SIMBox fraud and safeguarding the integrity of the telecom industry. In a recent case study, our laboratory encountered a situation involving SIM boxes. To validate SIM box fraud, we received SIM boxes containing several SIM cards along with hard disks suspected of having various software applications designed to convert VoIP calls to GSM calls. In this instance, the EnCase hard disk tool was employed to examine the installed applications. During the investigation, applications such as PhonerLite, Goautodial, FreeSwitch, PBX, Voice Gateway, Elastix, and Vicidial were discovered. This innovative approach enabled us to detect the presence of SIM box fraud, highlighting the significance of creative solutions in identifying and preventing telecom fraud, especially SIM box fraud.

Keywords: SIM box, Bypass fraud, voice over internet protocol, Global System for Mobile communication, PBX, national security.

ICAFS-OP-DF-06: Emoji Forensics : Decoding Digital Emotions

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ABSTRACT

In the field of forensic science, decoding emoji's enigmatic language is a compelling area for investigation. This study explores the subtleties of modern expression, using these light and flippant symbols to reveal their deep psychological meaning. This study entitled, “Emoji Forensics: Decoding Digital Emotions”, seeks to unravel the emotions in and through emojis' choice and frequency of use throughout spoken discourse. As the digital world becomes ever-changing, while communication can no longer be limited to a single language anymore. Emojis have thus become silent carriers of emotion, desire and context. This research analyses how the content is understood in the visual lexicon and investigates if emoji usage varies throughout people and cultures. By observing patterns among different demographics, we can reveal something of the emotional geography that people follow through their digital lives. The applications of this study reach into the world of digital investigations, where being able to decipher the psychology behind emoji use is like having a mighty weapon. The analysis of emojis in electronically transmitted communications can help to reconstruct events, identify emotions and detect possible deception. With emojis crossing linguistic barriers, their role in forensics is more and more important because they provide a common medium for expressing emotion.

Our research approach is multi-dimensional. We use qualitative thinking to analyze actual digital dialogue and quantitative assessment of emoji usage trends. By means of surveys, interviews and research into posts on social media we hope to depict the reasons people pick emojis as well as the feelings they represent. Similarly, digital means of communication have an impact on narratives and interactions in the current scenario. Emoji Forensics not only illuminates the psychological complexities behind how people communicate digitally, it can also be used to improve forensic investigators' capabilities in interpreting and decoding digital emotions.

Keywords: Emojis, Digital Emotions, Psychology, Communication, Expression.

ICAFS-OP-DF-07: Exploring the Economic Effects of Online Games and its Addiction among Juveniles in Covid-19

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ABSTRACT

This research paper explores the economic effects of online games and their addiction among juveniles in COVID-19 - 19. It'll explore the growing vacuity of online gaming platforms, their adding fashionability among juveniles, and how this has affected frugality. Juveniles were spending plutocrat in different ways similar to subscriptions, virtual products in games. They're getting attracted towards the offers and announcements. This was the major issue defying moment's society during the time of quarantine. This exploration will concentrate on two main areas the profitable impact of online gaming on employment, levies, and fiscal coffers, and the influence of online gaming on youthful people and life. A qualitative approach will be used to answer the exploration questions, drawing on literature and media reports. The paper will examine how online gaming has told frugality, how it has impacted young people's spending and earning habits, and the possible counter accusations of this for frugality and for youthful people's lives. also, the paper will explore implicit policy results to address the profitable and social impacts of online gaming. By assaying the exploration and examining the implicit goods of online gaming, this paper will give a substantiation-grounded discussion of the influence of online gaming on frugality and on youthful people's lives.

Keywords: quarantine, juveniles, online games, subscriptions, virtual products

ICAFS-OP-DF-08: Mitigating Cyber Threats: Leveraging AI for Scam Prevention and Sextortion Protection among Youth

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ABSTRACT

In an era dominated by digital interactions, the youth are increasingly susceptible to the rising threats of AI scams and sextortion. Cyber scams sets an AI vs AI clash between innocent and criminals. This poster presentation delves into the alarming statistics revealing that 62.5% of youngsters encounter AI scams, while a significant number, particularly teens and pre-teens, fall victim to sextortion.

My study, conducted through a comprehensive survey among peers, sheds light on the pervasive nature of these cyber threats, highlighting the prevalence of unsolicited messages from unknown individuals utilizing AI for deceptive purposes. As a forensic science student, the focus shifts towards proposing AI as a formidable ally in preventing deep cyber scams and safeguarding against sextortion.

This presentation aims to underscore various AI techniques that can be employed to counteract and mitigate the impact of these digital threats. From advanced pattern recognition to machine learning algorithms, the potential of AI in enhancing cybersecurity measures is vast. By leveraging AI, we can not only analyse and identify malicious patterns but also proactively shield individuals from falling prey to scams and extortion attempts.

Through this abstract, I advocate for the integration of AI-driven solutions in the realm of cybersecurity to fortify the defenses against evolving cyber threats faced by the younger demographic. As technology continues to advance, so too must our approaches to safeguarding the vulnerable, ensuring a secure digital landscape for the next generation.

Keywords: AI scams, sextortion, cybersecurity, machine learning, pattern recognition, youth protection.

ICAFS-OP-DF-09: Artificial intelligence in forensic science

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ABSTRACT

Artificial intelligence (AI) is the ability of machines to perform tasks that normally require human intelligence. The word "AI" is used when the computer imitates analytical functions, such as "learning and problem solving", that humans frequently associate with other human brains. AI can assist forensic specialists in properly managing data and doing meta-analysis at multiple levels. This may save forensic investigators a significant amount of time while also ensuring that they have adequate time and motivation to focus on other vital duties. The acquired data by the forensic specialists must also be freely available to the parties involved, so that it may be accessed at any moment as needed. AI technology may be used to prepare data repositories so that it can be routinely stored in your systems and accessed as needed. AI can also be a great tool in aspects like: Data analysis and availability to support the investigation, addressing well-scoped problems and methodology for cases, pattern recognition, reducing the level of false-positive or false negatives during analysis is very common in forensic science, having a well-organised performance evaluation, data mining and knowledge discoveries and building statistical evidence. Artificial intelligence is quickly becoming the most important applied science in all areas of life. Similarly, the forensic sector is benefiting from it, as long as our system does not become entirely dependent on it. Technology can make their job easier, but it will never be able to replace them. Because forensic science is an area of specialists, and AI will never be able to reach that level, it will only serve as a supplementary tool.

Keywords: Artificial intelligence, Forensic science, Data analysis, Pattern recognition.

ICAFS-OP-FMA-01: Comparison of Decomposition and Insect Colonization of Buried Pig Carcass at depth of 40 cm

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ABSTRACT

In violent crimes, where the perpetrator disposes of the victim's body in shallow graves, it becomes challenging to determine the postmortem interval. Many studies have been conducted on decomposition and insect colonization on surface remains, but research on buried remains is limited. So, the present study was carried out to compare the decomposition pattern and insect colonization on the buried carcass and carcass on terrestrial surface in spring season. A total of two pig carcasses were used for the present study. One pig carcass was buried at a depth of 40 cm, and one was placed on a terrestrial surface. The decomposition rate was found to be much slower for the buried carcass as compared to the carcass on terrestrial surface. The carcass on terrestrial surface took 13 days to pass from fresh stage to dry stage, while buried carcass took 110 days. The differences were also found in the taxon and colonization by the entomofauna. *Megaselia scalaris* (Phoridae), *Sarcophaga haemorrhoidalis* (Sarcophagidae), *Musca domestica* (Muscidae), *Pangaeus bilineatus* (Cyanidae), *Saprinus* spp., *Margarinotus brunneus* (Histeridae), Staphylinidae, *Syntomus foveatus* (Carabidae), and Armadillidae were collected from the carcass buried at a depth of 40cm. On the other hand, *Chrysomya megacephala*, *Chrysomya rufifacies* (Calliphoridae), *Sarcophaga haemorrhoidalis* (Sarcophagidae), *Musca domestica* (Muscidae), *Saprinus* spp. (Histeridae), *Necrobia rufipes* (Cleridae), and *Dermestes maculatus* (Dermestidae) species were collected from the carcass on terrestrial surface. *Megaselia scalaris* and *Sarcophaga haemorrhoidalis* were found to complete their life cycle on the buried carcass, while, *Chrysomya megacephala*, *Chrysomya rufifacies*, *Sarcophaga haemorrhoidalis* and *Dermestes maculatus* are the fly and beetle species which colonized the carcass on terrestrial surface. The findings of the study show that there is a significant difference in the decomposition pattern of the carcass along with the arrival and colonization by the insects in the buried state and on the surface.

Keywords: Forensic biology, postmortem interval, forensic entomology, buried carcass, graves, entomofauna succession

ICAFS-OP-FMA-02: Comparison of insect succession and colonization on burnt and unburnt pig carcasses during spring season

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ABSTRACT

Forensic pathologists face various challenges in identifying human remains and determining postmortem intervals, particularly in cases of criminal immolation. They play a crucial role in assessing entomofaunal succession and colonization patterns on burnt remains which helps in establishing minimum postmortem intervals (PMI_{min}). This study delves into the decomposition of the pig carcasses along with and succession patterns of entomofauna feeding on these pig carcasses classified as burnt to levels 1, 2, and 3 (Glassman & Crow, 1996), as well as an unburnt control, during the spring season. Differences in the decomposition process were observed on the carcasses. In the fresh stage, distinct changes such as leathery or cracking skin and a pugilistic attitude were noted in burnt level 1, 2, and 3 carcasses, while the control carcass did not exhibit any decomposing changes at this stage. The bloating stage arrived earlier (1st day) on level 3, a little later (2nd day) on level 2, and lasted (3rd day) on level 1, and the control. The dry stage appeared earlier in the control carcass compared to all burnt ones. Furthermore, a unique faunal succession pattern was observed for each carcass. *Chrysomya megacephala* was found to be the most abundant among all Diptera families. *Sarcophaga haemorrhoidalis*, *Chrysomya megacephala*, and *Chrysomya rufifacies*, *Musca domestica* were the earliest and most frequent visitors on all burnt and unburnt carcasses, followed by Coleopteran particularly *Dermestes maculatus*, *Necrobia rufipes*. Hymenopteran species i.e., *Camponotus compressus*, *Vespa orientalis* only visited on level 1 and 3 carcasses.

Notably, oviposition occurred earlier on burnt pig carcasses for all three levels by Sarcophagidae. The collected data showed a significant impact of burning on the decomposition and entomofaunal pattern of carcasses.

Keywords: Forensic Biology, Forensic Entomology, Postmortem interval, Criminal

ICAFS-OP-FMA-03: An anthropological approach to identify sex from footprint measurements: A Forensic study among the tribals of North-West India

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ABSTRACT

Footprints are ubiquitous in crime scenes since they are an intrinsic component of the human body. Because of its qualities and proportions, it may be useful as evidence in identifying a criminal. In forensic investigations, determining sex can significantly aid in the initial detection of someone's identity. The present research investigates footprint dimensions to determine if significant differences exist between two sexes and subsequently develop a population-specific model for sexual dimorphism. Using dermatoglyphic methods, static footprints were obtained from 205 young adults (128 males and 77 females) between the ages 17 and 26 years in Rajasthan, North-West India. Using anthropometric instruments, eight linear dimensions namely- stature, five-toe length measurements, and ball and heel breadths from the right and left feet were recorded from each foot impression. Results indicated footprints to be greater in the left side and significant variations ($p < 0.001$) were observed in T1 lengths of males, T4 and T5 dimensions in females. Discriminant functional analysis inferred LFPT5, LFPT1, LFPT2, RFPT5 and LFPT4 as the best predictors of sex with a classificatory analysis of cross-validated percentage 89.4% and 86.4% for males and females, respectively. As an outcome, the present investigation may assist forensic investigators by analysing footprints collected from crime scenes.

Keywords: forensic biology, criminal identification, sexual dimorphism, footprint dimensions

ICAFS-OP-FMA-04: Role of biomarkers for estimating time since death- A review

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ABSTRACT

Biomarkers are indications that are quantifiable through a variety of processes, including pathogenic and regular organic processes. Forensic biology is the study of biology as it relates to criminal investigation. In this subject, evidence pertaining to biological materials and living things discovered at the crime scene is analyzed. Basic and clinical research both make use of biomarkers. A biological molecule known as a biomarker is one that may be found in tissues, blood, or other bodily fluids and that can reveal an aberrant or normal process. The use of biomarkers enhances the exposure to risk variables' sensitivity and specificity. Every organ in the human body has the propensity to release distinguishing molecules known as biomarkers. Apart from organs, certain bodily fluids such as saliva, sweat, amniotic fluid, seminal fluid, vitreous humor, and synovial fluid also include markers. These indicators work together to play a critical role in controlling and preserving the body's metabolism.

Keywords: Biomarkers, Forensic biology, bodily fluids

ICAFS-OP-FMA-05: Osteometric Analysis of the Sternum in Forensic Anthropology

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ABSTRACT

Forensic anthropometry, a branch of forensic anthropology, systematically measures human skeletal elements to glean vital insights about individuals for forensic purposes. These help majorly in biological profiling through different bones, facial reconstruction or trauma reconstruction, where applicable. This review paper focuses on the osteometry of the sternum for the estimation of age, sex and stature of an individual, and assess the identity of an unknown. It also discusses studies that were conducted on sternum in different populations with special focus on Indian populations. This review paper also highlights the scope of forensic anthropometry in the field of forensic science and its development. And it also focuses on various digital tools used nowadays for analysis purposes.

Keywords: Forensic anthropometry, Forensic osteometry, sternum, biological profile, digital tools

ICAFS-OP-FMA-06: Estimation of Sex and Stature from Cephalic Index using Logistic Regression, Linear Regression and Likelihood Ratio

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ABSTRACT

India is a vast country that exhibits diversity not only in religion and culture but also in the physical characteristics of individuals, which vary from one region or state to another. Establishing sex and stature is crucial for identifying individuals, especially in medico-legal cases and in determining racial differences. The present study, titled “Estimation of Sex and Stature from Cephalic Index using Logistic Regression and Likelihood Ratio,” involved 200 individuals (100 males and 100 females) from the northern part of Telangana, aged 22 to 30 years. The samples were collected using a purposive sampling technique. A spreading caliper was used to measure the maximum head length and breadth. Stature was measured using an anthropometric rod while the subject was in the anatomical position. The obtained data were analyzed using Python (Version 3.12.0), Matplotlib (Version 3.8.2), and the Scikit-learn (Version 1.3.2) library. Binary Logistic Regression and the Receiver Operating Characteristic (ROC) curve were used to predict sex based on the cephalic index, while Simple Linear Regression was employed to predict stature based on the cephalic index. The results indicate that the logistic regression model successfully predicts sex but fails to accurately predict stature from the cephalic index.

Keywords: Forensic Anthropology, Cephalic Index, Stature, Binary Logistic Regression, Receiver Operating Characteristic curve, Simple Linear Regression

ICAFS-OP-FMA-07: Estimation of Sex and Region from Cephalic Index using Logistic Regression and Likelihood Ratio

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ABSTRACT

Morphological differences are common among living organisms. Physical diversity can be observed in individuals varying from one region to another. The cephalic index is an important parameter in forensic medicine, anthropology, and genetics for understanding sex and racial differences between individuals. Reviewing previous studies on the cephalic index conducted in different regions and observing socio-cultural uniqueness, a comparative study was conducted among males and females in the North Indian and South Indian populations. The study included a total of 200 individuals (100 males and 100 females) from both North and South Indian populations. Data were collected using purposive sampling techniques. Maximum head length and breadth were obtained using a spreading caliper, and the cephalic index was calculated using the formula $(\text{Maximum head breadth} / \text{Maximum head length}) \times 100$. Head shapes were classified based on the obtained cephalic index values using Hrdlicka's method. The collected data were analyzed using Python (Version 3.12.0), Matplotlib (Version 3.8.2), and the Scikit-learn (Version 1.3.2) library. Binary Logistic Regression and the Receiver Operating Characteristic (ROC) curve were used to predict sex and region based on the cephalic index. The results indicate that the logistic regression model successfully predicts sex but fails to accurately predict the region based on the cephalic index.

Keywords: Forensic Anthropology, Sex, Region, Cephalic Index, Binary Logistic Regression, Receiver Operating Characteristic curve

ICAFS-OP-FMA-08: Comparative effect of winter and summer conditions on the PMI estimation: A Forensic Entomological Perspective

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ABSTRACT

Forensic Entomology is an applied branch of forensic science dealing with the role of arthropods, majorly decomposing the body. The activity of these flies are significant and widely accepted in the determination of time of death. The presented research is aimed to determine the effect of environmental conditions both summer and winter on the life cycle and growth of calliphoridae in the Gurugram region. In this, beef liver was subjected to an environment with low temperatures and high humidity levels. At equal intervals of time, changes were observed and noted. The flies were attracted in about 4-5 days after the samples were kept whereas arrival of the flies is faster during the summer conditions. winter season where the temperature is ranging from 9.78°C-12°C in the night and early mornings, while afternoon remains from 12°C-20°C. Humidity ranges 85% on rainy days. On the other hand temperature varied from 30°C-36°C. Decline in the temperature leads to delayed completion in the life cycle. Study helps in the understanding of the climatic effect on the completion of the life cycle of blowflies and hence PMI estimation.

Keywords: Forensic Entomology, Calliphoridae, life cycle, Pupation, Time of Death

ICAFS-OP-FMA-09: Isotope Analysis in Human Teeth: A Powerful Tool for Forensic Identification

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ABSTRACT

Over the years, isotope analysis methods have experienced significant growth and have emerged as a valuable tool in determining the geographic origin of human remains and aiding forensic identification when standard procedures like DNA analysis, dental records, and fingerprints prove insufficient or unusable. Isotope analyses, particularly of strontium, carbon, oxygen, nitrogen, and lead, have played a pivotal role in both archaeological and forensic investigations. The preferred material for isotope analysis is dental enamel due to its mineral composition and relative resistance to environmental exchange (diagnosis). Dental enamel records physical-chemical stresses and food-related information during its formation, making it suitable for bio anthropological analysis. Additionally, dental enamel's robustness against decay and external factors, attributed to its high content of hydroxyapatite, renders it the hardest tissue in the human body. This unique quality enables the analysis of long periods after an individual's death., extending the window for investigation. This poster reviews isotope analysis in human teeth has become indispensable asset, augmenting forensic identification and geoforencing efforts in cases that present challenges for traditional methods

Keywords: Isotopes, Teeth, Forensic, DNA Identification

ICAFS-OP-FMA-10:Advancing Forensic Identification: The Role of Anthropometric Indices,with Emphasis on Nasal Index, in Human Identification and Facial Approximation

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ABSTRACT

Anthropometric indices are fundamental in forensic science, providing quantitative measurements that aid in the identification and analysis of human remains. One such index of particular importance is the nasal index, which is derived from measurements of the nasal width and nasal height. The nasal index reflects the shape and proportions of the nose and has significant implications in forensic anthropology and related disciplines.

In forensic investigations, the nasal index is utilized to determine the morphological characteristics of nasal structures, which can be indicative of ancestry and population affinity. Variations in nasal index among different populations have been well- documented, making it a valuable tool for assessing the racial or ethnic background of an individual from skeletal remains or facial reconstructions.

Furthermore, the nasal index can contribute to the estimation of facial features from skeletal remains, aiding in the process of facial approximation and reconstruction. By Incorporating nasal index data into facial reconstructions, forensic artists and anthropologists can create more accurate depictions of individuals, potentially leading to the identification of unknown persons.

Advancements in imaging technology, such as three-dimensional (3D) scanning and computational methods, have enhanced the precision and reliability of nasal index measurements. These technological advancements have enabled forensic experts to capture detailed nasal morphology and analyze subtle variations in nasal shape more effectively.

In conclusion, the nasal index is a valuable anthropometric index in forensic science, providing insights into the morphological characteristics of the nose that can accelerate the process of personal identification. Continued research into the applications of nasal index measurements, along with advancements in technology, will further enhance its utility in forensic investigations.

Keywords: nasal index, morphology, anthropometry, superimposition

ICAFS-OP-FSD-01: Advancement in Forensic Dna Analysis: from RFLP to Next Generation Sequencing

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ABSTRACT

Since the first forensic samples were tested for restriction fragment length polymorphism (RFLP), forensic DNA analysis has advanced dramatically. Methodologies progressed from gel electrophoresis to capillary electrophoresis and, finally, to next generation sequencing (NGS). Capillary electrophoresis was and continues to be the gold standard in forensic analysis. However, depending on the information needed, multiple ways can be employed to type a DNA fragment. Techniques for genetic examination of DNA samples include short tandem repeat (STR) fragment analysis, Sanger sequencing, SNaPShot, and capillary electrophoresis-single strand conformation polymorphism (CE-SSCP). Next Generation Sequencing is the most recent and groundbreaking technology, and it has the potential to become the new gold standard for genomic analysis. Deoxyribonucleic acid fingerprinting is a method which creates a unique genetic profile which helps forensic scientists to know whether the given sample is from the same person or not. This technique is universally used in paternity testing, medical diagnosis and many more. This review will briefly talk about the techniques and their applications used for the analysis of human DNA samples.

Keywords: STR, DNA Fingerprinting, RFLP, Gel electrophoresis, Capillary electrophoresis

ICAFS-OP-FSD-02: Age estimation through analytical quantification of melanosomes in root hair follicle

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ABSTRACT

Hair plays a significant role in determination of race, sex, species, and age. Melanin is a pigment found in human skin and hair. The pigment amount decreases with the increase of age. In the present study, age estimation using melanosomes and their concentration in hair using UV-Visible spectrophotometry and Fourier transform infrared (FTIR) spectroscopy was investigated. 105 samples from female hair of various ages (age group between 10 – 45 years) were collected. Melanosomes were isolated using DMF degradation and step protein enzymatic degradation. UV - Visible spectra were collected between 200 -700 nm, whereas, FTIR spectra were collected between 1000 – 1600 nm. Melanosomes were identified using specific peaks in UV – Visible region and IR region and their concentration was calculated using the Beer's Lambert law. The study observed that the volume of melanosome increases as individuals transition from the age group of 10-16 to 21-26, and subsequently remains constant for about 10 years. From the age of 36 to 45, the quantity of melanosomes decreases. The study holds great forensic significance because of its ability to help narrow down the search for a suspect by utilizing hair evidence found at the crime scene to determine the potential age range of the offender.

Keywords: Melanosome, age estimation, hair, UV Spectroscopy, FTIR, Evidence

ICAFS-OP-FSD-03: A Nanotechnological Approach for Forensic Investigation of Touch DNA

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ABSTRACT

Forensic examination of touch DNA has evolved immensely over the recent years. Touch DNA, which includes DNA left due to contact with a surface is ubiquitously found on the crime scenes. Touch DNA is encountered frequently on the doors, mobile phones, and other items at crime scene. Newer methods have developed for the extraction, isolation, and amplification of touch DNA. This abstract discusses the fusion of nanotechnology with touch DNA analysis, the advancements and implications of employing nanotechnological approaches in forensic science. The integration between nanotechnology and DNA fingerprinting presents promising opportunities for overcoming limitations such as sample degradation and trace DNA analysis challenges.

Keywords: Touch DNA, nanotechnology, trace evidence

ICAFS-OP-FSD-04: Current Trends in origin of Species Identification

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ABSTRACT

Crime against animals is an underrated issue in our society. We found many crimes against animals. This can be seen in the form of cruelty by beating, animal sacrifice, cruelty during transportation, killing of protected animals like cows, tigers, deer etc. Lot of evidences such as body fluids, hairs, muscle fibers etc. left behind while committing these types of offences. Usually, offenders commit offences and they claim that evidence present at crime scene does not belong to the said animal. Analyzing these types of evidences to confirm animal species is a challenging task for forensic experts due to common issues of insufficient sample size and poor quality or contamination of the evidences. There are several traditional methods to determine the origin of species. These traditional methods are time consuming and unsuitable for small samples. Therefore, the need of the hour to adopt modern non-destructive and rapid methods for the identification of species from different evidences.

Currently spectroscopic methods are being utilized on a larger scale for origin of species identification. These methods are sensitive, non-destructive in nature. These techniques may assist investigating agencies in solving these types of offences.

Keywords: Origin of species, animal cruelty, spectroscopic methods

ICAFS-OP-FCT-01: Synthesis and characterization of CoFe₂O₄ nanoparticles and assessment of their anti-fungal activity

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ABSTRACT

A wide variety of fungi is commonly found in domestic areas and common sources include walls, wooden furniture, clothes etc. Various nanomaterials are known for their antifungal properties and this property is exploited in this experiment to formulate a nanoparticle suspension to eradicate a wide range of mycelium. In this study, Cobalt ferrite (CoFe₂O₄) nanoparticles were synthesized and used as an anti-mycelium agent to eradicate the growth of mycelium. These nanoparticles were synthesised using combustion methods and were characterised using Scanning Electron Microscopy (SEM), Fourier Transform Infrared Spectroscopy (FTIR) and X-Ray Diffraction (XRD) [1]. The study encompasses in-vitro experiments with various growth parameters which were monitored for proliferation of mycelium at cellular level. The growth curve was obtained using UV Visible spectroscopy (UV-Vis) and the results were analysed with respect to nanoparticle suspension concentration and time period. Through rigorous experiments and analyses, we found that synthesised CoFe₂O₄ shows exceptional antifungal property and paves the way for the foundation of novel strategies to combat the wide varieties of mycelium.

Keywords: UV Visible spectroscopy, nanoparticles, antifungal

ICAFS-OP-FCT-02: Application of Ni(II)NHC complexes for electrochemical sensing of Zombie drug: Xylazine

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ABSTRACT

Xylazine is a potent sedative and analgesic drug commonly used in veterinary medicine, primarily for large animals like horses and cattle. However, its illicit use has led to it being referred to as a "zombie drug." Traditional drug testing techniques, such as HPLC, gas chromatography, missile chromatography, and mass spectrometry, have limitations in detecting xylazine due to its short half-life. To address this issue, electrochemical sensing using molecular electrocatalysts, specifically Ni(II)-NHC complexes with pyridine wingtip substitution, is being explored. These complexes provide structural and chemical stability and will be assessed for their electrocatalytic sensing of xylazine via square wave voltammetry, resulting in a LOD of 0.461 nM. Additionally, the modified electrodes have shown excellent selectivity, sensitivity, and reproducibility, along with an interference study involving spiking samples containing target molecules in the presence of interfering molecules like uric acid, ascorbic acid, dopamine, glucose, etc.

Keywords: Electrochemical sensing; Xylazine; N-heterocyclic Carbene; Square wave voltammetry; Electrocatalyst.

ICAFS-OP-FCT-03: Chemometrics: Bridging Forensic Spectral Data Analysis with Data Science

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ABSTRACT

Forensic investigations frequently depend on tangible clues to piece together the circumstances of a criminal act. Nevertheless, there is a pressing need for more objective methods in interpreting evidence, as well as thoroughly tested protocols for managing, preserving, and examining it. Chemometrics is recognized as an effective method in forensic analysis, aiding in interpreting and enhancing analytical processes. However, it is crucial to meticulously assess aspects such as sample collection, validation, and the foundational design of studies. This paper aims to provide a comprehensible summary of chemometric techniques in the realm of forensic science. It offers a detailed look at certain chemometric methods used in the analysis of spectral data involving UV-Vis, ATR-FTIR, Raman Spectroscopy, and any other spectroscopic techniques. The primary focus of the study is on the real-time application and interpretation of spectral data using a variety of multivariate analysis approaches, including K-Mean Clustering Analysis, Principal Component Analysis (PCA), Hierarchical Cluster Analysis, and Linear Discriminant Analysis (LDA). It then delves deeper into an extensive analysis of studies that demonstrate the utility of chemometrics in diverse forensic domains.

Keywords: Forensic Science, Chemometrics, Spectral Data, K-Mean Clustering Analysis, Principal Component Analysis

ICAFS-OP-FCT-04: Drugs and Their Metabolism in Forensic Science: Unveiling the Hidden Evidence

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ABSTRACT

An insightful overview of the crucial role of drug metabolism in forensic science, providing a foundation to understand how drugs leave their traces and offer vital evidence in criminal investigations. The analysis of drugs and their metabolites is integral to forensic toxicology, shedding light on a range of cases, from drug-related crimes to fatalities, and accidents involving impaired individuals. The diverse spectrum of drugs encountered in forensic science, spanning illegal substances, prescription medications, and over-the-counter remedies. These substances come from various pharmacological classes, each with distinctive metabolic pathways, making it essential for forensic experts to discern the specific metabolites associated with different drugs. Understanding these metabolic pathways aids forensic scientists in identifying drug exposure, determining its timing, and establishing the route of administration. It also emphasizes the potential challenges and advancements in drug analysis, including the emergence of designer drugs and synthetic analogs, which require innovative forensic techniques to detect and analyze.

Keywords: Designer drugs, metabolism, forensic science, criminal investigation.

ICAFS-OP-FCT-05: Forensic examination of tattoo inks

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ABSTRACT

Forensic examination of tattoo inks plays a crucial role in criminal investigations, providing valuable information that aids law enforcement in identifying suspects, establishing timelines, and linking individuals to specific crimes. Tattoo inks, composed of pigments suspended in a carrier fluid, can serve as unique chemical markers that distinguish one tattoo from another. Analyzing these inks involves a multidisciplinary approach, combining chemistry, microscopy, and spectroscopy techniques. One aspect of forensic examination involves the identification and characterization of the chemical composition of tattoo inks. Different tattoo artists may use distinct formulations, leading to variations in pigment composition. Spectroscopic techniques, such as infrared spectroscopy and mass spectrometry, can be employed to analyze the molecular structure of pigments and identify specific compounds within the ink. This information helps investigators trace the origin of tattoos or link them to a particular artist or source. In the present study, tattoo inks of different brands were analyzed using attenuated total reflectance (ATR) – fourier transform infrared (FTIR) spectroscopy. The generated data was then analyzed using chemometric tools such as principal component analysis (PCA) and linear discriminant analysis (LDA) to differentiate tattoo inks based on their brands.

Keywords: Tattoo inks, ATR-FTIR spectroscopy, chemometrics, principal component analysis (PCA), linear discriminant analysis (LDA)

ICAFS-OP-FCT-06: Metabolomic Approaches to Drug-Facilitated Crimes: A Forensic Perspective

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ABSTRACT

Drug-related crimes are among the most common in India. Forensic science laboratories focus on analysing and interpreting biological samples for drugs of abuse, prescription medications, and poisons. Metabolomics is the most recent of the "omics sciences," but new high-throughput technologies derived from physics and chemistry have demonstrated that it can be one of the most effective tools for identifying parent substances by analysing their specific metabolites. This article will look into and compile the most recent applications of metabolomics in forensic science. The vast field of -omics science aims to characterise, both qualitatively and quantitatively, the small-molecule products found in biological samples, the quantity and composition of which can vary depending on genetic modifications, environmental influences, and pharmaceutical substances. Metabolomics studies can be either targeted or untargeted. Targeted studies focus on a specific set of defined metabolites. The goal of untargeted metabolomics is to identify all metabolites found in a given sample. In both cases, valuable and significant information can be extracted using a variety of statistical techniques.

Keywords: Forensic Science, Drug of Abuse, Metabolomics, Targeted, Untargeted, Metabolites etc.

ICAFS-OP-CSI-01: Changing Dynamics in Crime Scene Investigation Using 3D Scanning Technology

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ABSTRACT

A thorough investigation and documentation of a crime scene are necessary, but the procedure is often quite challenging and time-consuming. Detailed documentation of a crime scene helps in the reconstruction of a crime scene at a later stage. Sketching, Photography, Videography, Note making, are some of the traditional methods used in documenting the crime scene. These techniques need more people and are labor-intensive. 3D scanning technology has changed the dynamics of a crime scene investigation in recent times. It allows for the rapid acquisition of highly detailed 3D model of any physical environment. This technology mainly helps in the reconstruction of the crime scene at a later point in time without re-visiting the scene with the help of the previously captured images. The instrument that uses this technology is called 3D crime scene scanner. 3D crime scene scanners allow the investigator for the detailed analysis of every single item which is present on the crime scene, including evidence and relevant aspects of the scene that may not be observed by the naked eye during the original response such as burn pattern evidence. Its ability to view and capture the scene through 3D laser scanning technology ensures the longevity and preservation of the scene and provides crime scene units with unprecedented abilities to evaluate the scene and evidence in a holistic manner. It helps in visual rendering, perspective observations, time management and most importantly, its unmatched precise measurement and calculation capabilities. The scanner can offer solutions that address the appearance and view of the original crime scene as well as those that can be tailored to courtroom presentations. This review paper describes the advanced 3D technology and its advantages over conventional methods of crime scene investigation.

Keywords: 3D Technology, 3D Crime Scene Scanner, Crime Scene Investigation

ICAFS-OP-CSI-02: Environmental Criminology- its Application and preventive techniques

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ABSTRACT

Environmental criminology is the study of how crime, the offender, and the victimization relate, first to a particular places, and secondly, to the way that individuals and organisation shape their activities within or around the place. It is a growing as theoreticians and researchers actively explore crimes as diverse events that can be understood when explored jointly considering potential offender's and their proximal and distal surroundings. Term that is used to encompass variety of theoretical approaches, all focusing on fourth dimension: Routine activity theory, the geometric theory of crime, rational choice theory, and pattern theory. Mapping is often used to define and determining crime patterns in environmental criminology. Maps assist in associating crime with land usage, traffic patterns, street/urban design, and the daily activities and movements of victims and offenders. This paper explores about its application and preventive techniques and methodology on primary data within the framework of environmental criminology. Hundred police officials were interviewed in Bangalore city region to know the preventive measures and techniques that can be applied for our future criminal violence. Preventive techniques were discussed such as extend guardianship, target hardening, natural surveillance, reduce rewards, reduce provocations, increase the effort, conceal targets, remove targets etc. Concluding that it will enable us to obtain evidence for the development of strategies for the situational prevention of crime, and in particular, design defensible spaces, based on the implementation of differential multi-dimensional actions in the territory.

Keywords: Routine Activity theory, Rational Choice theory, pattern theory, police officials, situational prevention of crime

ICAFS-OP-QDF-01: Machine Identification Codes for the Identification of sources from HP Laser-Colored Printouts

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ABSTRACT

In the present-day scenario, the authenticity of the documents is one of the most important disciplines to track the source of the colored laser-printed documents. With the rise in the era of digitization, the forging of documents and the procurement of counterfeiting currency has also increased. Digital steganography is one of the advanced methods for the identification of only color laser printers. The present study focuses on identifying the machine identification codes in HP color laser printouts. This technique was proven to be a non-destructive technique with a higher accuracy rate. The samples collected from the HP color laser printer were scanned using a 600 dpi Konica Minolta scanner. The scanned images were edited using a raster graphic editor, GIMP. The image was adjusted in both linear and non-linear parameters for better visibility and detection. The yellow motif dots observed in the brand HP are of a particular base pattern. The significance of this pattern is to differentiate the brand HP from other brands of laser printers.

Key Words: Laser Printers, MIC, Digital Steganography, graphic editors

ICAFS-OP-ODF-02: Application of schiff base sensors for the enhancement of latent fingerprints

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ABSTRACT

Fingerprints are very important evidence commonly found on different crime scenes. Their uniqueness and permanence is well recorded in literature. Many methods are available for the development of latent and patent fingerprints, however, more sensitive and reliable methods are still required. One of the alternative for fingerprint development is the use of colouring agents. Several sensors and colouring agents are used in forensic science to find latent fingerprints. Schiff base and their metal complexes have been extensively used as fluorescent sensors to detect latent fingerprints. These dyes have found extensive applications in forensic analysis due to their ease of synthesis and stability. Herein, we report the synthesis of salen compound 2, 2'-{1,2-phenylenebis[azanylylidene-(E)-methanylylidene]} diphenol for the detection of fingerprints. Fingerprints developed using this compound showed a vivid yellow fluorescence under the UV light. The schiff base sensor offers significant advantage as a fluorimetric sensor for the rapid and efficient detection of latent fingerprints.

Keywords: Fingerprints, latent, sensors

ICAFS-OP-FPY-01: Ethical conundrums in forensic psychology

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ABSTRACT

Ethics, often referred as the guiding principles of one's behaviour, dictate what one considers to be right and wrong. The terms ethics and morals are often used interchangeably but the difference between them lies in their interpretation and the application. Morals are more personal and subjective in nature whereas ethics are generally professional, stricter, and designed to cater the profession. Ethics applied in the practical scenarios in specific areas are applied ethics. Ethics relating to criminal investigation and forensic science apply to professionals working in crime scenes, forensic science laboratories, courtrooms, correctional and rehabilitation facilities. Forensic psychology, which is the application of clinical psychology to the legal justice system, is often used to study the criminal behaviour and to determine whether a person is capable of committing a particular crime or not which further gives rise to ethical conflicts. Ethical conundrums arise because of the conflict of interest between morality, ethical principles and the duty of a person. Unethical conduct in the field of forensic psychology include prejudice, bias, multiple relationships, failure to provide appropriate sources of information required for an expected forensic evaluation, lack of documentation during the evaluation. This paper discusses these challenges and attempts to find a solution for these challenges.

Keywords: Ethics, ethical conundrums, forensic science, forensic psychology, courtroom, rehabilitation

ICAFS-OP-FPY-02: The Effect of Advanced Technology on Children: Parental Perception

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ABSTRACT

The use of modern and sophisticated tools, devices, and systems that have emerged as a result of scientific advancements and innovation is very common nowadays. The advanced technology includes various digital devices, internet-connected technologies, virtual reality, artificial intelligence, robotics, and other cutting-edge technologies. The effects of these on children are a subject of increasing interest and concern. The present research aimed to investigate the parental perception regarding the effects of advanced technology on children in the Mangaluru city. The convenient sampling technique was adopted to study with sample size of 100 respondents. Structured questionnaire method is used for data collection. The study revealed that have a high level of awareness regarding advanced technology and its impact on children. 95% of the respondents have stated that there is positive impact on children. 51% of the respondents believe that creating awareness about cybercrimes is an effective way to prevent them. 66% of the respondents take the approach of setting limitations on their child's phone usage as a measure to ensure online safety, 20% of respondents prioritize maintaining open lines of communication with their child as a measure for online safety. Majority of the parents acknowledged the positive aspects of technology, such as increased access to information, educational opportunities, and entertainment. However, concerns regarding the potential negative consequences, such as reduced physical activity, cyberbullying, and addiction were also highlighted.

Keywords: Technology, devices, Children, Parents

ICAFS-PP-FMA-01 :Forensic Anthropology in Disaster Victim Identification (DVI) in Mass Disasters

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ABSTRACT

Crime scene investigation is an integral and fundamental part of forensic science. The methods, instruments, and procedures used vary depending on the crime scene. The procedures used in a mass disaster crime scene differ from those used in a typical murder or homicide crime scene. The term "mass disaster" refers to a broad range of events, including both man-made events like bombings, fires, and genocides, as well as natural disasters like earthquakes, floods, volcanoes, and tsunamis. In any mass disaster case, irrespective of the type of disaster, victim identification is very substantial, however, because identification often takes longer than expected, it can be challenging for the authorities to facilitate identification. Utilizing cutting-edge forensic methods, including expertise from fields like toxicology, post-blast residue analysis, forensic anthropology, and forensic odontology, to speed up the investigation. Disaster Victim Identification is a multidisciplinary approach and so collaboration from all the disciplines is needed so as to render justice. As an emerging field, anthropology is being included in the INTERPOL PASWG [7] as one of the sub working groups, with specific roles assigned in order to expedite the process of identification.

In this poster presentation the application of forensic anthropology to crime scene investigation in cases of mass disasters will be covered with the methods used at crime scenes with large numbers of victims in disaster situations to identify victims more quickly and easily. An overview of the potential contributions that forensic anthropologists can make to DVI will be given in this presentation, with a focus on how new insights and advancements in the field have enhanced these contributions. As a result, this poster explores the application of imaging in DVI efforts by forensic anthropologists and reviews the importance of their knowledge at the mortuary and at the scene of a disaster.

Keywords: Forensic Anthropology, Disaster victim identification(DVI), Interpol, Mass disasters

ICAFS-PP-FMA-02: Beyond Binary: Exploring True Hermaphrodite and Its Medico Legal Complexities

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ABSTRACT

True hermaphrodites are the most uncommon forms of the disorder of sexual differentiation (DSD), accounting for about 5% of all cases, on the basis of 67 cases with clear documentation reported on illustration of their chromosomal studies, whilst 90% of the time, the normal chromosomal profile carries 46 XX karyotypes. In *C. elegans*, there are two sexes: male and hermaphrodite. The basic body design and many of its structural distinctions between males and hermaphrodites are the same, despite the fact that there are many sex-specific differences that influence the majority of tissue which suggests that they have both comparable and distinctive ways of experiencing things. The major concern of this study is to depict the difference between true hermaphroditism and normal male or female reproductive system as well as to specify those corrective measures they go through to conceal their true identity which can cause complications in their sexual intimacies and psychological distress in future. The hermaphrodite babies were subjected to substantial stigma, discrimination, and prejudice in the society in addition to receiving several medical treatments as children for infertility, disclosure, body image, hormone therapy, and low bone mineral density. New terminologies are now necessary due to recent advancements in our understanding of the pathologic mechanisms underlying malfunctioning sexual differentiation and the social portrayal of the genuine hermaphrodite. The asymmetric distribution of POP-/Tcf, the single Tcf homolog in *C. elegans*, to anterior-posterior sister cells may be one potential reason. Such disorders are today designated as genetic defects in the differentiation of the genetic system. A multidisciplinary psychiatry is a prerequisite along with the educational programs that promote tolerance in society to variation in gender.

Keywords: Hermaphrodites, Intersex, DSD

ICAFS-PP-FMA-03: Knowledge Attitude and Perception Towards Forensic Odontology Among Police Officers

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ABSTRACT

The study of knowledge, attitude, and perception towards forensic odontology among police officials involves examining their understanding, opinions, and perspectives on dental evidence in criminal investigations. Research in this area could help enhance collaboration between forensic odontologists and law enforcement, ultimately improving the effectiveness of dental evidence in solving crimes. Such research could assess the extent of police officials' awareness of forensic odontology techniques, their willingness to incorporate dental evidence into investigations, and any existing challenges or misconceptions. Understanding these factors can guide educational initiatives and communication strategies to strengthen the integration of forensic odontology in law enforcement practices. Additionally, exploring how police officials perceive the reliability and relevance of dental evidence, as well as identifying potential barriers in its utilization, can contribute to refining protocols and training programs. This investigation aims to bridge gaps between forensic odontology experts and law enforcement, fostering a more informed and collaborative approach to solving crimes through dental analysis.

Keywords: forensic odontology, research, communication, knowledge

ICAFS-PP-FMA-04: Study on Knowledge , Attitude and Perception Towards Forensic Odontology Among Legal Authorities

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ABSTRACT

This study aims to investigate the knowledge, attitude, and perception of forensic odontology among advocates and judges. Forensic odontology, a crucial aspect of forensic science, involves the application of dental expertise in legal contexts. Understanding how the advocates and judges perceive and utilize forensic odontology is essential for enhancing the effectiveness of dental evidence in legal proceedings. The research will delve into the existing knowledge base of each group, examining their awareness of forensic odontology's capabilities and limitations.

Moreover, the study will explore the attitudes and perceptions of advocates and judges towards the reliability and significance of dental evidence in criminal investigations and court cases. By uncovering potential gaps or misconceptions, the research aims to contribute valuable insights for refining forensic odontology practices and education programs tailored to them. Ultimately, a comprehensive understanding of the diverse perspectives on forensic odontology within the legal and investigative realms can foster improved collaboration and utilization of dental evidence in the criminal justice system.

Keywords: Forensic Odontology, Criminal investigation, perception , justice , awareness

ICAFS-PP-FMA-05:Advancements in Multi-Sensor Fusion for Virtual Autopsy in Forensic Investigations

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ABSTRACT

Virtual autopsy, a rapidly evolving field within forensic science, has harvested significant attention due to its non-invasive nature and potential to revolutionize post-mortem examinations. Multi-sensor fusion plays a key role in enhancing the accuracy and comprehensiveness of virtual autopsies by integrating data from diverse imaging modalities. This abstract explores the current state of multi-sensor fusion in virtual autopsy, specifically focusing on its applications and benefits in forensic investigations. The integration of multiple sensors, such as computed tomography (CT), magnetic resonance imaging (MRI), and 3D surface scanning, allows forensic experts to generate a holistic and detailed reconstruction of the deceased's anatomy. Each imaging modality contributes unique information, enabling a more comprehensive understanding of the cause and manner of death. By fusing these modalities, forensic professionals can create a virtual representation that surpasses the capabilities of individual scans, ensuring a thorough analysis of both external and internal factors. Furthermore, multi-sensor fusion facilitates the incorporation of advanced technologies like 3D reconstruction and augmented reality, providing investigators with immersive and interactive tools for a more accurate interpretation of the evidence. This not only aids in the identification of injuries and abnormalities but also allows for the simulation of different scenarios to reconstruct the events leading to the demise. Additionally, the fusion of thermal imaging and spectroscopy can assist in detecting subtle changes in tissue composition, aiding in the identification of post-mortem interval and potential chemical exposure. Despite the undeniable advantages, challenges such as data integration, standardization, and ethical considerations must be addressed. Harmonizing data from various sensors and developing standardized protocols are essential for ensuring the reliability and consistency of virtual autopsies. The integration of diverse imaging modalities not only enhances the accuracy of post-mortem examinations but also opens avenues for innovative technologies that can significantly improve our understanding of the circumstances surrounding death. As technology continues to evolve, the collaborative efforts of forensic experts, technologists, and policymakers will be crucial in realizing the full potential of multi-sensor fusion in virtual autopsies.

Keywords: Virtual autopsy, multi-sensor fusion, Forensic science, Post-mortem examinations, Non-invasive, Imaging modalities, Computed tomography (CT), Magnetic resonance imaging (MRI), 3D surface scanning, Forensic investigations

ICAFS-PP-FBD-01: Extraction and Validation of DNA from Hair Sample

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ABSTRACT

For the purpose of identification and individualization, the field of forensic biology studies bodily fluids using DNA and serological techniques. Samples of blood, semen, and saliva taken from physical evidence items or crime scenes are among the materials that are commonly analyzed, though not exclusively. These kinds are commonly produced during the commission of violent crimes like killings, attacks, rapes, and fatalities from hit-and-run incidents. Finding the type of substance present is the ultimate objective. then afterwards establish a personal connection between that substance and that individual using DNA analysis.

DNA extraction from hair follicles is an essential procedure with a wide range of uses in the medical, genealogical, and forensic sciences. By Knowing how this process operates will allow us to unlock a multitude of data that can aid in the investigation of crimes, create fresh approaches to treating illnesses, and track our ancestry that spans the ages. Kits like the QiAamp DNA mini kit and the Nucleospin Tissue kit are used in the current study. Ethylene oxide (EO) is applied to these consumables. This implies that any DNA that could potentially be incorporated into plastic products during manufacturing is rendered inactive. Along with learning about maternity, paternity, and other DNA profiling applications, successful STR profiles are generated.

Keywords: DNA, Forensic biology, Hair, STR

ICAFS-PP-DFS-01: A Review on Deep Fake Technology

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ABSTRACT

Deep fake is generative deep learning algorithm that creates or modifies face features in a super realistic form, in which it is delicate to distinguish between real and fake features. This technology has greatly advanced and promotes a wide range of operations in television channels, video game industries and cinema such as improving visual effects in movies, as well as a variety of criminal activities, such as misinformation generation by mimicking famous people. It started as fun but like any technology, it is being misused. In the beginning these videos could be linked by human eyes. But due to the development of machine learning, it became easier to produce deep fake videos. It has almost become indistinguishable from real videos. Deep fake videos are generally created by using GANs (Generative Adversarial Network) and other deep learning technologies. The peril of this is that technology can be used to make people believe commodity is real when it is not. Smartphone desktop operations like Face App and Fake App are built on this process. These videos can affect a person's integrity. So, identifying and categorizing these videos has come a necessity. This paper evaluates methods of deep fake detection techniques and discuss how they can be modified to get more accurate results to make the internet a safer place.

Keywords: Deep fake, Deep learning, GAN

ICAFS-PP-FPY-01: Tailoring Probation for Recidivism Reduction- A Forensic Science Behavioral Science Approach

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ABSTRACT

Recidivism is a fundamental concept in criminal justice that refers to a person's relapse into criminal behavior. It commonly occurs after a person has faced penalties or undergone intervention for a previous crime. A recent survey reveals a 1.4 percent rise in the recidivism rate over the past two years. This underscores the importance for each individual to commit to avoiding criminal activities in their life. In the effort to decrease the recidivism rate following the grant of probation, a questionnaire was formulated and explained to the individuals with a history of reoffending. The researcher personally administered and collected the responses, assessing their motives, patterns, and character, incorporating Forensic Behavioral Science. Subsequently, the probation granted to each reoffender was analyzed based on data obtained from prisoners, prison management, and several NGOs. It was concluded that probation should be tailored to each individual's behavior, aiming to contribute to the reduction of the recidivism rate.

Keywords: Recidivism, Behavioral, prisoners

ICAFS-PP-FCT-01: A Review on Ink Analysis Through Thin Layer Chromatography

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ABSTRACT

Ink analysis plays a vital part in forensic examinations, historical document preservation and art authentication. Thin layer chromatography (TLC) emerges as an important methodology for unravelling the intricate composition of inks due to its simplicity, cost effectiveness, and versatility. This abstract provides an overview of the application of TLC in ink analysis, emphasizing its significance in decoding complex in mixtures and contributing to the fields of forensics, conservation, and art authentication. Thin layer chromatography involves the separation of ink factors grounded on their differential migrations on a thin layer of adsorbent material generally silica gel or aluminum oxide. the methodology allows for the separation of ink factors by capillary action and enables the visualization of distinct band or spots corresponding to different ink ingredients. this separation is critical for relating the colorful colors, colorings and components present in an ink sample. The forensic applications of TLC in ink analysis include the comparison of questioned documents, determination of origin of inks used in fraudulent conditioning, and the identifications of differences or forgeries. The distinct chromatographic patterns attained through TLC give forensic examiners with precious information for establishing links between documents, relating fake materials, and abetting felonious examination. In conclusion, thin layer chromatography has proven to be a necessary tool in the realm of ink analysis. Its capability to separate and identify ink factors has far reaching implications in forensic examinations, historical document preservations, and art authentication. As technology advances the integration of TLC with other logical ways continuous to enhance the perfection and depth in analysis, opening new avenues for understanding the composition of ink across different surrounds.

Keywords: Thin layer chromatography, separation, authentication

ICAFS-PP-FCT-02: A review on using carbonated water in chromatography – Greener method

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ABSTRACT

Chromatography is a commonly used technique in forensics, biology, chemistry, physics, etc. Through the analysis of a stationary phase and a mobile phase, complicated mixtures can be separated and analyzed using this technique. Typically, organic solvents, which have the potential to be hazardous to both human health and the environment, make up the mobile phase. Green chemistry uses cleaner solvents and materials while reducing waste to lessen the environmental effects of chemical operations and products. Particularly with chromatographic separation, considerable volumes of hazardous organic solvents, bases, acids, and salts are produced as waste byproducts. Greener analytical techniques have been suggested to be developed by CO₂-modified solvents, although they typically feature stationary phases that are resistant to the CO₂-modifier's chemical effects. We now present the effects of pH and concentration of the dissolved CO₂ mobile phase on separations using silica particles functionalized with primary, secondary, and tertiary amines. Now, CO₂-modified (carbonated) water has been used to separate pharmaceutical analytes having carboxylic acid groups, such as ketoprofen, naproxen, and ibuprofen. Retention, Selectivity, and Zeta in Chromatography. Utilizing carbonated water also helps to cut down on the production of waste. Because organic solvents used in chromatography are frequently thrown away after only one use, a large amount of waste is produced. Conversely, carbonated water can be recycled several times without losing its ability to separate substances effectively. In addition to cutting waste, this also lowers solvent disposal expenses. Carbonated water increases the separation efficiency. Sharper peaks and improved resolution can result from the stationary phase and analytes interacting more effectively due to the presence of carbon dioxide bubbles in the water. This can be especially helpful when examining intricate mixtures or minute concentrations of chemicals.

Keywords: Chromatography, carbonated, analytes

ICAFS-PP-FCT-03: Effects of second hand smoking and their importance in forensic investigations

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ABSTRACT

Ink analysis plays a vital part in forensic examinations, historical document preservation and art authentication. Thin layer chromatography (TLC) emerges as an important methodology for unravelling the intricate composition of inks due to its simplicity, cost effectiveness, and versatility. This abstract provides an overview of the application of TLC in ink analysis, emphasizing its significance in decoding complex mixtures and contributing to the fields of forensics, conservation, and art authentication. Thin layer chromatography involves the separation of ink factors grounded on their differential migrations on a thin layer of adsorbent material generally silica gel or aluminum oxide. The methodology allows for the separation of ink factors by capillary action and enables the visualization of distinct bands or spots corresponding to different ink ingredients. This separation is critical for relating the colors, colorings and components present in an ink sample. The forensic applications of TLC in ink analysis include the comparison of questioned documents, determination of origin of inks used in fraudulent conditioning, and the identifications of differences or forgeries. The distinct chromatographic patterns attained through TLC give forensic examiners with precious information for establishing links between documents, relating fake materials, and abetting felonious examination. In conclusion, thin layer chromatography has proven to be a necessary tool in the realm of ink analysis. Its capability to separate and identify ink factors has far reaching implications in forensic examinations, historical document preservations, and art authentication. As technology advances the integration of TLC with other logical ways continuous to enhance the perfection and depth in analysis, opening new avenues for understanding the composition of ink across different surrounds.

Keywords: Thin layer chromatography, ink analysis, examination

ICAFS-PP-CSI-01: Advancements in Sensing Technologies for Autonomous Vehicles in Crime Scene Investigation: A comprehensive review

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ABSTRACT

The integration of autonomous vehicles (AVs) into crime scene investigation (CSI) is a transformative boundary, promising to revolutionize forensic data collection. This abstract probes into the advancement of AVs through the incorporation of state-of-the-art sensors and technologies, with a focus on capturing high-resolution images, 3D scans, and other pertinent data crucial for comprehensive forensic analysis. A comprehensive examination of the current state of AVs in forensic data collection underscores the pressing need for enhanced sensing technologies to overcome existing limitations. The discussion clarifies with an exploration of high-resolution imaging systems, evaluating their potential to provide crystal-clear visuals essential for preserving and scrutinizing crime scene details. The investigation extends to 3D scanning technologies, investigating their capacity to map and recreate crime scenes, offering a nuanced understanding of spatial relationships critical for forensic analysis. LiDAR and radar applications are scrutinized, highlighting their role in boosting AVs' perception capabilities, enabling accurate mapping, obstacle detection, and a deeper comprehension of the crime scene environment. This abstract also addresses the integration of multispectral and hyperspectral sensors, shedding light on their ability to capture data beyond the visible spectrum. These sensors hold promise in identifying trace evidence and subtle details that might elude traditional sensing technologies. Additionally, the exploration of sensor fusion techniques reveals strategies for amalgamating multiple sensors, creating a cohesive and comprehensive data representation that enhances reliability and accuracy. Real-time data processing and analysis take centre stage in the discussion, exploring onboard capabilities for instantaneous data interpretation. Challenges inherent in equipping AVs with advanced sensing technologies, including power consumption and environmental factors, are dissected to offer a holistic understanding of the implementation hurdles. The abstract concludes by envisioning future directions and innovations in sensor development for AVs in CSI, highlighting emerging technologies that hold the potential to redefine forensic capabilities.

Keywords: Autonomous vehicles (AVs), Crime scene investigation (CSI), Forensic data collection, Sensors, technologies, High-resolution images, 3D scans, Current state, Limitations, Imaging systems.

ICAFS-PP-CSI-02: A Compilation Study of On-Scene Investigation Portable Instruments

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ABSTRACT

This review discusses portable instruments for crime scene evidence analysis. These instruments aid forensic officers, SOCOs, and police by providing quick results and support collecting required evidence for detailed analysis without contamination or destruction during transportation. The reviewed devices include handheld Raman spectroscopy, MS, NIR, microchip analyzer, mPAD, FTIR, PSI-MS, XRD, XRPD, XRF, and filter cone spray ionization-MS. Portable devices offer a solution to preserving and analyzing evidence on the spot at crime scenes by speeding up the identification of samples and providing immediate non-destructive analysis while preventing degradation and contamination during transportation, eventually lightening the burden of investigative officers and forensic officers, thereby finally helping in the smooth flow of justice.

Keywords: portable, instrument, microchip, SOCOs , preserving, analyzing, crime scene, Spectroscopy, XRD, XRF, forensic

ICAFS-PP-CSI-03:Forensic Science Implementation in Crime Scene Resolution

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ABSTRACT

This paper highlights the urgent need to fortify forensic science in India's crime scene investigations, given the unpredictable nature of crime rates. Proposing a comprehensive approach, the integration of forensic officers in every police station is recommended, coupled with specialized training emphasizing crime scene preservation protocols. Equipping police stations with essential forensic tools ensures the swift and effective collection of evidence, minimizing the risk of tampering. Increased employment opportunities for forensic experts across the nation further enhance response times.

Simultaneously, the dissemination of knowledge on evidence collection and preservation techniques among law enforcement officials is advocated. Additionally, the paper underscores the significance of incorporating smart surveillance technologies to augment investigative capabilities. This multifaceted strategy aims to bolster India's forensic capacities, contributing significantly to the overall efficiency of the criminal justice system.

Key words: evidence collection, forensic officers, drills and equipments, smart surveillance.

ICAFS-PP-QDF-01: The Effectiveness of Soot Removal Techniques for the Recovery of Fingerprints on Glass Fire Debris in Petrol Bomb Cases

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ABSTRACT

As there is a significant increment of petrol bomb cases when sensitive issues that caused civil unrest in society occurred and lack of research regarding recovery of fingerprints from fire damaged evidence being reported, an initial study was therefore carried out to determine the most suitable method for removal of soot and recovery of fingerprints from glass surfaces. There are three methods carried out to assess the effectiveness of soot-removal techniques which were brushing, 2%NAOH solution and tape lifting. Removal of soot by brushing method is an easy and simple method. The use of NAOH wash solution (2%) also success in removing excess soot covered on glass fragments. Tape lifting method was found to be the most effective method among the three methods. Although brushing is the most effective in laboratory experiment. The prints which were visible after soot removal were lifted directly while prints that were not visible were subjected to enhancement. Favorable results were obtained in varying degrees using each soot removal methods. In laboratory testing, brushing and 2%NAOH solution revealed fingerprints that were visible after removal of excess soot and were lifted directly. As for tape lifting technique, some prints were visible and was successfully lifted and the prints which was not visible were subjected to superglue fuming for effective fingerprint identification.

Keywords: Soot removal, glass, petrol bomb, brushing, NAOH solution (2%), tape lifting

ICAFS-PP-QDF-02: A Review on Skin Diseased Fingerprint Development Through Spatial Domain Filtering Algorithm

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ABSTRACT

Fingerprint plays a vital role in biometric authentication and crime investigation. Skin diseases on fingerprint causes denying biometric authentication. This paved the way to develop techniques and algorithm to develop fingerprint on skin diseased fingerprint. To develop the fingerprint of diseased finger spatial domain filtering algorithm can be used. This algorithm is able to adaptively improve the clarity of ridge and valley structures based on the local ridge orientation and ridge frequency. The major purpose of this review study is to depict how a fingerprint is developed through spatial domain algorithm as it is most widely used and accurate automatic fingerprint verification /identification techniques uses minutiae-based automatic fingerprint matching algorithm. Gabor filter is used for enhancement which gives a good result. The steps taken begin by increasing local image contrast by applying Adaptive Histogram Equalization (AHE) corrected by Gabor filter and binarization method. Image quality improvement was measured by Peak Signal to Noise Ratio (PNSR) and Mean Square Error (MSE).

Keywords : Spatial domain filtering algorithm, fingerprint, Gabor filter

ICAFS-PP-QDF-03:Ear Forensics: A Recent Approach in Personal Identification

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ABSTRACT

Identifying a person is one of the most important aspects of forensic science. There are many physiological features that have been proven to be highly discriminate among individuals. Biometrics play an important role in identifying a person. The most common biometrics are fingerprint, palm print, retina and iris recognition. Fingerprint and Iris are considered to be more accurate biometrics than the face. However, the face is easier to use in surveillance situations where fingerprint or iris capture is not possible. On the other hand, the face alone is not as precise and flexible as it could be for this scenario. In addition to these limitations, an ear image can be obtained in a similar way as a face image. So, ear can be potential evidence in many instances such as CCTV footages, side range camera images, identification parameter for prisoners and new born babies. A lot of researchers have argued that a human ear is so unique to each individual that it can be used as biometrics. Currently in the technological era, external ear can be used for tracking, surveillance and identification purposes. Several studies have been reported regarding the uniqueness and heredity of external ear.

Keywords: External Ear, Personal identification, biometrics

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